

Chapter 6: Effects during Construction of the Project

This chapter discusses how construction of the Preferred Alternative and SDEIS options would affect the natural and built environment in the project area. The No Build Alternative is not discussed in this chapter because it would not involve any construction and would not have construction effects. The Preferred Alternative and SDEIS options are compared to the extent that their construction methods, timing, and/or effects differ from one another.

Specific construction activities would affect portions of the SR 520 project area for varying amounts of time. All of the construction effects would be temporary, lasting less than 5 years, although some would last for several years. Areas outside the SR 520 right-of-way would be restored to their original condition as soon as possible after construction.

6.1 Transportation

Construction of the project, including demolition of structures and use of some areas for contractor staging, would require adjustments to the existing lanes and intersections on roadways. Construction equipment and activities would occupy a portion of the transportation right-of-way and construction truck traffic would be present on the roadways. These could affect the capacity of the roadway and pose distractions to drivers. During off-peak traffic periods, some travelers would encounter lane closures. Some local street delays can be expected during reconstruction of the Montlake Boulevard East bridge over SR 520, but during most of the construction period, congestion is expected to be similar to existing conditions due to temporary roadway improvements.

The most substantial construction effects would be related to closure of the Lake Washington Boulevard ramps to and from SR 520. When the ramps are closed, more traffic would travel through the Montlake/SR 520 interchange. There is limited transportation right-of-way available in the Montlake interchange area for construction activities to take place, and existing transportation conditions are congested. WSDOT would make improvements along Montlake Boulevard during construction to accommodate the temporarily increased activity and traffic.

How were construction effects evaluated for the project?

WSDOT analyzed transportation conditions with the presence of construction activities and the resulting travel constraints in the project area. Analysts evaluated the effects of traffic revisions that would change the way people access SR 520 and travel through the project area on the local streets. WSDOT performed traffic operations analyses for various construction scenarios that would be likely to exist at different times during construction, and performed intersection level of service (LOS) analysis to evaluate peak-hour operations on the local streets. WSDOT also conducted a simulation analysis to estimate changes in travel time for transit along Montlake Boulevard and a highway capacity analysis to estimate changes in LOS on SR 520 during construction. WSDOT used existing traffic volumes for the analysis without assuming a potential reduction in general-purpose traffic demand that could result from tolling during construction. In addition to the traffic operations analysis, the team identified changes to nonmotorized access, transit access, and parking facilities that would be likely to occur during construction of the project.

Most of the transportation conditions during construction would be similar under the Preferred Alternative and SDEIS options A, K, and L. Options K and L would have additional unique effects due to construction of the tunnel under the Montlake Cut, the single-point urban interchange, and the

intersection of NE Pacific Street and Montlake Boulevard NE. The following sections describe the common construction effects, followed by the unique effects of Options K and L, where applicable.

How would construction affect traffic operations?

Traffic operations would be most affected by the changes in the configuration of roadway lanes and intersections, which would be required in the Montlake interchange area as construction progresses. The changes would be similar under the Preferred Alternative and SDEIS options A, K, and L. When the Lake Washington Boulevard ramps are closed, more traffic would go through the Montlake interchange, resulting in some changes in local street traffic operations. Temporary roadway capacity improvements during construction would allow traffic conditions to remain similar to existing conditions throughout most of the construction period. However, increased traffic from Lake Washington Boulevard, in combination with the presence of construction activities along Montlake Boulevard, is expected to increase delay at the Montlake interchange during three periods of construction; this is described in more detail below.

Road Closures and Traffic Volumes

Throughout construction, there would be intermittent short-term lane closures along ramps, local streets, and the highway. These closures would be limited to nights and weekends when traffic volumes are lowest. Lane closures are not expected to substantially affect traffic operations during off-peak travel times. However, travelers can expect intermittent delays and, during isolated construction activities, some travelers would need to use alternate routes to reach their destinations. WSDOT would notify the public of all times when travel through the project area could be disrupted.

Traffic patterns on local streets would change periodically as the stages of construction progress, particularly in the Montlake interchange area. The major construction stages that affect traffic would last for approximately 1 to 2 years each and result in completion of major project elements in designated areas. After each stage, construction activities would move to new areas. The configurations of roadways, ramps, and intersections would be adjusted before each stage to allow space for workers and equipment. These adjustments would increase traffic volumes on some roadway segments, and decrease it on others.

Table 6.1-1 shows the expected traffic volumes at several locations in the Montlake interchange area during construction of the Preferred Alternative, and Options A, K, and L. Traffic volumes at other locations are not expected to change substantially. The most substantial changes in traffic volumes would occur when the Lake Washington Boulevard ramps are closed beginning in year 3. Before the north side of the west approach bridge can be constructed, the westbound off-ramp to Lake Washington

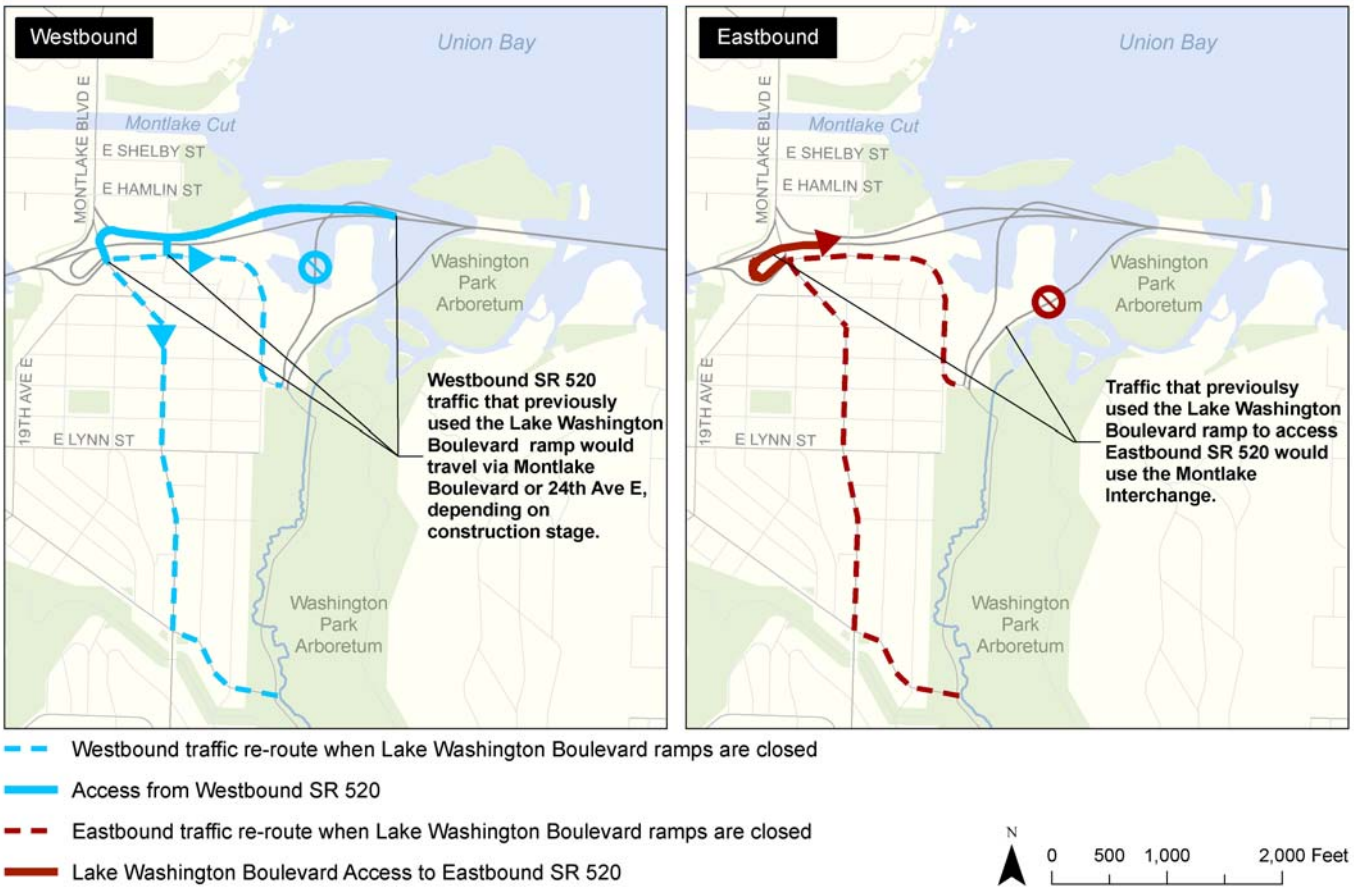
Boulevard must be closed and removed to make room for new construction. Later, the eastbound on-ramp would be closed to allow the south side of the west approach bridge to be constructed.

Table 6.1-1. Expected Traffic Volumes during Construction (AM and PM peak hours)

Location	Existing & Years 1-2		Years 3-4		Years 5-6		Year 7	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Eastbound Montlake Boulevard On-ramp	840	890	840	890	1,470	1,240	0	0
Eastbound Lake Washington Boulevard On-ramp	630	350	630	350	0	0	0	0
Westbound Lake Washington Boulevard Off-ramp	340	440	0	0	0	0	0	0
Westbound Montlake Boulevard Off-ramp, East of 24th Avenue East	670	730	1,010	1,170	1,010	1,170	2,480	2,410
Westbound Montlake Off-ramp, East of Montlake Boulevard East	670	730	1,010	1170	670	730	1,640	1,680
Montlake Boulevard East, North of SR 520	4,140	5,070	4,140	5,070	4,140	5,070	4,140	5,070
Montlake Boulevard East, North of Lake Washington Boulevard	3,350	3,830	3,690	4,270	3,350	3,830	3,340	3,400
Montlake Boulevard East, South of Roanoke Street	1,850	2,000	1,850	2,000	2,010	2,070	2,010	2,070
Lake Washington Boulevard, East of Montlake Boulevard East	760	840	960	1,060	1,230	1,120	730	830
Lake Washington Boulevard, East of 24th Avenue East	760	840	960	1,060	1,430	1,340	1,430	1,340
Lake Washington Boulevard, South of SR 520 Ramps	1,590	1,400	1,590	1,400	1,430	1,340	1,430	1,340

When the ramps are closed, traffic that currently uses them would transition to using the Montlake interchange, which would be the permanent location for access to and from SR 520 in the Montlake vicinity. Drivers who currently use the Lake Washington Boulevard ramps would reach the Montlake interchange via Lake Washington Boulevard or 24th Avenue East (Exhibit 6.1-1).

Exhibit 6.1-1. **Lake Washington Boulevard Ramp Detours**



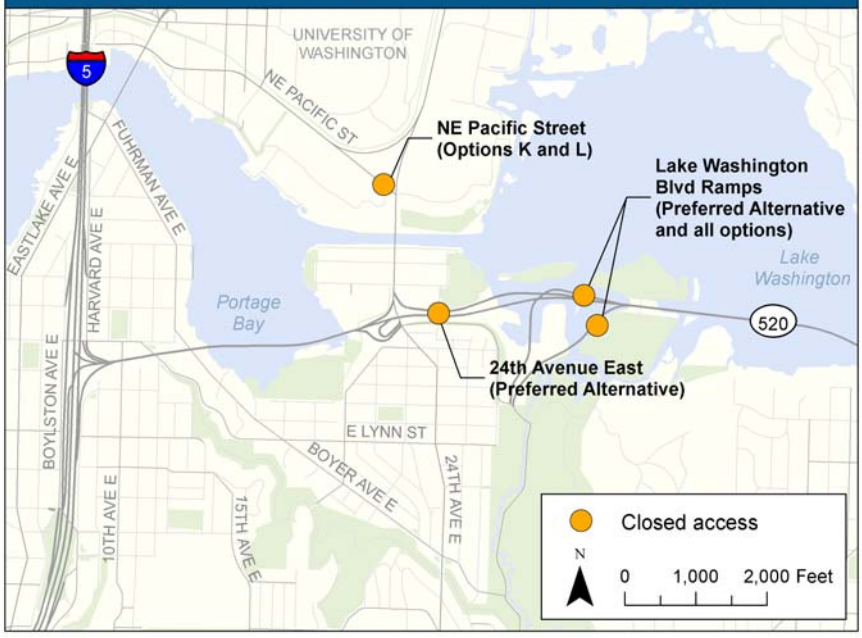
WSDOT would make several capacity improvements to the intersections on Montlake Boulevard before closing the Lake Washington Boulevard ramps. The improvements would accommodate the expected increases in traffic volumes and minimize substantial delays that otherwise would occur on Montlake Boulevard at SR 520. These improvements would help offset the effects of the Lake Washington Boulevard ramp closure. The proposed changes in the Montlake area include the following:

- Add capacity on the westbound off-ramp at Montlake by providing two dedicated turn lanes. In addition, a signal would be added to the intersection of the Montlake Boulevard/SR 520 westbound ramp.
- Add capacity on Montlake Boulevard across SR 520 to provide two northbound through lanes, three southbound through lanes, and southbound right-turn and left-turn lanes.
- Include dual northbound left-turn lanes from East Montlake Place East to the SR 520 eastbound on-ramp.
- Add an additional general-purpose lane on the SR 520 eastbound on-ramp at Montlake Boulevard.

- Add a westbound lane on Lake Washington Boulevard at the intersection with Montlake Boulevard.
- Relocate the transit stops on Montlake Boulevard at SR 520.

In addition to the Lake Washington Boulevard ramps, there would be one long-term, road closure common to construction of the Preferred Alternative and Options A, K, and L (Exhibit 6.1-2). The 24th Avenue East bridge across SR 520 north of Lake Washington Boulevard would be closed to all traffic for approximately 1 year while the bridge is demolished and reconstructed. The 24th Avenue East bridge provides access to the Museum of History and Industry (MOHAI), East Montlake Park, and McCurdy Park. The MOHAI facility would be moved prior to demolition of the bridge. A potential temporary alternative access to parking at East Montlake Park could be provided. Temporary closure of the 24th Avenue East bridge would not substantially affect traffic operations. When the new bridge is opened in conjunction with the new westbound off-ramp, it will alleviate some traffic congestion on Montlake Boulevard East. Drivers exiting from westbound SR 520 will be able to turn left on 24th Avenue East to access Lake Washington Boulevard or East Montlake Place East and travel south, without going through the Montlake interchange.

Exhibit 6.1-2. **Road Closures for Preferred Alternative and Options A, K, and L**



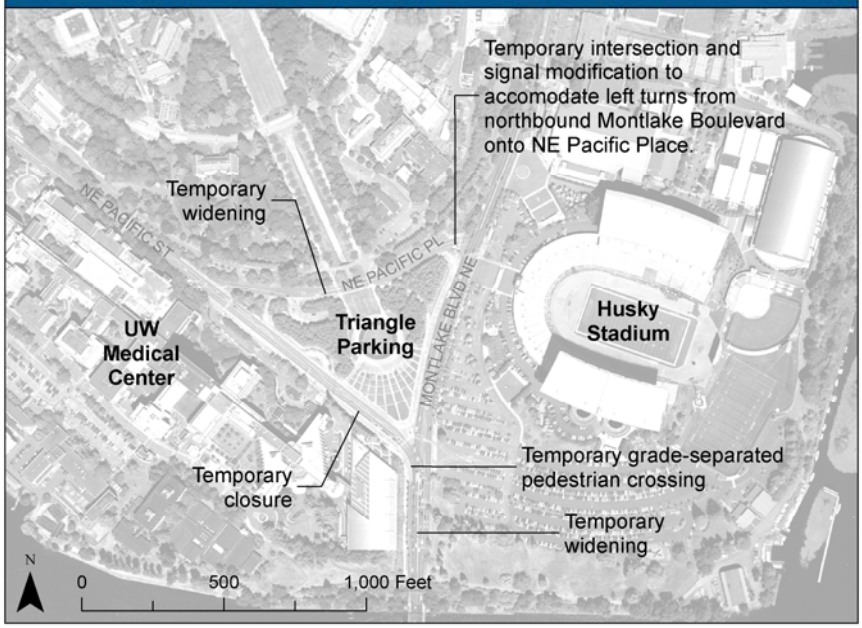
One notable revision to construction plans since publication of the SDEIS is that the Delmar Drive East bridge would no longer be closed during construction. In the SDEIS, the existing Delmar Drive East bridge over SR 520 was assumed to be closed for approximately 12 months under all options to accommodate construction on SR 520, and on the 10th Avenue East and Delmar Drive East lid. This closure would have required traffic to detour on other local and residential streets, increasing travel times for all

vehicles and nonmotorized travelers. The Delmar Drive East bridge closure would not be required for the Preferred Alternative or the SDEIS options.

Closure Unique to Options K and L

Options K and L would require one closure that is not needed for the Preferred Alternative or Option A. A portion of NE Pacific Street, just west of Montlake Boulevard in front of the University of Washington (UW) Medical Center, would be closed for up to 12 months to allow for lowering of the Montlake Boulevard/Pacific Street intersection. During this closure, traffic from NE Pacific Street would be detoured onto NE Pacific Place. Several widening improvements would be made to NE Pacific Place and its intersection with Montlake Boulevard to accommodate the additional traffic and turning vehicles (Exhibit 6.1-3). These improvements would include temporary widening of Montlake Boulevard NE and temporary widening of NE Pacific Place. New right- and left-turn pockets would be added to the Montlake Boulevard NE/NE Pacific Place intersection to accommodate turning vehicles. A westbound left-turn pocket from NE Pacific Place to the UW Medical Center would also be added for emergency vehicles and hospital visitors.

Exhibit 6.1-3. **Closure of NE Pacific Street under Options K and L**



Local Streets

WSDOT evaluated the local street traffic conditions that would be likely during construction. Due to the variations in volumes described above, traffic operations would also vary during the construction timeline at some locations. The results of the traffic operations analysis for affected intersections are shown in Table 6.1-2, in terms of LOS. The results are

grouped by periods of time when construction activities and traffic operations are expected to be relatively consistent. As with all major projects, the conditions associated with construction could change. This could result in somewhat different timing of effects, but the magnitude and duration of effects at specific locations should not change substantially.

Table 6.1-2. Traffic Conditions in the Montlake Area during Construction

Intersection	Existing & Years 1-2 LOS	Years 3-4 LOS	Years 5-6 LOS	Year 6 LOS	Year 7 LOS
AM Peak Hour					
Montlake Boulevard and East Roanoke Street	B	B	B	B	B
Montlake Boulevard and Lake Washington Boulevard/Eastbound SR 520 Ramps	E	E	E	F	C
Montlake Boulevard and SR 520 westbound Ramps	B	C	A	A	B
Montlake Boulevard and East Hamlin Street	A	A	A	A	A
Montlake Boulevard and East Shelby Street	B	B	B	B	C
24th Avenue East and East Lake Washington Boulevard	N/A	N/A	B	B	B
24th Avenue East and SR 520 westbound Off-Ramp	N/A	N/A	N/A	A	C
PM Peak Hour					
Montlake Boulevard and East Roanoke Street	B	B	A	A	B
Montlake Boulevard and Lake Washington Boulevard/EB SR 520 Ramps	E	E	D	E	D
Montlake Boulevard and SR 520 Westbound Ramps	B	C	A	A	B
Montlake Boulevard and East Hamlin Street	A	A	A	A	A
Montlake Boulevard and East Shelby Street	D	D	D	D	D
24th Avenue East and East Lake Washington Boulevard	N/A	N/A	B	B	B
24th Avenue East and SR 520 westbound Off-Ramp	N/A	N/A	N/A	A	C

N/A = not applicable

The construction activities affecting local street operations are planned to begin in the third year of construction, so traffic operations during the first 2 years of construction would be the same as existing conditions.

The results in Table 6.1-2 show that most intersections would function similarly to existing conditions, and better in some cases because the temporary intersection improvements would be included. Delay would increase at three locations: Montlake Boulevard East/SR 520 westbound ramps and Montlake Boulevard East/Lake Washington Boulevard/ Eastbound SR 520 ramps and Montlake Boulevard East/East Shelby Street. The increased delay at these three locations would not happen at the same time.

The moderate increase in delay at the Montlake Boulevard East/SR 520 westbound ramps is indicated by the change from LOS B to C during years three and four. The westbound Lake Washington Boulevard off-ramp would be closed in the third year of construction, and traffic that previously used the ramp would exit at Montlake Boulevard. A traffic signal would be provided to allow left turns onto southbound Montlake Boulevard. The additional left-turning traffic from the off-ramp would mean that traffic on Montlake Boulevard would need to make a stop that is not required under the existing conditions. The delay at this location would be alleviated when the 24th Avenue East bridge is opened in year 5.

Increased delay is also expected at the intersection of Montlake Boulevard East/Lake Washington Boulevard/Eastbound SR 520 ramps due to reconstruction of the Montlake Boulevard bridge. This is indicated by the change from LOS E to F during the AM peak in year 6 of construction. Montlake Boulevard East would be shifted east onto a portion of the new lid while the bridge is demolished and rebuilt. Due to the area occupied by construction, temporary capacity improvements on Montlake Boulevard would be limited. The traffic destined for the eastbound on-ramp from northbound Montlake Place East and from Lake Washington Boulevard would require through traffic on Montlake Boulevard to stop for a longer time than they currently do, resulting in an overall increased delay for vehicles traveling through this intersection during year 6.

A moderate increase in delay is expected at a third location during the last year of construction. The intersection of Montlake Boulevard and East Shelby Street is expected to change from LOS B to C during the morning peak. During that time, the loop ramp from Montlake Boulevard to eastbound SR 520 would be closed. Instead of using the loop ramp, vehicles on southbound Montlake Boulevard would make a left turn to access the temporary on-ramp. This change of traffic pattern would result in a slightly increased delay, but would not substantially affect overall traffic operations.

KEY POINT

Road Closures and Detours

The Preferred Alternative and the SDEIS options would close the Lake Washington Boulevard ramps for a period of time during construction. Traffic from Lake Washington Boulevard would be detoured to the ramps at Montlake Boulevard.

Options K and L would close NE Pacific Street for 9 to 12 months. Detour traffic would use the Montlake Boulevard NE/NE Pacific Place intersection to make any turning movements.

For Options K and L, temporary access for emergency vehicles to the UW Medical Center may be provided from Montlake Boulevard along an existing paved pedestrian trail that runs along the south side of the medical center.

Local Street Effects Unique to Options K and L

The transportation effects of construction under Options K and L would be similar to those of the Preferred Alternative and Option A near I-5, the 10th Avenue East and Delmar Drive lid, and the SR 520/Montlake interchange. However, reconstruction of the Montlake Boulevard NE/NE Pacific Street intersection under Options K and L would have much greater adverse effects on traffic operations and transit facilities, particularly near the Montlake Triangle. The effects would result from the road closure and traffic shifts that would be required to modify the Montlake Boulevard NE/NE Pacific Street intersection, as well as the amount of truck traffic required for construction of the new interchange.

The closure of NE Pacific Street would increase vehicle delays substantially at the intersection of NE Pacific Place/Montlake Boulevard NE. This intersection would operate at LOS F during the morning and afternoon peak hours, and long queues would form on eastbound NE Pacific Place. Much of the delay would be experienced by vehicles traveling to and from NE Pacific Street and Montlake Boulevard NE. Table 6.1-3 shows existing peak-hour intersection traffic conditions in the area of NE Pacific Street and the estimated conditions during construction under Options K and L.

Table 6.1-3. Traffic Conditions in the Montlake Boulevard/Pacific Street Area during Construction of Options K and L

Intersection	Existing LOS	Year 1 LOS	Years 2-3 LOS	Years 4-5 LOS
AM Peak Hour				
Montlake Boulevard/ NE Pacific Street	C	B	B	A
Montlake Boulevard/ NE Pacific Place	A	B	B	F
NE Pacific Street/ NE Pacific Place	B	B	B	C
PM Peak Hour				
Montlake Boulevard/ NE Pacific Street	D	D	C	A
Montlake Boulevard/ NE Pacific Place	C	C	C	F
NE Pacific Street/ NE Pacific Place	C	C	C	B

Note: Adding the suboptions to Option K or L would not change the traffic conditions listed in this table.

Because this is a heavily used transit route, many transit users would be affected. Sound Transit is constructing a station for the University

Link light rail system at the UW's Husky Stadium, just east of the intersection of Montlake Boulevard NE and NE Pacific Street. Although most major construction activities at the UW station would be complete prior to the closure, vehicles accessing the station would also experience the delays described above.

Freeways

Traffic conditions on the freeways would remain similar to existing conditions during the most congested times of the day. Intermittent delays could be expected due to isolated construction events, but activities that close lanes on the highway would not be allowed during the daytime. When the Lake Washington Boulevard ramps are closed and when other ramps are shifted temporarily, the locations of existing congestion on SR 520 would change, while overall delay would remain much like it is today.

How would construction haul routes affect traffic?

As discussed in Chapter 3, local jurisdictions can limit the use of nonarterial streets for truck traffic; therefore, efforts were made to identify designated arterial streets for potential use as haul routes. Final haul routes will be identified by the contractor(s) in cooperation with local jurisdictions, and all necessary permits will be obtained as required by law. Most of the haul routes would be common to the Preferred Alternative and Options A, K, and L. Additional potential haul routes are identified for SDEIS Options K and L due to the greater excavation and construction needed for the new single-point urban interchange. For the SDEIS options and analysis, some nonarterial residential streets were assumed to be affected by haul truck traffic during construction of nearby facilities. Two of these streets are no longer assumed to be used during construction of the Preferred Alternative and the SDEIS options, based on refinements to construction plans. East Miller Street and 11th Avenue East would not experience construction truck traffic because the SR 520 crossing on Delmar Drive East would be kept open throughout construction. Two nonarterial residential streets, East Shelby Street and East Hamlin Street, could be affected by construction of the new interchange under Options K and L, as was previously described in the SDEIS.

Most of the construction truck trips on local streets would use Montlake Boulevard to access SR 520. Other arterials would be affected, but the estimated number of truck trips along these arterials would be relatively low compared to overall arterial volumes, as described below.

To minimize truck traffic on Montlake Boulevard, a construction access ramp is planned directly into the construction zone from the SR 520 westbound Montlake off-ramp. Outbound trucks could also re-enter the westbound Montlake off-ramp near the intersection with Montlake Boulevard. These trucks could go either straight to access the SR 520

westbound on-ramp or turn left and travel to the SR 520 eastbound on-ramp to reach their final destinations.

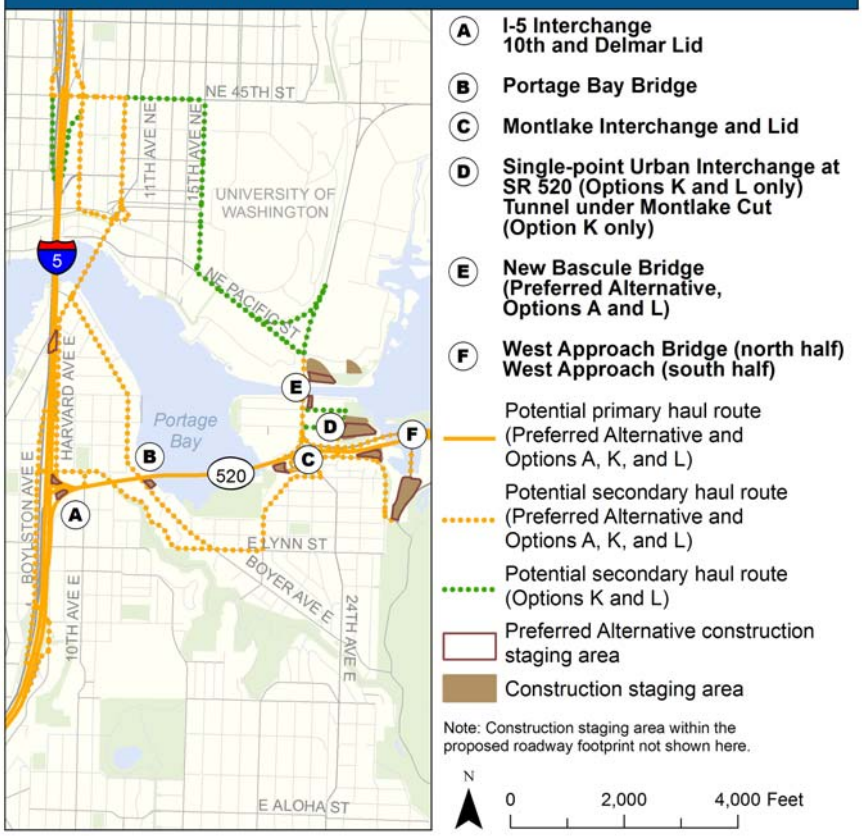
Based on current construction schedules, excavation and tunneling of the UW light rail station is scheduled to be completed in 2013, and major construction elements, including pile-driving, completed by the end of 2014. Haul traffic for construction of the UW station is expected to be completed before the end of 2015. The SR 520, I-5 to Medina project does not currently identify any active haul routes north of the SR 520/Montlake Boulevard interchange until 2016. However, some station construction may be ongoing at the time the Lake Washington Boulevard ramps are closed, and some Sound Transit construction traffic is expected through the interchange. The current construction schedules for the two projects show that there would not be concurrent haul route traffic on Montlake Boulevard NE between the SR 520 interchange and areas to the north. Coordination between WSDOT and Sound Transit has been initiated to minimize project conflicts and concurrent construction effects, and will continue throughout project construction.

WSDOT updated some haul route assumptions based on comments received on the SDEIS and coordination with stakeholders. Some locations of potential truck traffic were revised or eliminated and road closures were revised. The analysis of construction truck effects was refined to more clearly depict the estimates of construction truck traffic at specific locations in the project vicinity.

Revisions of the haul route assumptions include removal of routes through a portion of north Capitol Hill on East Miller Street and 11th Avenue East, and along Boyer Avenue East between East Lynn Street and 24th Avenue East. Construction trucks on East Montlake Place East are not expected to travel south of East Roanoke Street. Also in the north Capitol Hill area, closure of the Delmar Drive East bridge at SR 520 is no longer planned. The assumed locations of potential haul routes are shown in Exhibit 6.1-4. The staging areas that would require truck access via the haul routes are also shown on the exhibit.

Some local arterial streets on the Eastside would need to be used on a limited basis during construction of the Evergreen Point Bridge and Eastside transition area. Most trucks would access the project site directly from the freeway via temporary construction entrances. During approximately the last 18 months of construction, direct truck access to eastbound SR 520 would be unavailable because of roadway construction east of the site. The SR 520, Eastside Transit and HOV project will need to close the access to complete construction of the roadway in that area. Trucks would still enter the work site directly from SR 520, but would need

Exhibit 6.1-4. **Potential Haul Routes**



to leave the site along local streets to return to SR 520. Most trucks would arrive loaded and leave the site unloaded.

Average Daily Construction Trucks

The estimates for average daily trucks represent the volume of construction trucks that could be expected to pass each location on a typical day when the haul route is in use. Volume is a traffic term that refers to the number of vehicles passing by a location on the road during a given amount of time.

The volumes reported in this section reflect the sum of both travel directions. This means that one project truck would be counted once on the way to the site and once on its return trip away from the site. The typical day-to-day volumes would vary from the reported averages over the duration of the project depending on the types of construction activities in progress. On intermittent days of high activity, the construction truck volumes would be much higher than the typical daily average. This is referred to as peak construction, which is described separately below.

The construction truck estimates in the SDEIS described the number of truck trips that would be generated by major construction elements of the project. The potential volumes at specific locations on the roadways were not shown in detail. Since publication of the SDEIS, WSDOT developed construction truck estimates for the Preferred Alternative and refined the

construction truck estimates to show the potential volumes at specific roadway locations in the project vicinity. The project truck estimates for Options A, K, and L are unchanged from the SDEIS.

Local Streets

The volumes of construction trucks on local streets are shown in Table 6.1-4 as a comparison of project truck traffic estimates to the existing truck traffic. The estimates are for construction activities that would be common to the Preferred Alternative and Options A, K, and L. Traffic studies typically describe truck volumes as a percentage of the total vehicle volumes. The percentages of trucks generated by the project are shown in comparison to the percentages for the existing conditions at each location. This shows how the project trucks would relate to the overall traffic conditions in the project vicinity. The volume of trucks on typical urban arterial streets is in the range of 2 to 3 percent of total vehicles, which is reflected in the data for most locations around the project. During typical construction days, the project would add trucks amounting to less than 1 percent of total traffic at any location.

Table 6.1-4. Estimated Daily Construction Truck Volumes, Common to Preferred Alternative and SDEIS Options

Route Segments	Existing Daily Vehicle Volume	Existing Daily Trucks & Buses	Existing % Trucks	Project Average Daily Trucks	Project Average % Trucks
Boyer Avenue East, South of SR 520, and East Lynn Street	5,700	125	2.2	15	0.3
East Roanoke Street and Delmar Drive East	6,000	130	2.2	25	0.4
Harvard Avenue East, North of East Roanoke Street	17,640	690	3.9	15	0.1
Boylston Avenue East, South of East Roanoke Street	13,700	340	2.5	25	0.2
East Roanoke Street, West of Montlake Boulevard	4,630	140	3.0	20	0.4
Montlake Boulevard East, North of East Shelby Street	57,350	1,410	2.5	10	< 0.1
Montlake Boulevard East, North of Lake Washington Boulevard	33,180	920	2.8	25	0.1
Lake Washington Boulevard, East of Montlake Boulevard East	7,230	90	1.2	30	0.4
NE 24th Street, West of 84th Avenue NE	3,500	70	2.0	20	0.6
84th Avenue NE, at SR 520	7,790	220	2.8	2	< 0.1
NE 28th Street, East of 84th Avenue NE	4,390	60	1.4	5	0.1
92nd Avenue NE, South of SR 520	5,000	90	1.8	20	0.4

Construction Truck Effects Unique to Options K and L

The construction truck effects of Options K and L would be similar to the Preferred Alternative and Option A for many elements of the project. As described above, construction of the single-point urban interchange under both options, and the tunnel under option K, would require more earthwork and concrete construction. Both of these activities would require a high frequency of construction trucks, resulting in higher volumes under Options K and L, in addition to those required under the Preferred Alternative and Option A. The additional project average daily trucks under Options K and L are shown in Table 6.1-5, along with the haul route locations that would be affected.

Table 6.1-5. Estimated Daily Construction Truck Volumes Unique to Options K and L

Construction Element	Project Average Daily Trucks		Affected Haul Route Locations
	Option K	Option L	
Single-point Urban Interchange at SR 520 (Options K and L only)	50	13	East Shelby Street and East Hamlin Street, East of Montlake Boulevard
Tunnel under Montlake Cut (Option K only)	17	N/A	Montlake Boulevard East, North of Lake Washington Boulevard Lake Washington Boulevard, East of Montlake Boulevard East

N/A = not applicable

Regional Freeway System

The number of construction tucks on the freeway system under the Preferred Alternative would be similar to what was assumed for Option A in the SDEIS. Options K and L had higher truck estimates than the Preferred Alternative and Option A because of the volumes of excavation and concrete required to build the single-point urban interchange. Option K would result in the most truck traffic due to additional excavation of the tunnel under the Montlake Cut. On freeways, the existing total vehicle volumes including trucks and buses are much greater than on arterial streets, so the relatively minor additional volume of project trucks would not have a substantial effect. Most construction trucks would travel during off-peak traffic conditions because road congestion results in delayed arrivals that would reduce construction productivity.

The estimated volumes of construction trucks on freeways under the Preferred Alternative are shown in Table 6.1-6, alongside the existing total vehicles and existing trucks and buses. The estimates are shown for average construction days and peak construction days. Peak construction is discussed in more detail in the next section. The estimates for both are substantially less than the existing daily volumes of trucks and buses.

Table 6.1-6. Preferred Alternative Estimated Freeway Truck Volumes per Day

	Existing Weekday		Preferred Alternative Construction	
	Total Vehicles	Trucks & Buses	Average Daily Trucks	Peak Daily Trucks
SR 520, Portage Bay	104,100	4,100	60	350
SR 520, Lake Washington	115,000	4,400	60	350
SR 520, Medina	115,000	4,400	110	590
SR 520, 108th Avenue NE	113,300	4,400	120	590
I-5, North Seattle	216,600	21,700	50	340
I-5, Downtown Seattle	247,800	24,800	50	340
I-405, Kirkland	193,300	7,700	50	240
I-405, Bellevue	206,200	8,300	50	240

Most of the construction trucks would reach the project area from the west via I-5, particularly for activities on the west side of Lake Washington. For the floating bridge and Eastside transition area, most trucks would arrive from the east. Of the total project trucks, approximately 75 to 85 percent would travel on SR 520 to reach the work sites. About 65 percent would travel on I-5, and 30 percent would use the I-405 corridor. The existing volumes of trucks and buses amount to about 4 percent of total daily vehicles on SR 520 and I-405, and about 10 percent of total daily vehicles on I-5. On average construction days, the trucks added to freeways by the project would be negligible at all locations. Haul routes and truck traffic resulting from project construction are not expected to affect I-90. For comparison, Table 6.1-7 shows the estimates of peak construction trucks on the freeways under Options A, K, and L.

Peak Construction Trucks

Under the Preferred Alternative and Options A, K, and L, some construction activities such as concrete placement would require much more frequent arrivals of trucks than what would be observed on typical

Table 6.1-7. Summary of Truck Estimates for Options A, K, and L

Regional Freeway	Estimated Number of Peak Construction Truck Trips per Day		
	Option A	Option K	Option L
SR 520	350	620	420
I-5	268	403	303
I-405	187	323	222

days of construction. These activities are infrequent, requiring much work and preparation on the site between occurrences. Since this high-production work requires substantial effort and above-average construction truck activity, it is referred to as peak construction activity. The term, *peak construction*, is unrelated to peak hour or peak period traffic discussed elsewhere in the Final EIS. The effects of peak construction are described for local streets and freeways in the following sections.

On days when peak construction activities occur, the volume of project trucks added to local streets would be similar to the existing volumes of trucks and buses at most locations. The additional trucks would range from 2 to 4 percent of existing vehicle volumes. One location, East Roanoke Street at Montlake Boulevard East, is expected to have more than 4 percent added trucks because of its proximity to work bridges on the south side of the Portage Bay Bridge. Additional trucks at that location are estimated to be about 6 percent of existing vehicle volumes. Of the remaining locations, those with truck traffic near the high end of the 2 to 4 percent range would be Lake Washington Boulevard East in Montlake and Boyer Avenue East near Portage Bay. The added trucks on Montlake Boulevard East during peak construction would be just under 1 percent at the interchange and less than 0.5 percent in the Shelby-Hamlin area. At the Eastside locations, additional trucks during peak construction would be less than 3 percent of existing vehicle volumes. These levels of additional truck traffic would not substantially affect local street delay compared to existing conditions.

During peak construction days, the estimated additional trucks on the freeways would amount to 0.5 percent or less of total daily vehicles. The additional trucks would not affect freeway traffic operations in comparison to existing conditions.

KEY POINT

Construction Effects on Transit

The Preferred Alternative and all options would intermittently close the Montlake Freeway Transit Station, and relocate transit stops on Montlake Boulevard. Options K and L would temporarily relocate several transit stops on NE Pacific Street and Montlake Boulevard.

How would construction affect transit operations?

Construction would affect transit stations and associated bus operations along SR 520, as well as several bus stops on local streets in the construction zone. Road closures, lane shifts, and intersection modifications would affect existing transit facilities and require service adjustments or other accommodations to maintain operations. As with other transportation elements, the transit effects in most areas during construction would be similar for the Preferred Alternative and Options A, K, and L. Options K and L would have additional unique effects because of construction of the tunnel under the Montlake Cut, the single-point urban interchange, and the intersection of Montlake Boulevard NE and NE Pacific Street. The following sections describe the common construction effects, followed by the unique effects of Options K and L where applicable.

Montlake Freeway Transit Station

Under the Preferred Alternative and Options A, K, and L, the Montlake Freeway Transit Station on SR 520 would be permanently closed after construction is completed. The station would remain open during construction, but may be closed for short periods of time to accommodate construction activities.

During periods of closure, riders who travel from the east side of Lake Washington and currently use the station for access to Montlake or the University District would not be able to use any of the westbound SR 520 bus routes. Instead, they would need to board a bus on one of the University District routes. Riders who do not already use a University District route would need to transfer buses at one of the SR 520 freeway transit stations on the east side of Lake Washington. Similarly, riders who travel from Montlake or the University District to the Eastside would need to use one of the University District routes on SR 520 and might need to transfer at one of the freeway transit stations. Those who transfer to and from local routes on Montlake Boulevard could do so near East Shelby Street on Montlake Boulevard, or on NE Pacific Street by the UW Medical Center. Some riders might have increased walking distances to reach the nearest stop, while others would have reduced distances.

During closures, riders who use the Montlake Freeway Transit Station for travel to and from downtown Seattle would not be able to use the SR 520 routes. They would need to use local bus routes through the University District and Eastlake or through Capitol Hill. Starting late in year 5 of construction, they would also be able to use light rail.

Eastside Freeway Transit Station

During closures of the Montlake Freeway Transit Station, the Eastside freeway transit stations at Evergreen Point and 92nd Avenue NE will be essential transfer points for riders who currently transfer at Montlake. Both of the transit stations currently provide substantial transfer functions. Sufficient capacity for the additional transfer activity must be available at these locations. WSDOT is coordinating the construction activities along SR 520 to provide the needed capacity throughout construction of the SR 520, I-5 to Medina project. Earlier construction plans, as described in the SDEIS, assumed that the Evergreen Point Freeway Transit Station would be closed for 4 to 6 months during construction. Current plans call for the station to be closed intermittently during construction of the Eastside transition area.

Montlake Boulevard Transit Stops

Under the Preferred Alternative and Options A, K, and L, the bus stops on Montlake Boulevard at SR 520 would need to be relocated during construction. The current northbound bus stop at the Montlake

Boulevard/SR 520 westbound ramp termini serving northbound routes would be combined with the existing bus stop at Montlake Boulevard/Shelby Street. The southbound stop on Montlake Boulevard at the eastbound off-ramp could be relocated north to the intersection with East Shelby Street until construction is complete.

Pacific Street Transit Stops

The UW transfer point located on NE Pacific Street in front of the UW Medical Center provides access to the medical center, the main UW campus, and Husky Stadium. The stops on NE Pacific Street would not be affected by the Preferred Alternative or Option A, but would be affected by Options K and L as described in detail below.

10th Avenue East

The bus stop on southbound 10th Avenue East at East Roanoke Street is located on the existing bridge over SR 520. The stop would remain near its current location during construction, but it would be moved to a nearby temporary location when the bridge is demolished. This would not substantially affect access to transit or transit operations.

Electric Trolley Buses

Construction of the Preferred Alternative would affect trolley bus operations on 10th Avenue East and Montlake Boulevard. Traffic on 10th Avenue East would be shifted to a portion of the new 10th and Delmar lid during construction of the new 10th Avenue East crossing over SR 520. Similarly, traffic on Montlake Boulevard would be shifted during demolition and reconstruction of the existing bridge over SR 520. These temporary realignments could require construction of temporary trolley wire, including providing new switches and poles along the route or other changes to the transit facilities.

Transit Travel Times

In response to comments received on the SDEIS, WSDOT evaluated the changes to midday transit travel times along Montlake Boulevard that could occur during construction. Many daily bus riders travel during this time, and unlike the peak periods, Montlake bridge openings can stop traffic during the midday periods. The estimated changes in travel times are shown by year of construction in Table 6.1-8 for local and SR 520 bus routes that operate on Montlake Boulevard. The results indicate the expected change in minutes from the existing average travel time through the Montlake interchange area, accounting for bridge openings. The temporary road capacity improvements on Montlake Boulevard were included in the analysis, resulting in travel times similar to existing conditions for most time periods and routes. This analysis is focused on the Montlake interchange area, and does not include the effects of closing NE Pacific Street under

Options K and L. As described in the discussion of local streets in the *How would construction affect traffic operations?* section, the closure would result in substantial delays on NE Pacific Street and Montlake Boulevard NE. The delay would be in addition to the results below, for riders traveling through the University District and the Montlake interchange.

Table 6.1-8. Average Off-Peak Transit and HOV Travel Times with Bridge Opening (minutes)

Routes	Existing	Travel Time Change from Existing				
		Years 1-2	Years 3-4	Year 5	Year 6	Year 7
Southbound Montlake Blvd to eastbound SR 520	13.0	0	0	-1	+4	+1
Southbound Montlake Blvd (local routes)	12.0	0	0	-3	0	-5
Southbound Montlake Blvd to westbound SR 520	12.0	0	0	-1	+2	-4
Westbound SR 520 to northbound NE Pacific Street	5.5	0	0	-1	0	-2
Westbound SR 520 to northbound Montlake Boulevard NE	5.5	0	0	-1	0	-1
Northbound Montlake Boulevard (local routes)	7.5	0	+1	-1	0	+4

During years 1 and 2, most construction activity would be away from the Montlake interchange and travel times would not be affected. Prior to year 3, capacity improvements at the Montlake interchange would be built to accommodate traffic from the westbound Lake Washington Boulevard exit ramp. This would allow travel times to remain similar to existing conditions, with more traffic on Montlake Boulevard during years 3 and 4 after the ramp is closed. Northbound travel times for local routes could increase slightly due to the addition of a traffic signal at the westbound SR 520 ramp intersection.

The lower travel times in year 5 are the result of reduced traffic on Montlake Boulevard after completion of the bridge over SR 520 on 24th Avenue East. In combination with the capacity improvements on Montlake Boulevard, completed in previous stages, the bridge will improve traffic circulation at the Montlake interchange.

During year 6, southbound travel times for SR 520 bus routes would likely increase during reconstruction of the Montlake Boulevard Bridge, and right-of-way constraints would limit the potential capacity improvements on Montlake Boulevard. Also during this time, traffic volumes through the intersection of Lake Washington Boulevard and Montlake Boulevard East

would continue to be higher because of the eastbound Lake Washington Boulevard ramp that closed in year 5.

During year 7, the eastbound SR 520 loop ramp at Montlake Boulevard would be reconstructed. All traffic destined for eastbound SR 520 would use a temporary on-ramp along the alignment of the future HOV direct-access ramp. This would result in a high-volume southbound left turns at the intersection of the westbound off-ramp/eastbound on-ramp on Montlake Boulevard. Northbound roadway capacity on Montlake Boulevard would be affected by stops required to allow the southbound left turns, resulting in increased northbound travel times.

Effects Unique to Options K and L

Options K and L would have substantially greater effects on transit than the Preferred Alternative and Option A near the Montlake Boulevard NE/NE Pacific Street intersection. The intersection would be reconstructed under Options K and L, requiring a closure of NE Pacific Street and partial closures of Montlake Boulevard NE. The effects in that area are described below.

Pacific Street Transit Stops

Options K and L would require several transit stops on NE Pacific Street and Montlake Boulevard to be relocated during construction of the Montlake Boulevard NE/NE Pacific Street intersection. Both the westbound and eastbound stops at the UW transfer point located on NE Pacific Street in front of the UW Medical Center would be relocated to NE Pacific Place during construction. When traffic is detoured onto NE Pacific Place, the transit stops are likely to increase traffic delays on NE Pacific Place. Transit pull-outs could be provided at these temporary stops to help facilitate traffic flow and reduce congestion; however, pull-outs may also increase transit delays if buses are unable to re-enter congested traffic.

The transit stops located on the and west sides of the Montlake Boulevard NE/NE Pacific Street intersection would also need to be relocated during construction. The stop on the east side of the street could be moved south to allow riders access to a temporary pedestrian bridge that is proposed to be constructed across Montlake Boulevard. This temporary crossing would be designed to provide both safety for pedestrians and access for workers in the construction zone. The transit stop located on the west side of the street could be moved north of the construction area. These stops serve one route and are not heavily used.

Transit Facilities and Operations near the Montlake Triangle

The detour of traffic from NE Pacific Street to NE Pacific Place under Options K and L would substantially increase traffic volumes and delays at the intersection of NE Pacific Place and Montlake Boulevard NE. This

would particularly affect the transit routes that currently make turns to and from Montlake Boulevard and NE Pacific Street.

During reconstruction of the Montlake Boulevard NE/NE Pacific Street intersection, lane shifts on Montlake would also require closure of transit priority lanes. Removal of the transit priority lanes would prevent buses from bypassing congestion on Montlake Boulevard.

The existing bus layover space on NE Pacific Place would be removed during construction to allow for roadway widening. The layover space is necessary to maintain transit reliability. The Montlake Triangle also serves as a turnaround location for buses. This function would be disrupted during construction under Options K and L when the southbound transit-only, right-turn lane from Montlake Boulevard to NE Pacific Street would be removed.

The closure of NE Pacific Street and removal of layover and turnaround functions at the Montlake Triangle would prevent trolley operation in the current configuration. A detour of the existing trolley routes onto NE Pacific Place would require temporary transit improvements such as new overhead trolley wires, switches, and poles to maintain service.

How would construction affect bicycle and pedestrian travel?

Construction of the Preferred Alternative and the SDEIS options would have some effects on bicycle and pedestrian access within the project corridor. The effects of the Preferred Alternative and Option A would be similar, while Options K and L would have some additional unique effects. The closure of the Delmar Drive East bridge over SR 520, which was common to all options in the SDEIS, is no longer planned and would not affect cyclists and pedestrians.

KEY POINT

Bicycles and Pedestrians

All options would close the 24th Avenue East bridge and the Bill Dawson Trail for most of the construction duration, leaving only Montlake Boulevard open to bicycle and pedestrian traffic. Bicycle and pedestrian access might be restricted to one side of Montlake Boulevard.

In addition to general construction activities that would affect bicycle and pedestrian access, some local bicycle and pedestrian routes in the Montlake vicinity would be closed during construction. There are four north-south connections for pedestrians and bicyclists across SR 520 in the Montlake vicinity. They include Montlake Boulevard, the Bill Dawson Trail, 24th Avenue East, and the Arboretum Waterfront Trail. Of these, only Montlake Boulevard would be open continuously throughout construction for bicycle and pedestrian travel. Closure durations at the other locations would vary.

Montlake Boulevard, including the bridge over SR 520, has sidewalks on each side that provide an important route across SR 520, and connect to the bascule bridge across the Montlake Cut. This route provides a bicycle and pedestrian connection between the University District and neighborhoods south of SR 520. During construction, bicycle and pedestrian access would be provided along Montlake Boulevard, which would be the primary north-south route. Bicyclists and pedestrians would be exposed to more traffic,

including trucks, along Montlake Boulevard compared to other routes. The project would increase the frequency of trucks on roadways; however, the exposure throughout the day would not be substantially greater than existing conditions, as described above.

When nearby routes are closed, bicyclists and pedestrians would experience increased traffic on the sidewalks and crossings along Montlake Boulevard. Bicyclists and pedestrians would also be exposed to increased vehicle traffic on the roadway when the Lake Washington Boulevard ramps are closed. Construction of the Montlake lid and interchange would affect Montlake Boulevard near SR 520 for about 4 years. Construction activities could restrict bicycle and pedestrian access to one side of Montlake Boulevard over SR 520 for short periods of time. Major realignments of Montlake Boulevard would be needed during construction. The pedestrian crossings would be realigned along the section of Montlake Boulevard over SR 520. Safe access meeting the Americans with Disabilities Act requirements will be provided throughout construction.

Montlake Boulevard provides access to the Montlake Freeway Transit Station for bicyclists and pedestrians. When this station is closed, bicyclists and pedestrians who use the station would have to use the SR 520-University District routes at bus stops on Montlake Boulevard or NE Pacific Street, as described in the *How would construction affect transit operations?* section. The number of available bike racks on cross-lake buses would be reduced because there would be fewer routes to choose from. When the Montlake Freeway Transit Station is closed, the heavily used bicycle lockers at that location would also be closed. WSDOT will relocate the lockers, and is currently coordinating with King County Metro Transit to identify a suitable nearby location.

The Bill Dawson Trail runs under the Portage Bay Bridge, connecting the Montlake Playfield to Montlake Boulevard north of SR 520. The area where the Bill Dawson Trail is located would be used for construction access and staging for the Portage Bay Bridge. The trail would be closed to bicyclists and pedestrians throughout most of construction. Montlake Boulevard would be the nearest alternative route to cross SR 520.

There is an on-street bicycle route on 24th Avenue East between East Shelby Street and East Lake Washington Boulevard. During construction, the 24th Avenue East bridge over SR 520 would be demolished and replaced as part of the Montlake lid. The 24th Avenue East bridge would be closed to pedestrian and bicycle access. Bicyclists and pedestrians who currently use the bridge to cross SR 520 would be routed during the closure to Montlake Boulevard, where they could be exposed to higher traffic volumes, more street crossings, and higher bicycle and pedestrian traffic.

During construction of the west approach bridge, the portion of the Arboretum Waterfront Trail that currently travels under the existing SR 520 main line would be closed while structures over the trail are rebuilt. The trail would otherwise be open during construction. Access to the Arboretum Waterfront Trail from East Montlake Park would not be affected. Also in this area, a portion of the Ship Canal Waterside Trail would be closed within East Montlake Park. However, the remainder of the trail could be accessed from the trailhead in West Montlake Park during project construction. After construction, trail access would be restored.

Effects Unique to Options K and L

The NE Pacific Street intersection would be affected by Options K and L due to reconstruction of the intersection at NE Pacific Place and Montlake Boulevard NE. The Preferred Alternative is similar to Option A, and would not substantially affect this intersection. The SR 520, I-5 to Medina project would coordinate with other projects in this area, such as the Sound Transit University Station and the UW Rainier Vista projects, to maintain continuity of bicycle and pedestrian routes during construction. When construction is active adjacent to Montlake Boulevard, bicyclists and pedestrians could be detoured to one side of the street for safety.

How would construction affect parking?

Construction would affect parking at several locations in the project vicinity. The effects at most locations would be similar under the Preferred Alternative and Options A, K, and L. Parking effects at the UW lots would be greater under Options K and L because of the extension of NE Pacific Street to the new single-point urban interchange at SR 520.

Table 6.1-9 presents the construction effects on parking supply. The most substantial effects are as follows:

- All ten parking stalls at Bagley Viewpoint would be closed when construction of the 10th and Delmar lid begins. The viewpoint would be closed throughout construction, and parking at this location would not be available.
- Approximately 50 spaces at the NOAA Northwest Fisheries Science Center would be unavailable during construction.
- All 150 stalls in the MOHAI parking lot would be removed when construction begins. Parking would be constructed at East Montlake Park and access to this location would be maintained except during construction of the lot itself.
- Five on-street parking stalls located on the west side of 24th Avenue East just south of East Hamlin Street would be closed during construction. The closure would be temporary under the Preferred Alternative and Option A; it would be permanent under Options K and L.

- The WSDOT public lot on East Lake Washington Boulevard would be used as a construction access. Approximately 12 of the 24 spaces in this lot would be unavailable during construction.
- In the UW E-11 and E-12 lots south of Husky Stadium, construction would cause a temporary loss of up to 10 spaces under the Preferred Alternative, 55 spaces under Option A, up to 550 spaces under Option K, and 210 spaces under Option L.
- On Lake Washington Boulevard, 35 on-street parking spaces would be closed during construction of the Montlake lid.

Table 6.1-9. Parking Effects during Construction

Location	Existing Capacity	Spaces Closed during Construction			
		Preferred Alternative	Option A	Option K	Option L
Bagley Viewpoint	10	10	10	10	10
MOHAI and East Montlake Park	150	124	124	150	150
Husky Stadium Lots E-11 and E-12	1,175	10	55	550	210
NOAA Northwest Fisheries[a]	132	50	95	50	50
WSDOT Public Lot	24	12	12	24	24
24th Avenue East	5	5	5	5	5
Lake Washington Boulevard	35	35	35	35	35

[a] Parking supply includes 38 spaces located on WSDOT right-of-way under the existing Portage Bay Bridge.

Effects of Suboptions

Adding the suboptions to Option A, K, or L would result in no additional parking effects.

How can the project minimize negative effects on transportation during construction?

As with any large construction project, the presence of construction activities will change the normal flow of traffic. WSDOT has developed preliminary construction plans and performed the traffic analysis described in this section to determine the temporary capacity improvements that would be needed to maintain the flow of traffic through the project vicinity. WSDOT will construct the improvements prior to other construction activities that would affect the flow of traffic. In addition to roadway improvements, WSDOT will (to the maximum extent practicable) restrict lane closures to nights and weekends, when traffic volumes are lowest. WSDOT will engage in regular, ongoing coordination with all affected jurisdictions to identify potential conflicts with other projects or public events, and plan for isolated construction activities that require special

transportation considerations. WSDOT will also implement a continuous public information program to inform travelers, nearby residents, and businesses about transportation conditions, upcoming changes, and travel options during construction.

WSDOT will work to manage the flow of traffic and minimize traffic demand during construction using a combination of methods, all of which will be incorporated into the construction traffic management plan (TMP). The traffic management plan will be coordinated with the public outreach communications plan.

Traffic Management Plan

WSDOT will prepare a construction TMP, in coordination with other stakeholders, to ensure that construction effects on local streets, property owners, and businesses are minimized. The TMP will include, as a minimum, the following measures:

- Details on required street and lane closures (duration and timing)
- Proposed detours and signing plans (for vehicles, pedestrians, freight, and bicycles)
- Compliance with Americans with Disabilities Act accessibility requirements.
- Measures to minimize effects on transit operations and access to/from transit facilities (in coordination with transit service providers)
- Traffic enforcement measures, including deployment of police officers
- Coordination with emergency service providers
- Measures to minimize traffic and parking effects from construction employees
- Measures to minimize effects of truck traffic for equipment and material delivery
- Measures to minimize disruption of access to businesses and properties
- Measures to minimize conflicts between construction activities and traffic during events

Work Zone Management Techniques

Other mitigation options include developing and implementing work zone management strategies. These strategies may include using intelligent transportation systems, traveler information, real-time work zone monitoring, traffic incident management, and enforcement techniques. More details on strategies feasible for this project are described below.

Traveler Information Systems

Traveler information systems are designed to inform the general public of construction activities and transportation system operating conditions. They

allow drivers to avoid traffic problems, save time, and reduce frustration. Examples include, but are not limited to, dynamic and variable message signs, highway advisory radio, e-mail alerts, and project Web sites that provide real-time information on traffic conditions around construction and outlying areas. The traveler information system already in place will be used for this project, which includes all the above-mentioned examples except for a project-specific Web site with real-time information.

Incident Management Systems

WSDOT's current incident response program will continue to be used for this project. Incident management systems are planned and coordinated strategies to detect, respond to, and remove traffic incidents to restore traffic capacity as safely and quickly as possible. The process of restoring traffic capacity involves a number of public and private sector partners, which can include law enforcement, fire and rescue, emergency medical services, transportation, public safety communications, emergency management, towing and recovery services, hazardous materials contractors, and traffic information media. Incident management systems can help reduce effects during construction in the following areas:

- Incident clearance time: reduction of 38–66 percent
- Emergency vehicle response time: reduction of 20–30 percent
- Primary crashes: reduction of 35–40 percent
- Secondary crashes: reduction of 30–50 percent

Active Traffic Management

Active traffic management technology dynamically controls traffic based on the prevailing conditions. Using integrated systems and a coordinated response, both recurrent and nonrecurrent congestion can be managed to improve roadway safety and traffic flows. Potential tools used as part of an active traffic management system include the following:

- Overhead sign bridges to display variable speed limit and real-time traffic information over each lane.
- Variable speed limit to dynamically and automatically reduce speed limits approaching areas of congestion, collisions, or special events.
- Queue warning to warn commuters of downstream queues (or backups) and direct through-traffic to alternate lanes.
- Travel time signs to display estimated travel time and other condition reports, as well as communicate travel and traffic conditions. WSDOT currently uses variable message signs to post travel time information.

Construction Worker Shuttle Service

This service shuttles workers from outlying temporary or permanent parking facilities into the work zones, thereby reducing the number of

vehicles arriving at and leaving the work zone areas and the parking demand in the work zones.

Special Events

Several strategies would be used to help mitigate construction activities during special events, including graduations, city functions, and sporting events at the UW:

- Tailor special event traffic management plans to consider project construction congestion, including transit priority and special event shuttle services.
- Increase shuttle services so access is provided both to and from events.
- Provide event discounts with the use of transit shuttles.
- Implement additional event date/time-specific parking restrictions.
- Add police officer traffic control as needed.
- Provide a Web site and other outreach regarding construction and travel options to special events that is accessible and understandable.
- Restrict construction activities during major events.

Transportation Demand Management

Transportation demand management (TDM) includes a variety of strategies that provide alternatives to driving in single-occupant vehicles, particularly during peak traffic periods. TDM programs include financial incentives, outreach to increase public awareness about travel options, and services that help people choose a new travel option. They even provide new travel options such as vanpools to encourage a shift away from travel in single-occupant vehicles. TDM is implemented in a regional context through a variety of ongoing state and local jurisdiction programs.

Purpose of TDM during Construction

The SR 520, I-5 to Medina project would be built over a period of up to 7 years. As with any major project, construction activities would affect the normal travel patterns of road users within the project vicinity. TDM may be used, in addition to other mitigation techniques, to minimize these effects by reducing the traffic demand through the project area.

TDM and Transit

The goal of TDM is to increase the efficiency of travel on roadways by moving more people in fewer vehicles. Transit is typically a primary consideration for any comprehensive TDM program because it is a reliable mode of moving many people in fewer vehicles. This is particularly true in urban areas with well-established transit systems in place. The people-moving capacity of transit is necessary for many TDM strategies to be successful. WSDOT is coordinating with King County Metro and Sound Transit to develop construction management plans that maintain the

reliability of transit as an alternative to driving. WSDOT will continue this coordination throughout construction.

TDM during Construction

As part of the construction TMP, WSDOT will evaluate a set of temporary TDM and transit enhancements to provide additional travel options to the public during construction.

Many jurisdictions where SR 520 users live and work have existing TDM programs. Bellevue, Kirkland, Redmond, and Seattle each have established programs that provide travel options to commuters. King County also provides these services through its own efforts in addition to operating a popular vanpool program. WSDOT supports local jurisdictions through its investment in a variety of strategies and through the Commute Trip Reduction program.

WSDOT will focus on supporting existing programs rather than implementing an entirely new program during the construction period. Therefore, a major aspect of the strategy will involve communication and cooperation with local experts who are already implementing successful programs. WSDOT will coordinate with jurisdictions affected by SR 520 to offer services to travelers through programs they already use. This approach will encourage continuity in the services provided to users. When construction is complete, it will allow a streamlined transition of project-related TDM services back to the ongoing programs managed by the local jurisdictions.

Conditions often change during the construction of complex projects, and it will be necessary to communicate changes quickly and effectively to those affected. The TDM strategy will include a feedback process to monitor its effectiveness. The feedback will be used to identify improvement opportunities and under-performing elements so that adjustments can be made to ensure that the project meets its goals.

The TDM strategy and goals for the project will be developed during the final planning phase of the project. WSDOT will develop demand management goals based on the estimated construction effects on traffic for the project. The goals will be designed to complement the other construction traffic management techniques that will be implemented. WSDOT will evaluate areas of greatest need and benefit to maximize traveler options in those areas.

6.2 Land Use and Economic Activity

This section covers effects on existing land uses along the SR 520 corridor as well as potential effects on the regional and local economy that would occur during the multi-year construction period. Construction durations and sequencing of activities are described in Chapter 3 by geographic area between I-5 and Medina. The Preferred Alternative and Options A, K, and L would increase noise, dust, and truck traffic during construction. These types of construction effects are described in detail in Section 6.1, Transportation; Section 6.3, Social Elements; Section 6.4, Recreation; Section 6.7, Noise; and Section 6.8, Air Quality.

How would construction affect land use?

Construction would occur within existing WSDOT right-of-way, adjacent to SR 520, to the extent possible. However, in some places within the project area, land now used for other purposes would be used for construction purposes. Exhibits 6.2-1 through 6.2-4 show the areas where construction would occur and the affected properties.

I-5 Area

Construction easements in the I-5 area would be similar for the Preferred Alternative and Options, A, K, and L. As shown in Exhibit 6.2-1, construction would occur adjacent to Seattle Fire Station 22 on East Roanoke Street. Construction on East Roanoke Street would be staged in this area so that the station would be fully operational, access would be

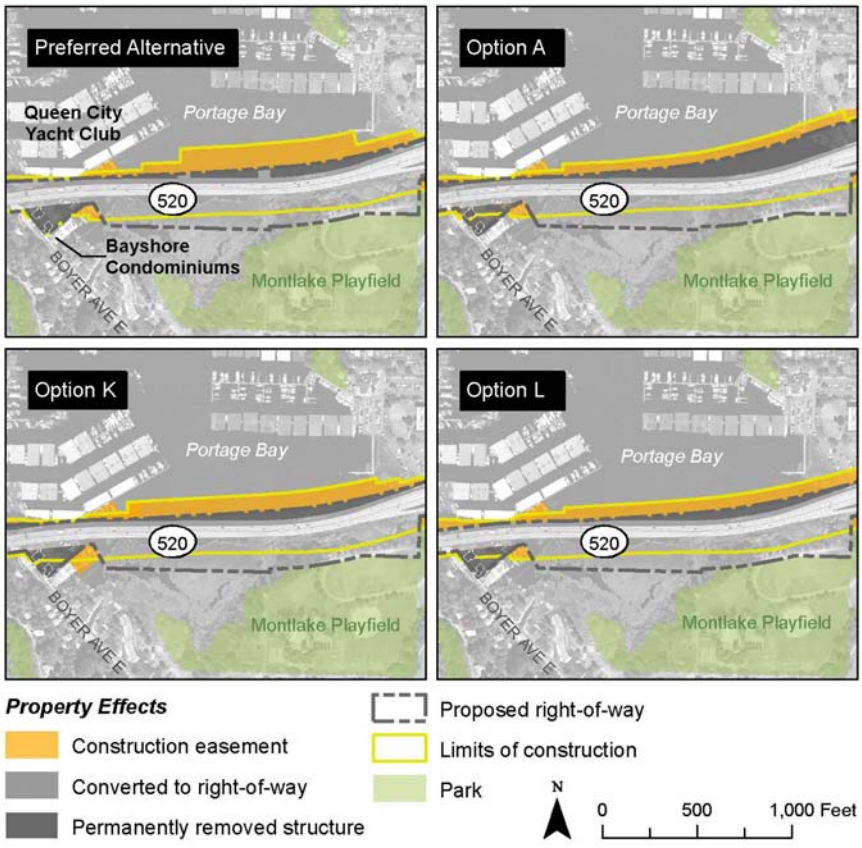
Exhibit 6.2-1. **Property Affected by Construction in the I-5 Area (Preferred Alternative and Options A, K, and L)**

maintained, and emergency response would not be affected. See Section 6.3, Social Elements, for a detailed description of potential effects on area neighborhoods.

Portage Bay Area

The effects of the construction work bridges adjacent to the Portage Bay Bridge would be similar for the Preferred Alternative and all SDEIS options. Easements for the north work bridge would require relocation of all boat slips along the south side of the south dock of the Queen City Yacht Club for the duration of construction (Exhibit 6.2-2). Easements for the south work bridge would also require relocation of approximately ten boat slips at the Bayshore Condominiums for the duration of construction. WSDOT would provide temporary moorage for all affected slips. WSDOT will work with affected property owners to identify specific moorage locations when construction staging information is further refined, prior to construction. Construction in the Portage Bay area is expected to last approximately 64 months. These moorages would be replaced in their original locations after construction is completed.

Exhibit 6.2-2. **Property Affected by Construction in the Portage Bay Area**



Montlake Area

Preferred Alternative

Under the Preferred Alternative, construction easements in the Montlake area would be most similar to those of Option A, with differences near the eastbound off-ramp and westbound on-ramp of the Montlake interchange. As shown on Exhibit 6.2-3, the limits of construction for the Preferred Alternative changed such that the construction easements would be less than those of Option A in this area. Unlike Option A, the Preferred Alternative would not remove the Montlake 76 gas service station or any buildings on the NOAA Northwest Fisheries Science Center property. Construction easements at the University of Washington Open Space (immediately north of the Montlake Cut), at residences east of the new Montlake bascule bridge, and at East Montlake Park would be similar to those needed for Option A. Construction in the Montlake area is expected to last approximately 56 months.

Option A

Option A would require construction easements on land in the University of Washington Open Space (immediately north of the Montlake Cut); within East Montlake Park; east of the new Montlake Boulevard bascule bridge; along East Lake Washington Boulevard and East Montlake Boulevard; and at the existing SR 520/East Montlake Boulevard interchange.

Option A would permanently remove the Montlake 76 service station on Montlake Boulevard East at the SR 520 ramps. Although some of the parcel would be converted to WSDOT right-of-way, most of the parcel would be used for construction staging, vacated by WSDOT after construction, and available for development after construction.

Option K

Option K would require construction easements on a large portion of land in the University of Washington parking lot south of Husky Stadium for the new tunnel and its approach, and on Foster Island to construct the land bridge. Smaller easements would be necessary along East Lake Washington Boulevard and at the existing SR 520/East Montlake Boulevard interchange.

Option K would also relocate the University of Washington Waterfront Activities Center buildings that are southeast of Husky Stadium on Union Bay and the Montlake Cut (Exhibit 6.2-3) to accommodate construction of the tunnel under the Montlake Cut. The two buildings at the Waterfront Activities Center would be removed and their functions relocated during construction. The specific location has not been determined and is subject to discussions with the University of Washington. The University of Washington's Waterfront Activities Center (WAC) is located southeast of

Exhibit 6.2-3. **Property Affected by Construction in the Montlake Area**

Husky Stadium on Union Bay and the Montlake Cut. The Washington Yacht Club, Sailing Team, Kayak Club and Union Bay Rowing Club organize their activities at the WAC. The WAC also offers canoe and rowboat rentals, storage for private non-motorized boats, and waterfront activities for students, staff, and alumni association members. Options K and L would relocate the functions of this facility during the multi-year construction period.

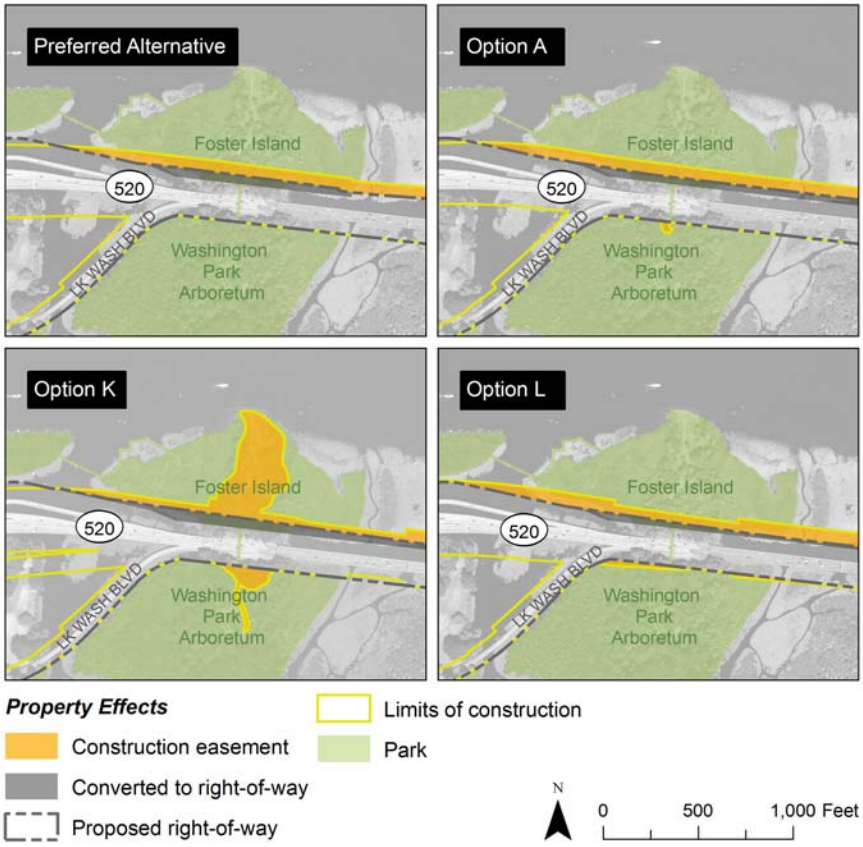
Option L

Option L would affect land on the west side of the University of Washington parking lot south of Husky Stadium; along the Montlake Cut, McCurdy Park, and University of Washington Open Space for bridge construction; and at the existing SR 520/East Montlake Boulevard interchange.

West Approach Area

The Preferred Alternative and Options A and L would require similar construction easements to the north on Foster Island (Exhibit 6.2-4). Option K would result in a larger easement for construction of the land bridge. Construction in the west approach area is expected to last approximately 60 months.

Exhibit 6.2-4. **Property Affected by Construction in the West Approach Area**



Lake Washington

Construction easements in Lake Washington would be the same for the Preferred Alternative and all options. WSDOT has already acquired two properties and has removed the two houses that occupied them. Both parcels also have a dock that would be permanently removed. An additional private dock to the north may not be usable during the 36-month construction period of the east approach. Construction in this area is expected to last approximately 41 months and includes construction activities for the bridge maintenance facility and mainline improvements near Evergreen Point Road.

Eastside Transition Area

No construction easements would be needed for the Preferred Alternative or SDEIS options because restriping of SR 520 would occur within the existing right-of-way between Evergreen Point Road and 92nd Avenue NE.

How would construction affect economic activity?

KEY POINT

Economic Activity

The positive effects of construction-related jobs, spending (e.g., project spending and spending by construction workers), and resulting sales tax revenues would be widely dispersed through the local and regional economies.

Generally, access to businesses and residences throughout the study area would remain open or a detour would be provided during the construction period. WSDOT would minimize traffic delays by phasing and scheduling construction activities outside of high traffic demand periods as much as possible. Ramp closure hours and dates would be timed to accommodate special events and would be coordinated with closures on other freeways.

It is possible that nighttime lane closures could affect businesses near SR 520 that receive much of their revenue in the evening, such as restaurants, theaters, gas stations, or other specialty retailers. As a result, some sales losses could be experienced by those businesses. However, SR 520 would not be the only (or even the main) road that customers of those businesses use. Thus, it is unlikely that many businesses would experience a substantial loss of sales from nighttime lane restrictions.

Under the Preferred Alternative and Options A, K, and L, construction could increase congestion and detour traffic on local streets at times. The degree of congestion would vary during the construction timeline and would change with the intensity of construction activities. Sales at some businesses, especially those that rely heavily on drive-by traffic, could decrease during construction. However, such decreases would likely be minor because reductions in access would occur mainly at night and during off-peak hours. In addition, alternative access would be provided to business districts and neighborhoods. Revenues for some businesses near construction activities could also increase from spending by construction workers. This, in turn, could increase local sales tax revenues.

It is expected that most of the daily construction-generated trips (e.g., hauling) would use SR 520. Given the anticipated peak-period congestion

levels on SR 520, this would have a moderate effect on traffic flow. See Chapter 10 of the Final Transportation Discipline Report (Attachment 7) for a quantitative analysis of construction effects on traffic flow. Contractors would likely avoid travel during peak periods because their productivity would be hampered by congestion.

Construction activities would change access for some nearby businesses, located in the I-5 area along East Roanoke Street and Delmar Drive East. The effects in the I-5 area would be similar for the Preferred Alternative and Options A, K, and L, although effects would be somewhat less for the Preferred Alternative because the I-5 lid described for the SDEIS options would not be built. Since the SDEIS was published, construction staging has been revised such that the 10th Avenue East and Delmar Drive East overcrossings would remain open during construction. Because the overcrossings would remain open, the businesses along 10th Avenue East are not expected to experience a substantial loss of sales. This grouping of retail and personal service businesses extends from the overcrossing south for about two blocks (Exhibit 6.2-1).

Construction effects in the Montlake area would be similar for the Preferred Alternative and Options A, K, and L. Construction activities would change access for some nearby businesses, in the Montlake area along Montlake Boulevard East, 24th Avenue East, and Lake Washington Boulevard East. Although a few customers would likely be deterred from visiting these areas because of construction at the interchange, most of these businesses serve local customers who would travel to them on local streets. Any economic effects on businesses in this area during construction would be small. WSDOT would minimize traffic delays by phasing and scheduling construction activities outside of high traffic demand periods as much as possible. In addition, access to businesses and residences throughout the study area would continue during the construction period. If roadways and direct business access were closed, detours would maintain access. If practical, short-term roadway closures would occur at night or during low-traffic-volume periods during the day.

Even though access would be maintained in the Montlake area, congestion is expected to worsen due to slowing that typically occurs in work zones. Drivers may elect other routes or adjust their schedules to avoid the increased congestion and delay. As a result, sales at some businesses, especially those that rely heavily on good access and drive-by traffic, could decrease during construction. This, in turn, could decrease local sales tax revenues. Conversely, revenues for some businesses near construction activities could increase from spending by construction workers. This, in turn, could increase local sales tax revenues.

Construction activities under the Preferred Alternative and SDEIS Options A, K, and L in the Montlake area could also deter some patrons from attending sporting events, exhibitions, and other events held at the

University of Washington. The Preferred Alternative and Option A would have the smallest effect on parking in University of Washington lots E-11 and E-12, with 10 and 54 stalls, respectively, acquired for construction staging. Options K and L would result in the greatest number of stalls acquired with 549 and 211, respectively. According to Commuter Services at the University of Washington, more than 11,400 parking stalls were available for campus parking in 2007, and the average parking utilization was 71 percent (University of Washington 2008).

Preferred Alternative and Option A

Under the Preferred Alternative and Option A, construction of the new Montlake interchange and lid would take approximately 64 months, and effects would be as described in the previous section.

Option K

Under Option K, construction of the single-point urban interchange (SPUI), the tunnel under the Montlake Cut, and the NE Pacific Street lid would occur over approximately 78 months. Under this option, a partial closure of NE Pacific Street would be required for up to 12 months and would detour traffic to NE Pacific Place at the NE Pacific Street interchange, which would reroute access to the University of Washington Medical Center.

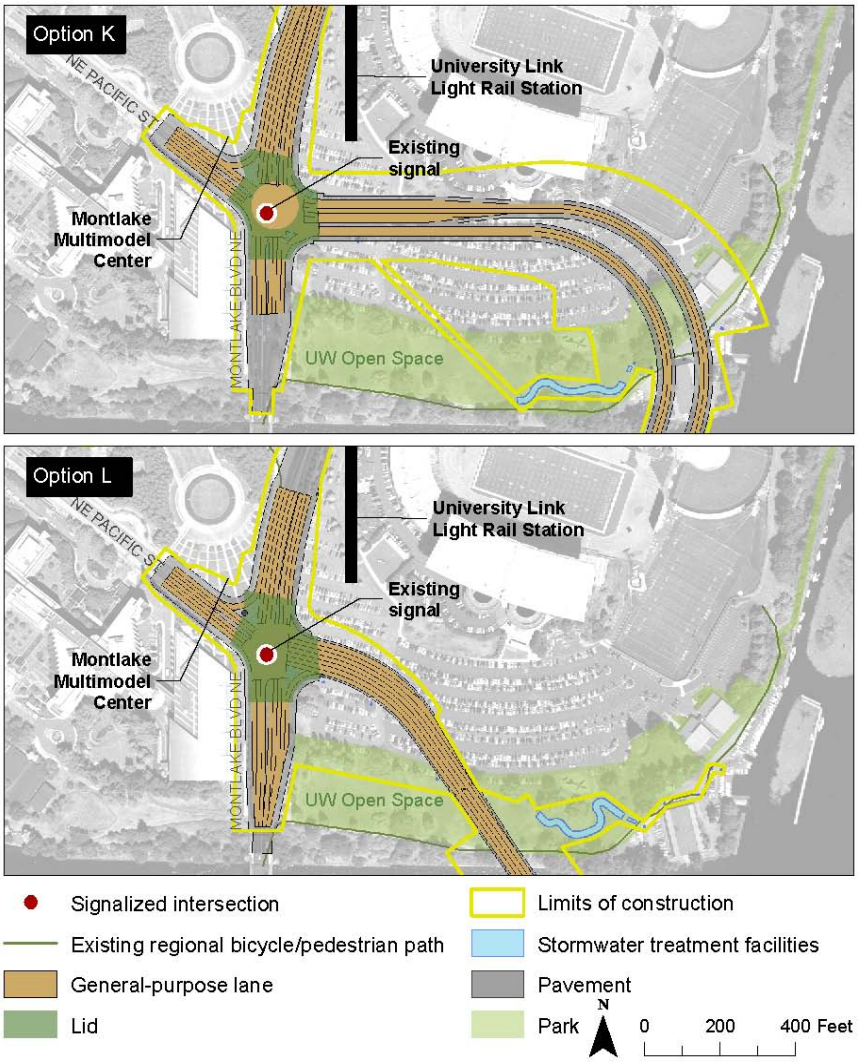
Option K would require the use of approximately 549 parking stalls for construction staging at University of Washington lots E-11 and E-12. This would represent approximately 47 percent of the total stalls in these two parking lots (Exhibit 6.2-5). Of the three options, Option K would inconvenience the largest number of visitors and employees to that part of the campus. However, the number of stalls that would be used for construction staging would represent less than 5 percent of the total campus parking spaces available. According to the Draft Westside Construction Traffic Technical Memorandum (WSDOT 2009m), the parking spaces affected under Option K would be taken in phases and not all at once. While parking in other parts of the campus might help mitigate the loss of some of the parking in lots E-11 and E-12 during construction, the available lots might not be convenient for those working at the University of Washington Medical Center. The loss of parking near Husky Stadium with Option K would affect event attendees and campus visitors.

Option L

Under Option L, construction of the SPUI and the NE Pacific Street lid would occur over approximately 60 months. Similar to Option K, Option L would require a partial closure of NE Pacific Street for up to 12 months and would detour traffic to NE Pacific Place at the NE Pacific Street interchange, which would reroute access to the University of Washington

Medical Center. The loss of 211 parking stalls near Husky Stadium with Option L would affect event attendees and campus visitors (Exhibit 6.2-5).

Exhibit 6.2-5. **Options K and L Effects on UW Parking Lot E-11 and E-12**



How would construction affect employment?

During construction, transportation projects usually increase employment and spending near the project. The extent of these effects would largely depend on two factors: (1) the source of project funding and (2) the makeup of the construction crews (for example, number of workers and whether they were local or from areas beyond the affected communities).

How much a highway project affects a region economically depends on the source of project funding. Funds from local (City of Seattle) or regional (Puget Sound) sources are transfers that could have been spent by residents and businesses on other economic activities. Typically, only "new money"

(state or federal funds) to a region has a measurable economic effect on employment and income gains resulting from project construction. For the Preferred Alternative and all SDEIS options, state and federal funds would be used, resulting in some income and job benefits that would otherwise not occur.

During construction, spending would increase demand for construction materials and jobs. These expenditures could increase the output (for example, of sand) of firms in other industries, which would supply the demand for inputs (for example, concrete) to the construction industry. Finally, wages paid to workers in construction trades or supporting industries would be spent on other goods and services in their local communities and the region. Workers generally spend their incomes on goods and services in the communities in which they live. This localized spending would generate local and state sales and use taxes over the entire construction period.

Some local firms and workers from the Seattle/Eastside areas might be directly involved in the construction of the facility. Other local firms and their employees would supply construction materials such as cement, asphalt, wood, steel, gravel, and electrical equipment. Firms within the four-county Puget Sound region would likely provide most of the workers and supplies. Ultimately, it would be up to the contractors to secure vendors and subcontractors and to assemble the workforce.

Table 6.2-1 summarizes the employment estimates during construction for the Preferred Alternative and SDEIS options. Using the Washington State Office of Financial Management's job-estimating methodology for construction projects, it is estimated that the project would result in approximately 7,700 to 12,600 direct, indirect, and induced jobs during the peak year of construction (Washington State Office of Financial Management 2009).

DEFINITION

Direct jobs are those created directly from project construction (e.g., construction worker).

Indirect and induced jobs are those created through the purchase of commodities and services that support project construction (e.g., concrete suppliers).

Table 6.2-1. Full-time Jobs

	Preferred Alternative[a]	Option A	Option K	Option L
Construction period	7 years	6 years	7 years	6 years
Peak year	2015	2015	2014	2014
Cost in 2014 dollars (billions)[b]	$2.9	$2.9	$5.0	$3.5
Number of jobs in peak year[c]	7,683	7,683	12,620	9,526

[a]Economics analysis assumed that peak year construction data were similar for the Preferred Alternative and Option A.
[b]Includes preliminary engineering, right-of-way, and construction costs.
[c]Includes direct, indirect, and induced employment.

How could the project minimize negative effects during construction?

WSDOT would coordinate with business owners to reconfigure or provide alternative access for customers during construction. Signage would be used that clearly marks detour routes and indicates that businesses are open.

Land use effects, particularly from Options K and L, on the University of Washington during construction would result in a reduction in parking and associated revenues at the Husky Stadium. WSDOT would coordinate with the University of Washington on appropriate mitigation for these effects.

WSDOT would coordinate with property owners to identify relocation or other mitigation options for relocation of the Waterfront Activities Center (Option K) and boat moorages that would be affected over the multi-year construction period (see Chapter 5, Section 5.2).

6.3 Social Elements

This section discusses potential construction effects on residents and neighborhoods adjacent to the SR 520 corridor, including construction effects on neighborhood streets, transit service, bicycle and pedestrian linkages, visual quality, and community cohesion. Potential effects on low-income and minority populations and on public service providers and utilities are also discussed. Effects from construction-related noise on neighborhoods are discussed in Section 6.7, Noise.

How would construction of the project affect neighborhoods?

Project construction could affect the interaction of residents within and between neighborhoods along the corridor and temporarily reduce community cohesion during periods of heavy construction activity. Although construction would be sequenced along the corridor, related activities would be noticeable in adjacent neighborhoods for periods lasting from several months to several years.

Project area neighborhoods adjacent to construction could experience negative effects from detour routes, haul truck traffic, and relocated bus stops on neighborhood streets. Construction effects on communities would also include increases in noise, dust, and visual clutter in residential, business, and park areas adjacent to construction zones. These effects could reduce residents' quality of life and limit connections to community resources, patronage at neighborhood businesses, or use of recreational amenities. Partial closures of sidewalks, bicycle paths/routes, trails, and park areas could also discourage neighborhood activity and use of community resources, and could have a negative effect on disabled populations.

Exhibit 6.3-1 shows the locations of neighborhoods and community resources relative to areas where construction would occur.

KEY POINT

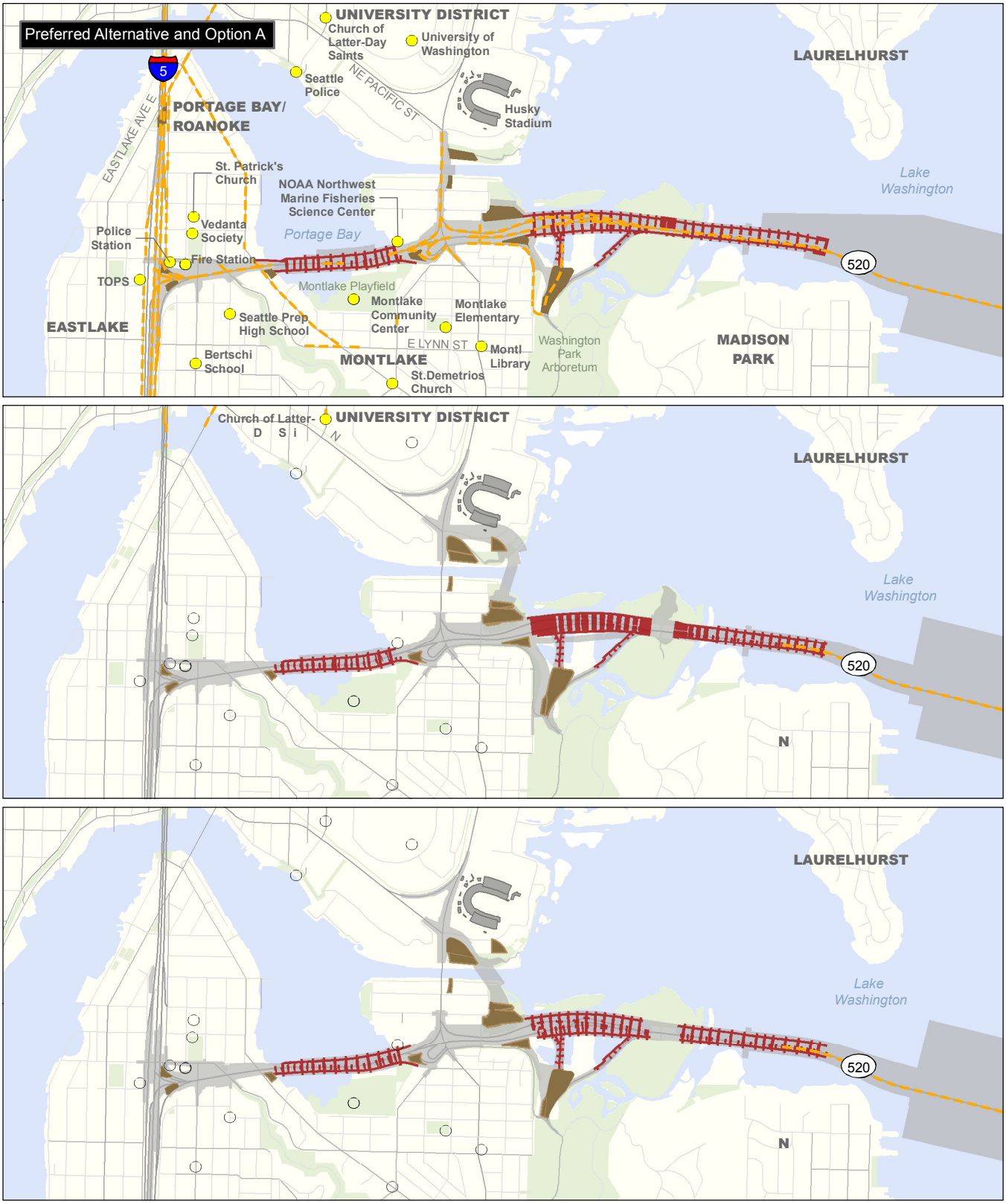
Neighborhoods

The Preferred Alternative and all options would affect adjacent neighborhoods during construction. These neighborhoods could experience negative effects from detour routes, haul truck traffic, and relocated bus stops. Construction would also increase noise, dust, and visual clutter in residential, business, and park areas adjacent to construction zones. These effects could reduce residents' quality of life and limit connections to community resources, patronage at neighborhood businesses, or use of recreational amenities.

Effects on Neighborhood Streets

Project area neighborhoods may absorb some of the diverted traffic volumes from the roadway and ramp closures described in Section 6.1. "Cut-through" routes along residential streets could increase as drivers try to avoid congested detour routes. As a result of more traffic on local roads, travel times to neighborhood schools, community centers, neighborhood businesses, and the University of Washington (UW) could increase during construction.

Exhibit 6.3-1. **Community Resources Relative to Construction Staging Areas**



As described in Chapter 3 and Section 6.1, Transportation, primary haul routes and detour routes would follow arterials and/or designated truck routes wherever possible. WSDOT has attempted to minimize truck trips on the non-arterial neighborhood streets; however, portions of neighborhood residential streets in Montlake and north Capitol Hill may need to be used for truck haul routes due to the location of proposed construction activities and the lack of available arterial routes immediately adjacent to construction sites.

KEY POINT

Partial closures of sidewalks, bicycle paths/ routes, trails, and park areas could discourage neighborhood activity and use of community resources.

On-street bicycle routes on local streets subject to roadway closures would be re-routed. Bicycle routes along Montlake Boulevard and NE Pacific Place connecting to the Burke-Gilman Trail would be rerouted through or around the construction zone.

Transit Service

Road closures, detours, and station closures during construction would result in effects on transit riders. Transit riders would also experience noise, dust, and visual effects at any of the transit stops in proximity to construction activities. Section 6.1 includes additional information on construction effects related to transit service.

Pedestrian and Bicycle Linkages

All of the project area neighborhoods feature parks, trails, and community centers, many of which are linked by pedestrian and bicycle paths. Construction under the Preferred Alternative and all SDEIS options would require periodic closures of the Ship Canal Waterside Trail, portions of the Arboretum Waterfront Trail, the Bill Dawson Trail, and the East Campus bicycle route for varying durations. See Section 6.1, Transportation, and Section 6.4, Recreation, for a detailed description of temporary closures.

Visual Quality

Construction of the Preferred Alternative and all SDEIS options would be very noticeable from many locations in project area neighborhoods. The most visible construction features would be work bridges, barges, and cranes on Lake Washington, detour bridges (Option K only), and the presence of construction equipment in work zones adjacent to the highway.

Bridge construction from barges

Construction work bridges would be trestle-like structures erected on both sides of the Portage Bay Bridge, the west approach to the Evergreen Point Bridge through the Washington Park Arboretum, and at the east approach of the Evergreen Point Bridge. Both near and distant views of the corridor and Lake Washington would change over the duration of construction. Also visible would be the results of ongoing construction and mitigation activities, such as exposed cut areas, stockpiled soil, silt fences and mulched areas, and temporary sedimentation ponds. See Section 6.5 for more detail on visual quality effects.

Community Cohesion

Effects from construction activities on community life and residents and groups located within the study area would last for the duration of the construction period, with activities occurring on and off for approximately 72 months. Construction-related traffic, light and glare, noise, and dust would affect residents living within approximately one to two blocks of the construction zone. In addition, residents living across the street or adjacent to potential construction staging areas would also be affected, primarily from an increase in truck traffic. Construction effects could negatively affect residents' ability to meet socially and recreate compared to existing conditions. Construction activities associated with the proposed project could cause residents to avoid areas near construction. The following discussions summarize construction effects by neighborhood.

Eastlake

Construction of the Preferred Alternative and all options would occur at the I-5/SR 520 interchange and at East Roanoke Street along the eastern fringe of the Eastlake neighborhood. Construction of the interchange and the enhanced crossing (Preferred Alternative) or the lid (Options A, K, and L) could affect the neighborhood near the interchange, east of Boylston Avenue East. Neighborhood residents could experience increased noise and fugitive dust from construction activities (if not controlled onsite) as well as increased truck traffic. Construction activities for these elements are common and would occur over a 26-month period. Section 6.1 provides more information on actual volumes of haul trucks and Section 6.7 provides information on noise associated with construction.

A potential haul route for the Preferred Alternative and all options is identified along East Roanoke Street and Boylston Avenue East. Trucks would periodically use Boylston Avenue East adjacent to The Option Program at Seward (TOPS) School for construction of the I-5 crossing structures. Increased traffic along Boylston Avenue could increase travel times for school buses and parents who drive their children to school. However, this would likely only affect those heading north or south on Boylston, and alternate routes are available. Additionally, the main entrance and the parking lot for the TOPS School are located on Franklin Avenue East. As part of the I-5/Roanoke lid construction under Options A, K, and L, Boylston Avenue would be narrowed temporarily and shifted to the west. WSDOT would use best management practices (BMPs) to minimize construction effects on the TOPS School.

Rogers Playground (located a block west of the interchange) could also experience increased noise and dust. Overall, however, effects would be minor because of the playground's distance from construction and the shielding that adjacent buildings provide. Park users may experience some intermittent noise during periods of peak construction.

As compared to the SDEIS options, the effects of the Preferred Alternative would be less intensive and of shorter duration because the Preferred Alternative would not demolish and rebuild the existing East Roanoke Street bridge, and would construct only the enhanced pedestrian/bicycle crossing.

North Capitol Hill

Construction of the 10th Avenue East/Delmar Drive East lid would affect north Capitol Hill residences adjacent to SR 520 and along potential haul routes. North Capitol Hill neighborhood residents on the south side of SR 520 could experience increased noise, fugitive dust, and possible vibration from construction activities as well as increased truck traffic. Construction activities would occur over a 26-month period. The effects of the Preferred Alternative would be less intensive than the SDEIS options because there would be no haul routes, no long-term road closures, and no detour routes within the north Capitol Hill neighborhood.

As identified for Options A, K, and L, the haul route along 11th Avenue East would increase traffic volumes from haul truck trips, which could affect the Seattle Preparatory School, a private high school located on 11th Avenue East. Additionally, construction activities under Options A, K, and L would require the Delmar Drive bridge to be closed for approximately 9 months. A temporary bridge at 10th Avenue East would cross SR 520 and include sidewalks for safe pedestrian and bicyclist movements.

Portage Bay/Roanoke

Portage Bay/Roanoke neighborhood residents along East Roanoke Street and along Boyer Avenue East could experience increased noise, fugitive dust, and possible vibration from construction activities to build the 10th Avenue East/ Delmar Drive East lid and new Portage Bay Bridge. Noise and other effects would vary during the anticipated 26 months of lid construction and 72 months of Portage Bay Bridge construction, depending on which activities are occurring. These elements are common to the Preferred Alternative and Options A, K, and L.

Roanoke Park and the surrounding neighborhoods would experience construction noise and dust, especially in the southern part of the neighborhood near Roanoke Street. The Preferred Alternative and all options identify potential haul routes along 10th Avenue East and Roanoke Street. Although truck traffic along the borders of the neighborhood would increase, the estimated number of truck trips would be relatively low compared to overall arterial volumes.

During construction, East Roanoke Street would experience temporary lane closures and detours during the realignment work. These would include short-term closures during off-peak times, which might require detours for approximately 15 months, resulting in temporarily restricted access to

properties along East Roanoke Street. At least one lane would be open at all times to allow traffic access on East Roanoke Street. No long-term road closures or detour routes have been identified within the Portage Bay/Roanoke neighborhood.

Two religious institutions, Saint Patrick's Catholic Church and Vedanta Society of Western Washington, are located north of Roanoke Park, but are not located along potential haul routes. Under Options A, K, and L, construction-related traffic may result in more circuitous travel routes for those who typically access these institutions from SR 520 or across Delmar Drive East. For construction of the Preferred Alternative, effects on access would be less intensive because the Delmar Drive East undercrossing would remain open during construction.

The construction work bridges, barges, and heavy equipment used to demolish and construct the Portage Bay Bridge would be the most obtrusive construction effect on neighborhood cohesion, especially for residents along Boyer Avenue and the Portage Bay houseboat community. Noise levels for some of these residents would be very loud (up to 105 dBA) during times of pile-driving, especially because the ground slopes down to the waterfront area and many of the homes have a direct line of site to the Portage Bay Bridge. As illustrated in Exhibit 6.7-3 (in Section 6.7), noise levels would decrease as distance from the source increases.

Although construction of the new Portage Bay Bridge is expected to last between 64 to 72 months, pile-driving activities would occur for only a small portion of this time. Table 6.3-1 shows the expected number of months that pile-driving would occur during each construction season for the Portage Bay Bridge (the table is representative of all options). As shown in the table, pile-driving would occur over several non-contiguous periods, not continuously over the entire 72 months.

Table 6.3-1. Pile-Driving for the Portage Bay Work Bridges and Falsework

	Year 1	Year 2	Year 3	Year 4	Year 5
Timing	Sept-Apr	Feb-Apr	N/A	Feb - Apr	N/A
Duration[a]	8 months	3 months	N/A	3 months	N/A
Total Piles	1,000	200	N/A	200	N/A

[a]Duration is not continuous.
N/A = not applicable

The Preferred Alternative and all options also identify Fuhrman Avenue East and Boyer Avenue East as a potential haul route for material transport to and from the Portage Bay Bridge.

Montlake

Construction in the Montlake area would affect residents and community resources in the Montlake neighborhood between the Montlake Cut on the north and the area bounded by the Arboretum and Interlaken Park on the south, east, and west. Construction activities would occur over a 56-month period under the Preferred Alternative and Option A, a 66-month period under Option K, and a 60-month period under Option L.

KEY POINT

Montlake Area

The Preferred Alternative and all options would have similar effects except in the Montlake and UW south campus areas, where the scale and intensity of construction would differ. The scale and intensity of construction-related effects within these areas would be greatest with Option K. Construction would cause longer and more intense effects due to noise, dust, vibration, construction traffic, and visual changes with construction of the tunnel (Option K) or new bascule bridge and ramps (Option L).

Several haul routes proposed in the Montlake area are associated with lid construction and interchange improvements under the Preferred Alternative and all options (see Exhibit 6.3-1). During peak construction periods, Options K and L would have used a loop through the Shelby/Hamlin portion of the Montlake neighborhood to transport materials for construction of the single-point urban interchange and construction of the tunnel under Option K. This haul route would have been used intermittently; the majority of truck trips would access SR 520 from an access ramp onto the Montlake westbound off-ramp. WSDOT received many comments from the public expressing concern about a potential haul route along East Shelby and East Hamlin Streets. Since publication of the SDEIS, FHWA and WSDOT announced a Preferred Alternative that would not require the use of East Shelby Street or East Hamlin Street.

Use of staging areas in East Montlake and McCurdy Parks would result in noise, dust, and visual effects on park users and residents along East Shelby Street, East Hamlin Street, and Park Drive East during the duration of construction. The closure of McCurdy Park and the partial closure of East Montlake Park would also eliminate opportunities for residents to enjoy the facilities and amenities, or to use them to gather and meet socially. Residents who currently have views of these areas of the park would likely see construction equipment stored there, and residents on surrounding streets would experience noise from the additional truck traffic and construction vehicles driving to and from construction sites.

Options K and L would have the greatest potential effects on the Shelby-Hamlin portion of the Montlake neighborhood because of their higher truck trips and the greater intensity and duration of construction activity in the MOHAI area. Residents on East Hamlin Street and East Shelby Street would experience fewer effects under the Preferred Alternative than under the SDEIS options because these streets would not be potential haul routes. The revised potential haul routes for the Preferred Alternative also do not include the route along 24th Avenue East as shown in the SDEIS.

University District

Although there are no residences in the University District close to proposed construction activities, construction effects on community cohesion could still result from construction activity and access disruptions

near UW facilities along Montlake Boulevard East. For the SDEIS options, construction truck trips through the University District would use Montlake Boulevard, NE Pacific Street, and 15th Avenue NE. The Preferred Alternative has a more limited extent and would not propose to use haul routes on these streets.

Under Options K and L, construction activities would affect access to UW's south campus and athletic facilities. Students, employees, and visitors who use Montlake Boulevard East and NE Pacific Street to access the campus would experience additional congestion and longer travel times. Construction of the tunnel or new bascule bridge for Option L across the Montlake Cut and lowering the NE Pacific Street/NE Montlake Boulevard intersection would create longer and more intense construction effects. Construction activities and increased truck traffic would last for approximately 48 months. Noise, dust, vibration, construction traffic, and visual changes on the UW campus would be greater for Options K and L than for the Preferred Alternative or Option A.

KEY POINT

UW Medical Center

Under Options K and L, closure of NE Pacific Street could affect response times and emergency access to UW Medical Center.

For the Preferred Alternative, bascule bridge construction would be limited to the area adjacent to the Montlake Cut and north to the intersection of Montlake Boulevard East and NE Pacific Street. Construction activities and increased truck traffic would occur for approximately 29 months.

Madison Park

Madison Park neighborhood residents along the shoreline south of SR 520 would have the potential to experience increased noise and visual effects from work bridges, barge activity, demolition, and construction of the west approach. Noise and other effects would vary during the approximately 59 months anticipated for construction of the west approach, depending on which activities are occurring.

Although construction of the new west approach is expected to last up to 57 months, pile-driving activities would occur for only a small portion of that time. Table 6.3-2 shows the expected number of months that pile-driving would occur during each construction year for the west approach work bridges (the table is representative of all options). In addition, pile-driving would occur over several non-contiguous periods, not continuously over the entire 59 months.

Table 6.3-2. Pile-Driving for the West Approach Work Bridges

	Year 1	Year 2	Year 3	Year 4	Year 5
Timing	Aug-Mar	Nov-Mar	Sept-Dec	N/A	N/A
Duration[a]	8 months	5 months	5 months	N/A	N/A
Total Piles	900	450	700	N/A	N/A

[a]Duration is not continuous.
N/A = not applicable

For all options during construction, the closure of the Lake Washington Boulevard ramps would require a change in travel patterns for residents in Madison Park who use Lake Washington Boulevard through the Arboretum.

Laurelhurst

Laurelhurst neighborhood residents along the Lake Washington shoreline north of SR 520 could experience noise and visual effects from construction of the west approach. The construction work bridges, barges, and heavy equipment used to demolish and construct the west approach would create noise and visual effects for residents, particularly due to the topography of the area and the views from the properties toward the bridge. Noise and other effects would vary during the approximately 57 months anticipated for construction of the west approach, depending on which activities are occurring.

Medina

The freeway transit station at Evergreen Point Road would be closed intermittently during construction of the Eastside transition area. Shuttle service between the Evergreen Point Freeway Transit Station and the transit stop at 92nd Avenue NE may be provided. Views of Lake Washington from residences along the Medina shoreline would also be affected by replacement of the Evergreen Point Bridge. Haul routes for construction of the east approach would travel westbound on SR 520 to I-5 or eastbound SR 520 to I-405. Construction near Fairweather Park would occur within existing WSDOT right-of-way, and would consist of minor grading and restriping of SR 520.

Medina residents north and south of SR 520 would experience noise effects, including noise from pile-driving. Pile-driving activities would occur over approximately 3 months during the first year of construction and 4 months during the second year of construction of the East Approach structures (Table 6.3-3; the table is representative of all options). Pile-driving would occur over several non-contiguous periods, not continuously for the entire period. Noise effects would be very loud (up to 105 dBA) during pile-driving activities.

Table 6.3-3. Pile-Driving for the East Approach Work Bridges and Falseworks

	Year 1	Year 2	Year 3	Year 4
Timing	Aug-Oct	Oct-Jan	N/A	N/A
Duration[a]	3 months	4 months	N/A	N/A
Total Piles	450	700	N/A	N/A

[a]Duration is not continuous.
N/A = not applicable

How would project construction affect low-income, minority, and LEP populations?

Neighborhoods

Construction would affect low-income, minority, and limited-English-proficient (LEP) residents of neighborhoods in the project study area in the same way that it would affect other residents. As discussed in Chapter 5, demographic analysis shows that neighborhoods in the project study area have relatively low proportions of low-income, minority, or LEP populations compared to adjacent, unaffected neighborhoods. Construction-related effects on neighborhoods would not fall disproportionately on low-income, minority, or LEP populations.

The majority of construction effects associated with the Preferred Alternative and SDEIS Options A, K, and L would occur within the Montlake neighborhood. This neighborhood has relatively low percentages of low-income, minority, and LEP residents (3 percent low-income, 13 percent minority, and less than 1 percent LEP). The University District has the highest concentrations of minority populations (44 percent minority and just over 3 percent LEP). The University District would experience construction effects near the south end of the neighborhood in the vicinity of the Montlake Bridge under the Preferred Alternative and Option A and Husky Stadium under Options K and L. However, because no residences are near where construction activities would occur, no negative effects are expected.

Tribal Fishing

The construction limits of the Preferred Alternative and all SDEIS options would be within the usual and accustomed fishing areas of the federally recognized Muckleshoot Indian Tribe. The tribe's usual and accustomed fishing areas within the project area include all of Lake Washington, the Ship Canal, and other areas where pontoons would be outfitted and transported. Pontoon construction and transport are addressed in the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b and in Section 6.15 of this Final EIS. The Muckleshoot Indian Tribe may harvest salmon from the study area pursuant to judicially recognized treaty rights, as interpreted by the Boldt Decision of 1974. In effect, the Boldt Decision affirmed that tribes had retained the right to fish at "usual and accustomed" fishing areas when they signed treaties with the U.S. government in 1854 and 1855, according to the Web site Historylink.org (Historylink.org 2010). In addition to fishing rights, treaty rights include hunting, gathering, and other rights, reserved under the Point Elliott and Medicine Creek treaties.

Usual and accustomed fishing areas are crucially important to the livelihood, lifestyle, and identity of Muckleshoot Indian Tribe members.

According to the official Muckleshoot Indian Tribe Web site, Muckleshoot.nsn.us:

> Perhaps the most important element of the Muckleshoot Tribe's battle for recognition of its inherent rights as the original people of this ecosystem was the battle over treaty fishing rights. The right of tribal members to take Salmon at all of their "usual and accustomed" fishing sites was explicitly guaranteed in the treaties, and efforts to reassert those rights led to the so-called "Fish Wars" of the 1960s and 70s. The subsequent Boldt Decision, which reaffirmed the Tribe's treaty fishing rights, had a vast impact on the Muckleshoot Tribe, resulting in improved economic conditions and an opportunity to serve as co-manager of regional salmon resources. Many of today's Tribal leaders were active participants in the Fish Wars.

Constructing the Preferred Alternative could prevent or limit access to usual and accustomed tribal fishing areas because of the following:

- Existing areas used by the Muckleshoot Indian Tribe for fishing would be partially obstructed.
- Navigation channels would close during construction of the bridge's new spans and demolition of the existing bridge spans over the navigation channels. For example, under the Preferred Alternative, WSDOT would close down Montlake Cut to all boat traffic periodically over a 3 to 4 week period for a total of approximately 6 full (24 hour) days. To reduce the potential effects of construction activities on tribal fishing vessel traffic, the bridge would be constructed one leaf at a time, so that half the bridge could remain open through some of the construction process.
- Construction-related vessel and barge movement in Portage Bay, Union Bay, Lake Washington, and the Puget Sound could interfere with tribal fishing. Construction barges would likely only be located in the Montlake Cut during actual bridge assembly work.
- Pontoon storage and staging areas could limit access to tribal fishing areas.
- The Muckleshoot Indian Tribe would lose access to fishing areas for several years while in-water work is taking place.

Construction activities might also adversely affect treaty fisheries resources by limiting the availability of fish for subsistence, ceremonial, and commercial purposes. In general, construction of the Preferred Alternative could adversely affect fish population productivity, aquatic habitat, and migration of juvenile and adult fish. According to the Ecosystems Addendum and Errata (see Attachment 7), under the Preferred Alternative, the following construction effects may create adverse conditions for fish

populations in usual and accustomed tribal fishing areas in Lake Washington and nearby waterways:

- In-water construction could harm fish. For example, driving steel piles with an impact hammer might injure or kill fish. Similar to Option A, the Preferred Alternative would involve substantially less in-water and over-water work than Option K, lessening opportunities to harm fish. Based on site-specific pile-driving evaluations (WSDOT 2010b), sound-reducing BMPs can reduce underwater pile-driving noise levels to background levels within 380 feet of the pile-driving location. In addition, these BMPs can reduce the range at which a single pile strike could produce sound levels capable of injuring fish to less than 1 meter from the pile-driving location. The Preferred Alternative would require about 3,500 in-water piles, which is at the upper end of the range for the SDEIS options (2,900 to 3,700 piles) for construction of the bridge. The Hydraulic Permit Approvals that would need to issued prior to start of this type of work would determine the appropriate time of year and duration for this activity.
- Construction activities in the primary migration route could cause some adult fish to delay or avoid going through construction areas in Lake Washington, which could lead to adverse effects. For example, adult fish could die before spawning, which would adversely affect salmon populations in Lake Washington. According to the Ecosystems Discipline Report Addendum and Errata (Attachment 7), substantial portions of the project alignment do not appear to provide preferred habitat for native salmonid and other fish species. Migrating salmonids typically pass through the project site relatively quickly, so long-term displacement of individual fish due to construction is not expected.
- During construction, unintentional sediment discharge from installing the permanent support column, falling debris during construction of the new bridge, and demolition of the existing bridge deck could injure or kill fish or lead to changes in fish behavior. WSDOT would use standard over-water and in-water and demolition BMPs to prevent such discharge and falling debris. Therefore, this process would have limited potential to adversely affect fish or aquatic habitat in the area.
- Accidental spills of hazardous materials or pollutants in the water could kill or harm fish. WSDOT would use BMPs to prevent such spills.
- Lighting associated with nighttime highway construction could affect the distribution and behavior of fish, depending on the intensity and proximity to the water. It is expected that construction lighting would be used to a greater extent between late summer and early spring. Few juvenile salmon are expected to appear in the study area during this time of year. Therefore, WSDOT does not anticipate substantial adverse effects from construction lighting.

- As with the SDEIS options, WSDOT would need to build construction work bridges along both sides of the existing bridge structure (see Exhibit 9 in the Social Elements, Public Services, and Utilities Discipline Report Addendum and Errata in Attachment 7). These work bridges would create shading of open water in usual and accustomed tribal fishing areas during construction. Areas under these structures would probably not provide optimal conditions for aquatic plant growth because of light restrictions. This could directly or indirectly affect fish (including native salmonid) potentially affecting salmonid migration and the distribution of predators. However, work bridges would be confined primarily to shallow water areas, where expansive aquatic vegetation limits use by juvenile and adult salmonids. The Preferred Alternative would result in 10.9 acres of over-water shading from work bridges during construction, which is within the range of the SDEIS options (10.3 to 11.8 acres). These construction work bridges would be in place for 36 to 60 months, depending on location.
- Construction barges temporarily anchored in deep water would also create shading, similar to the SDEIS options.

WSDOT has determined that there would not be a disproportionately high and adverse effect to tribal fishing because of the project, regardless of the build option. This is because WSDOT will continue to work through government-to-government consultation with the Muckleshoot Indian Tribe on an agreement to resolve fully and fairly issues associated with the impacts of the project on treaty rights.

Foster Island

The Preferred Alternative and all options would affect the Foster Island traditional cultural property (TCP) through construction activities and by requiring additional land for construction easements beyond the permanent right-of-way expansions. The construction easement would be on the north side of the existing right-of-way.

KEY POINT

Foster Island

Option K would have the greatest effect on the Foster Island TCP and the highest potential to encounter cultural resources due to the larger amount of excavation in this area.

The Preferred Alternative and Options A and L would require clearing and grading on Foster Island, as well as small amounts of excavation for placement of bridge columns. Option K would require 2.8 acres of excavation on Foster Island for pilings and to accommodate the land bridge. Therefore, the potential for encountering cultural resources would be greater for Option K than for the Preferred Alternative or Options A and L due to the higher degree of ground disturbance.

In consultation with interested and affected tribes, WSDOT has determined that the construction of the Preferred Alternative would diminish the integrity of the Foster Island TCP and contribute to the project's adverse effect on historic properties. If project construction were to encounter important cultural resources of significance to Native American tribes on Foster Island, a minority population could predominantly bear construction

effects. If this were to occur, Native American tribes are expected to experience disproportionately high and adverse effects. As such, FHWA and WSDOT would need to consult with the tribes and the Department of Archaeology and Historic Preservation (DAHP), FHWA, and WSDOT to identify appropriate mitigation measures.

How would construction of the project affect public services and utilities?

Construction activities along Roanoke Street would occur adjacent to Seattle Fire Department Station 22 and the Washington State Patrol. Access and egress would be maintained at all times for these two public service providers. The Delmar Drive East bridge would have been closed under SDEIS Options A, K, and L, although this closure was not expected to result in negative effects on emergency response times because the temporary bridge at 10th Avenue East would be constructed prior to any demolition work. Under the Preferred Alternative, both 10th Avenue East and Delmar Drive East would remain open during construction. Detour routes and access interruptions would be developed and shared with these providers in advance to minimize effects.

Construction-related closures of the Lake Washington Boulevard ramps would change emergency vehicle access to the UW Medical Center. Detour routes would be developed in advance and shared with providers of fire, emergency medical, and police services to minimize negative effects.

Increased police security may be needed to protect equipment and materials at construction sites and staging areas. Also, depending on the magnitude of construction that is occurring along the corridor, there could be an increased demand on emergency medical aid from fire departments due to the increased risk of construction site accidents. A westbound left-turn pocket from NE Pacific Place would be added to the Montlake Boulevard NE/NE Pacific Place intersection to accommodate turning vehicles.

WSDOT's existing system of lighting, traffic control, and ramp metering would continue during construction. The use of temporary electrical systems would ensure that traffic control systems and lighting on temporary bridges and construction areas are able to operate without interruption.

Pile-driving, earth-moving, and roadway alignment work may affect utilities both below ground (pipes and conduits) and above ground (overhead wires). Utility lines and/or cables may be rerouted or protected in place, which could cause temporary outages. These outages would likely be short-term and intermittent. As described in Section 6.1, temporary roadway realignments could require construction of temporary trolley wire, including providing new switches and poles along the route or other changes to the transit facilities.

Relocation of some utilities may affect other utilities near the relocation work. These effects would be reviewed and approved on a case-by-case basis prior to action. Before construction, WSDOT would prepare a consolidated utility plan verifying the exact location and depth of utilities with utility providers, and construction methods would be developed to minimize utility effects. For utilities with WSDOT franchise agreements, any relocation would be addressed under the provisions in each provider's agreement.

How would the project minimize negative effects during construction?

Potential best management practices that WSDOT may implement to avoid or minimize construction effects during construction are identified below.

Social Elements

- WSDOT is developing a community construction management plan to help minimize the effects of construction activities on affected communities.
- A traffic management plan would be prepared that would identify measures and practices to minimize construction effects on local streets, transit and transit users, property owners, and businesses (see Section 6.1, Transportation).
- Where practicable, construction access to and from the construction zones would be provided from SR 520 and existing on- and off-ramps to reduce the volume of construction trucks using the residential streets.

Additional minimization measures to reduce noise and dust levels, minimize visual effects, reduce traffic congestion, and minimize effects on park and recreational facilities during construction are identified in Section 6.4, Recreation; Section 6.5, Visual Quality; Section 6.7, Noise; and Section 6.8, Air Quality.

Environmental Justice

- WSDOT is coordinating with the Muckleshoot Tribe to identify important access points to usual and accustomed fishing areas in areas where proposed structures would be built. There would be additional coordination to avoid construction conflicts with tribal fishers harvesting salmon in Portage Bay, Union Bay, and Lake Washington.
- During construction, BMPs would be required to minimize the potential adverse effects of pile-driving, falling debris, unintentional discharge of sediment, and other construction effects that could harm fish habitat.

- Construction would be restricted to identified in-water work windows in order to reduce potential adverse effects on fish populations or habitat.
- Mitigation measures to restore shorelines, floodplain areas, wetlands, and riparian vegetation would be implemented to compensate for effects on habitat (see Section 6.11, Ecosystems).
- In the event construction encounters previously unidentified cultural or archaeological resources on Foster Island, the resources would be evaluated to assess their historical significance, and WSDOT would consult with the tribes and the Washington State Department of Archaeology and Historic Preservation to determine appropriate avoidance, minimization, and mitigation measures for any NRHP-eligible resources as part of the project's archaeological treatment plan.

Public Services and Utilities

- WSDOT will work with affected communities to provide advance notice of any service disruptions or outages.
- WSDOT will notify service providers of construction schedules, street closures, and utility interruptions in advance.
- WSDOT will coordinate with law enforcement agencies to implement crime prevention plans for construction sites and staging areas.
- WSDOT will notify and coordinate with police departments prior to construction to plan for adequate staffing for traffic and pedestrian movement control.
- WSDOT will notify and coordinate with the fire departments throughout project construction regarding traffic congestion and road closures.
- WSDOT will notify and coordinate with fire departments for water line relocations that could affect water supply for fire suppression, and establish alternative supply lines prior to any service interruptions.
- WSDOT will notify and coordinate with fire departments for utility service interruptions (power and phone) that could affect fire detection and notification systems, and establish alternatives prior to any service interruption.
- WSDOT will work with utility service providers to prepare a consolidated utility engineering plan consisting of key elements such as existing locations, potential temporary locations, and potential new locations for utilities; prepare sequenced and coordinated schedules for utility work; and develop detailed descriptions of any service disruptions.

6.4 Recreation

Three types of construction effects would occur at parks and recreation resources in the project area: temporary easements that close portions of parks during construction periods; temporary activities that would close or reroute trails and recreational boating access; and offsite work that would create traffic or noise effects. Permanent, full park acquisitions (Bagley Viewpoint and McCurdy Park) and permanent effects from right-of-way acquisitions were discussed in Section 5.4. Those acquisitions would occur at the start of construction.

Depending on the Preferred Alternative or SDEIS option, the project would require construction easements in parts of Interlaken Park, Montlake Playfield, East Montlake Park, University of Washington Open Space, and Washington Park Arboretum. Construction would also require periodic closures of portions of the Bill Dawson Trail and the Arboretum Waterfront Trail. Table 6.4-1 and Exhibit 6.4-1 show the recreation areas affected by construction closures.

Construction effects occurring at or in the vicinity of parks located in the same general areas are grouped and discussed together in this section by alternative.

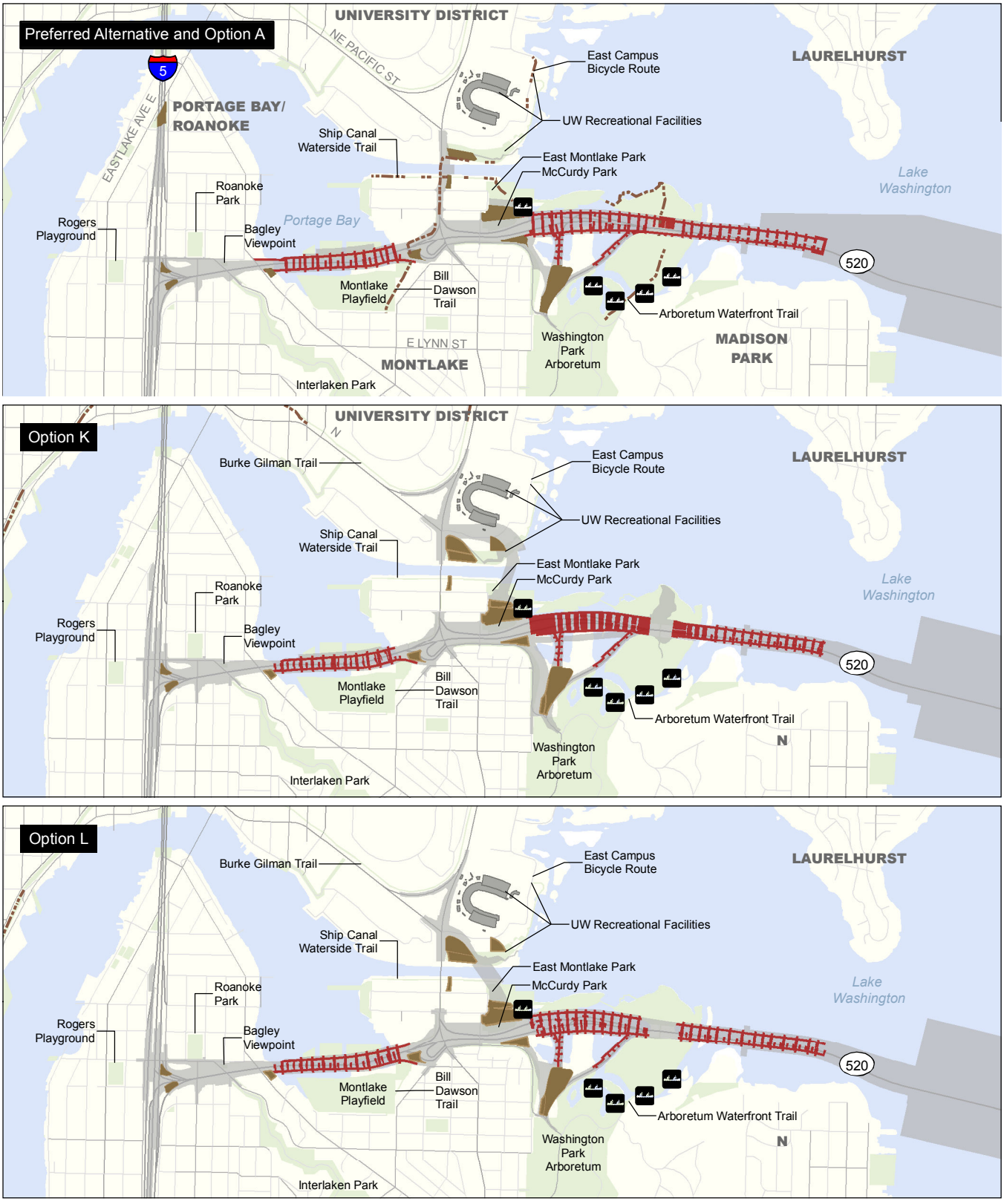
Table 6.4-1. Construction Easements in Parks (acres)

Resource	Park Size	Preferred Alternative	Option A	Option K	Option L
Rogers Playground	1.9	0	0	0	0
Roanoke Park	2.2	0	0	0	0
Interlaken Park	51.7	0	0.05	0.05	0.05
Montlake Playfield	26	3.2[a]	1.8[a]	2.6[a]	2.1[a]
East Montlake Park	8.8	1.2	1.1	0.4	1.1
Washington Park Arboretum	230	1.8	1.8	5.2	2.3
University of Washington Open Space	3	1.2	1.2	0.8	1.5
Total Effects	--	7.4	5.9	9.0	6.9

Note: Adding the suboptions to Option A would temporarily affect an additional 0.1 acre of East Montlake Park and 0.3 acre of the Arboretum during construction. Adding the suboptions to Options K and L would result in no measurable difference in the park effects listed in this table.

[a] Construction easments include the submerged lands north of the Portage Bay Bridge. The Preferred Alternative includes an additional 1.5 acres of construction easement for barge work area. If Option A, K, or L were advanced as the build alternative, the construction easement in Montlake Playfield would also need to increase by an additional 1.5 acres.

Exhibit 6.4-1. **Construction Effects on Parks**



How would construction affect recreation resources?

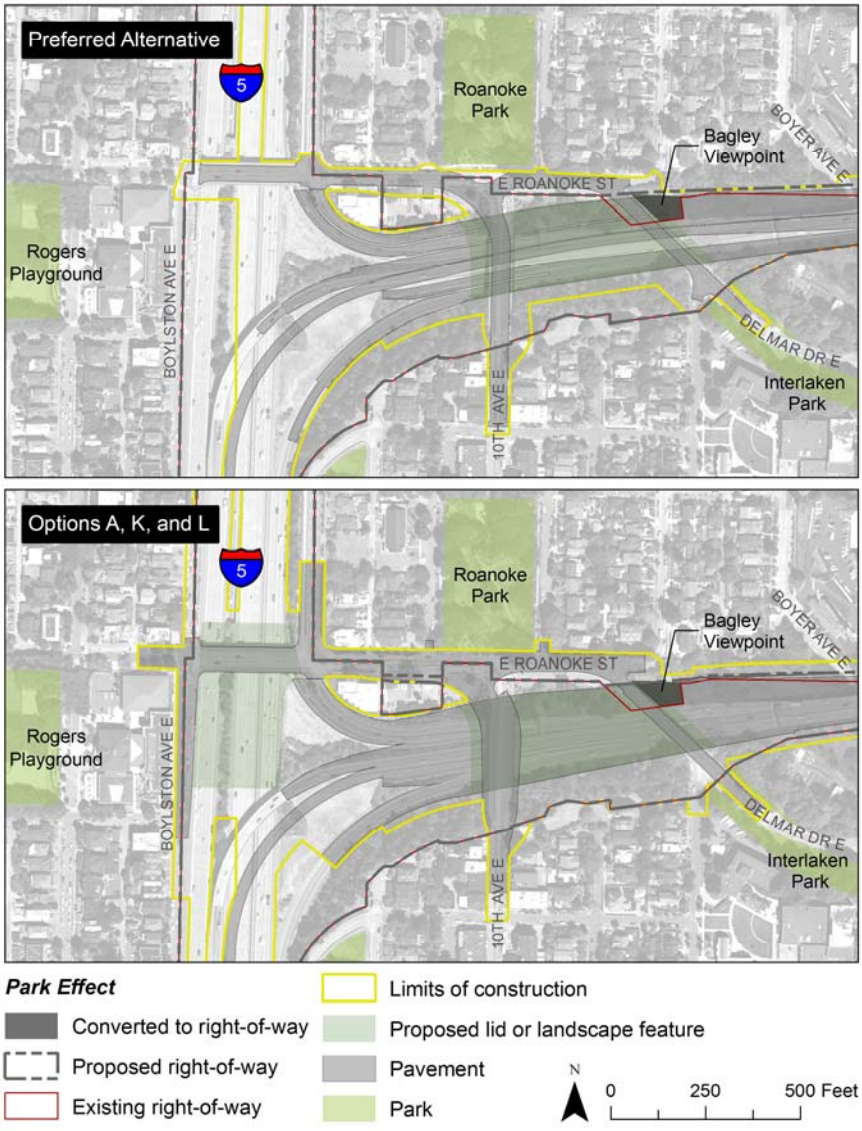
I-5/Roanoke Area

The parks and recreation features in this area that were evaluated for construction effects are Rogers Playground, Roanoke Park, and Interlaken Park. The Bagley Viewpoint, discussed in Sections 4.1 and 5.1, would have been acquired at the start of construction in the area. Exhibit 6.4-2 shows the location of these features, and Table 6.4-1 confirms that there would be no temporary easements in these parks under the Preferred Alternative or any SDEIS option.

KEY POINT

The Preferred Alternative and all options would acquire Bagley Viewpoint in its entirety, and all options would include a proposed haul route adjacent to Roanoke Park. Construction effects on both of these parks would be the same for all options.

Exhibit 6.4-2. Construction Effects on Parks in the I-5 and Roanoke Area



Preferred Alternative

There would be no construction easements needed within any of these parks under the Preferred Alternative, and construction in the I-5 area is estimated to last up to 26 months.

The effects of construction on the views and background noise levels at Rogers Playground would be minimal. The closest construction activities to Rogers Playground would be haul trucks traveling along Boylston Avenue East as described below. Noise, visual quality, or dust effects that might otherwise occur at Rogers Playground would be blocked by the The Option Program at Seward (TOPS) School buildings and street trees located along the playground. Street trees located along both East Louisa Street and East Roanoke Street would also block views, noise, and dust effects. There would be no change in vehicular or bicycle/pedestrian access to the playground or to on-street parking nearby during construction.

Activities associated with construction of the 10th Avenue East/Delmar Drive East lid would occur near or adjacent to Roanoke Park, creating increased noise and traffic near the portion of the park closest to construction work as it progresses. The park is located on East Roanoke Street, which is also a proposed haul route. Bicycle and pedestrian access to the park from East Roanoke Street would not be limited during construction because the sidewalk along the north side of the street would remain open. None of the access points along the park's perimeter or the on-street parking around the park would be disturbed by construction.

Both Boylston Avenue East and East Roanoke Street near the Rogers Playground and Roanoke Park would potentially be used intermittently as a secondary haul truck route. This means that on most days, there would be no noticeable difference in traffic volumes from existing conditions as a result of using the roadway for hauling. Section 6.1 provides more information on haul trip volumes. Chapter 3 provides a discussion of haul truck trips and a description of project staging and likely timing of work near the parks.

Interlaken Park is divided into two portions by Delmar Drive East, and the work associated with the construction of the 10th Avenue East/Delmar Drive East lid would stop short (approximately 100 feet to the north) of the park. There would be no effects on bicycle and pedestrian traffic traveling south into Interlaken Park along this route. Users of the northern portion of the park would be able to hear noise from pile-driving associated with the Portage Bay Bridge (for approximately 14 months) and likely some of the construction work associated with the 10th Avenue East/and Delmar Drive East lid. Use of Delmar Drive East as a potential secondary haul route would not produce traffic, noise, or dust that would substantially affect users of Interlaken Park. See Section 6.1 for more information on haul routes including volumes of trucks.

Options A, K, and L

The effects on Rogers Playground and Roanoke Park would be generally the same as under the Preferred Alternative. The same haul routes would be used for construction of these options as for construction of the Preferred Alternative.

Since publication of the SDEIS, the construction easement in Interlaken Park has been eliminated. There would be no easement needed in the park under these options (Exhibit 6.4-2 and Table 6.4-1). Delmar Drive East would be closed temporarily during construction of the 10th Avenue East and Delmar Drive East lid. Bicyclists and pedestrians who currently use the on-street bike path to access the park would be routed along the 10th Avenue East construction crossing. Construction noise in the park would be similar to that for the Preferred Alternative.

Portage Bay/Roanoke Area

The parks and recreation features in this area that were evaluated for construction effects are the Montlake Playfield, Bill Dawson Trail, private recreational boating and moorage on Portage Bay south of SR 520, the Queen City Yacht Club, and the Seattle Yacht Club. Exhibit 6.4-3 shows the location and Table 6.4-1 discloses the construction easements proposed at the Bill Dawson Trail and the Montlake Playfield.

Preferred Alternative

Within the Montlake Playfield (including the submerged lands that are part of the site), approximately 3.2 acres of construction easement would be needed for the work bridge that would be used to widen the existing Portage Bay Bridge and construct the new Montlake Boulevard ramp. The work bridge would remain in place to support demolition of the existing Portage Bay Bridge and construction of the new bridge and ramp over a period of approximately 64 to 72 months. The work bridge would be in the water adjacent to the Portage Bay Bridge, as well as on approximately 0.3 acre of land on-site where there are no developed features. This on-land portion of the park does need see a great amount of use.

KEY POINT

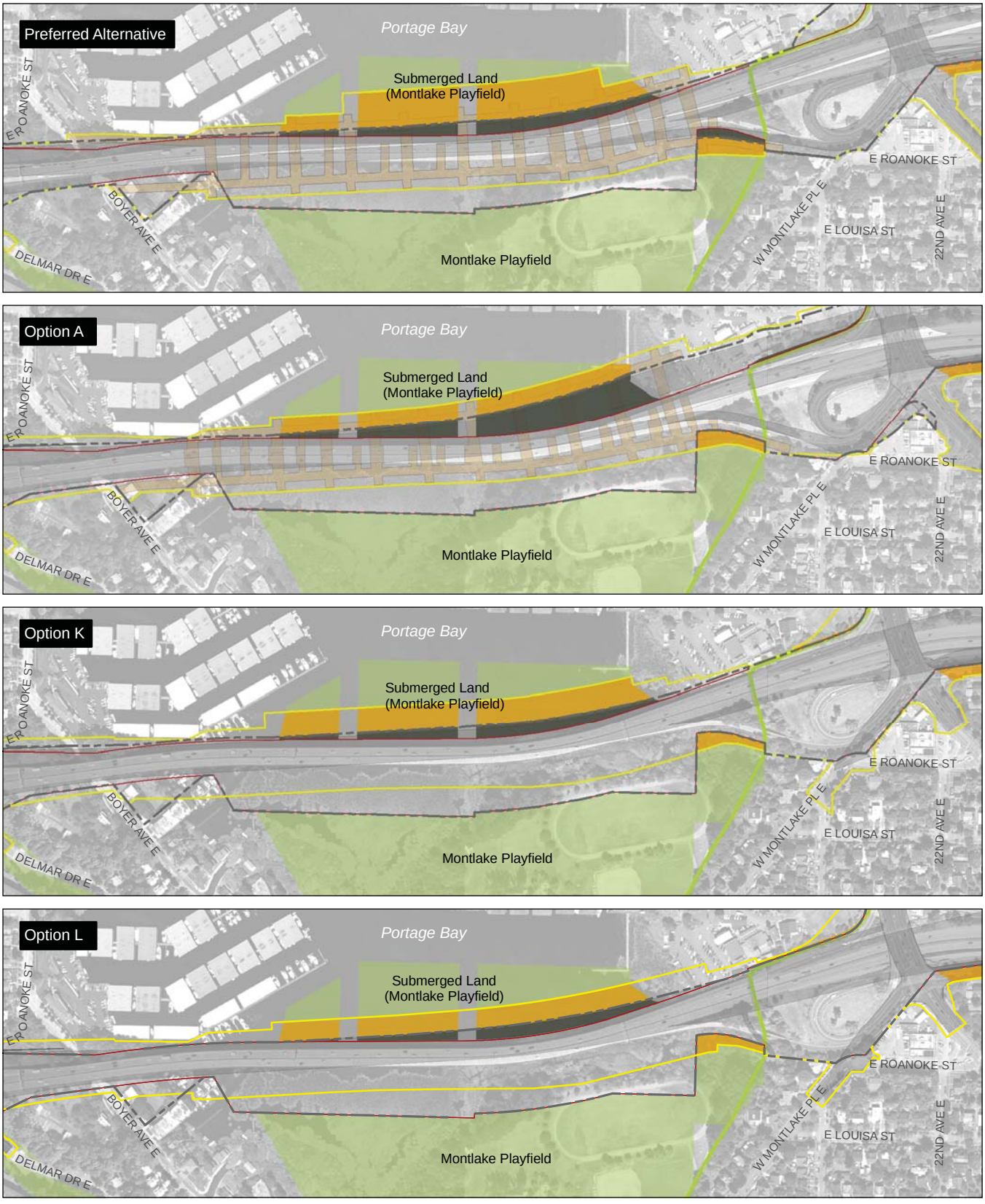
Work Bridges

The Preferred Alternative and all SDEIS options would construct work bridges in Portage Bay, Union Bay, and Lake Washington in the west approach area. The use of recreational vessels such as canoes or kayaks would be prohibited beneath the work bridges at times during construction for public safety.

Construction activities in the vicinity of the park would generate noise and vibration and would change views from the park for the construction duration. There would be no physical impediment to launching and landing of hand-carry boats at the shoreline of the park. There would be no change to the park's access points for motor vehicles or to on-street parking.

During construction, the segment of the Bill Dawson Trail within the WSDOT right-of-way and north of SR 520 would be closed. Detours for pedestrians and bicyclists who would normally use this trail would be provided using on-street and sidewalk connections to maintain trail connectivity between Montlake Boulevard and Montlake Playfield, as shown on Exhibit 6.4-3.

Exhibit 6.4-3. Construction Effects on Montlake Playfield



During construction in Portage Bay, access to and from the private moorage at the Bayshore Condominiums along the south end of Portage Bay would be limited. Work bridges would be designed to provide limited clearance underneath, but at times access beneath the work bridges would not be possible in order to ensure public safety. Boats would also not be allowed to pass underneath the Portage Bay Bridge during demolition activities. A work bridge would be needed on the north side of the Portage Bay Bridge to demolish the existing structure and build the new one (Exhibit 6.4-3). Barges would be used to haul material to the construction site and would be moored underneath the Portage Bay Bridge for some construction activities. Barges moving into this area would not be a regular occurrence and they would not be moored in locations that would affect boat movement to and from the yacht clubs.

The slips on the south side of the Queen City Yacht Club's south dock (underneath the right-of-way) would be unavailable for the construction duration There would be no effects on the Seattle Yacht Club's property or moorage. Water access to the Seattle Yacht Club and the Queen City Yacht Club would be affected at times during construction (as barges travel by or during construction of the work bridge north of SR 520, for instance). Traffic to and from the yacht clubs on and around Opening Day of boating season would not be impeded by construction or barge movement and moorage because WSDOT would time its construction activities to avoid such interference. Access to the yacht club from area streets would be maintained at all times. Other likely types of effects on the yacht clubs would be generation of noise and vibration, and changes to views. During the estimated 64 to 72 month construction period associated with the Portage Bay Bridge, pile-driving to install the work bridges would be the most intrusive activity, and it would generate noise and vibration for approximately 14 months, non-consecutively, during the overall construction period.

Options A, K, and L

Options A, K, and L would have construction effects similar to the Preferred Alternative's except that the duration of construction and the area of construction easement would be different due to the different Portage Bay Bridge configurations. As seen in Table 6.4-1, Option A would require a 1.8-acre construction easement for the bridge; Option K's easement would be 2.6 acres; and Option L's easement would be 2.1 acres.

Closures of the Bill Dawson Trail would occur for the duration of construction in this area (estimated at about 72 months) with these options during rebuilding of the Portage Bay Bridge and the Montlake Boulevard interchange. As with the Preferred Alternative, detours for bicyclists and pedestrians using the trail would be provided. See Chapter 9 for more information on the Bill Dawson Trail and Section 4(f).

Montlake Area

The parks and recreation features in this area that were evaluated for construction effects are the East Montlake Park and the University of Washington Open Space. Exhibit 6.4-4 shows the location and Table 6.4-1 discloses the construction easements proposed at both parks.

Preferred Alternative

The Preferred Alternative would temporarily affect 1.2 acres of East Montlake Park (Exhibit 6.4-4). McCurdy Park (discussed in Sections 4.4 and 5.4) is adjacent to East Montlake Park, and would be acquired and permanently closed at the start of construction. Only the northern portion of East Montlake Park would remain in recreational use during construction. The areas not closed to the public would continue to provide access to Lake Washington, the Ship Canal Waterside Trail, the Arboretum Waterfront Trail, and the Montlake Cut. The shoreline areas of the park are where the most intensive recreation activity generally occurs. The kayak and canoe launch point on the Lake Washington shoreline would be periodically inaccessible, but would remain open and accessible for most of the construction period. Some parking would be retained on-site during the majority of the construction phase.

KEY POINT

East Montlake Park, McCurdy Park, and the University of Washington Open Space

The Preferred Alternative and all options would affect East Montlake Park and the University of Washington Open Space. All options would permanently acquire McCurdy Park and a portion of East Montlake Park prior to the start of construction. The scale and intensity of construction near these parks would vary among the options.

The 24th Avenue East crossing of SR 520, which provides access to East Montlake Park and is a designated city bike route, would also be closed at times during construction, with detours directed to Montlake Boulevard. The northern portion of East Montlake Park and the trailheads for the Arboretum Waterfront Trail and the Ship Canal Waterside Trail in East Montlake Park would remain open during construction, with exceptions as noted below.

KEY POINT

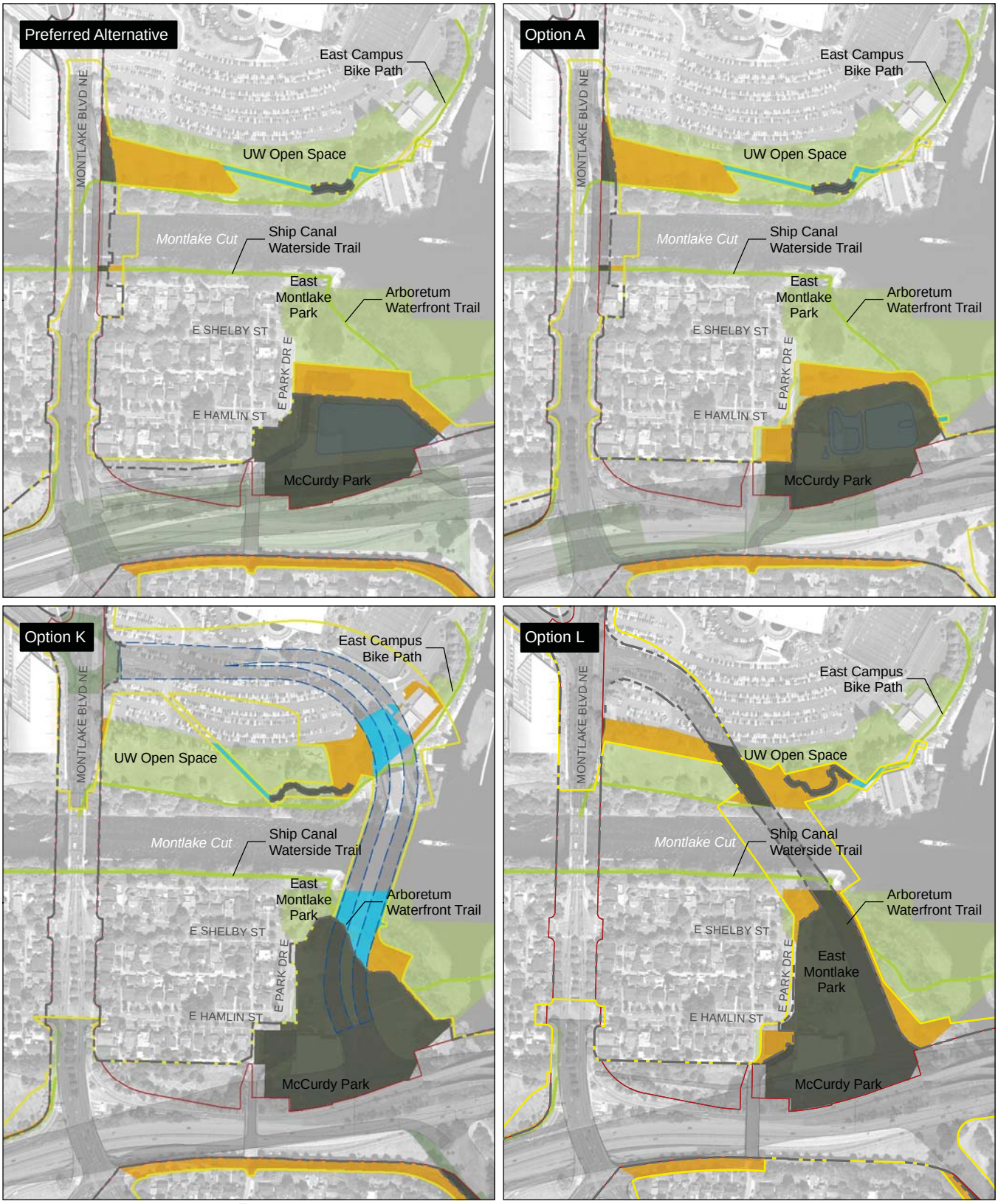
Trails

The Preferred Alternative and SDEIS options would require periodic closures of portions of the Ship Canal Waterside Trail and portions of the Arboretum Waterfront Trail. The kayak and canoe launch point on the Lake Washington shoreline at East Montlake Park would also be periodically inaccessible.

Construction would occur in the park and near the site for up to 56 months, slightly longer than the anticipated with Option A because of the larger Montlake lid design and construction staging schedule developed for the Preferred Alternative.

During construction of the second bascule bridge over the Montlake Cut, a portion of the Ship Canal Waterside Trail in East Montlake Park would be periodically closed for safety reasons. The new bascule bridge would be located east of the existing bridge and its construction would mainly affect access to the University of Washington Open Space and associated Waterfront Activities Center (WAC). WSDOT would have permanently acquired approximately a quarter acre of the University of Washington Open Space (Exhibit 6.4-4) to construct the new bascule bridge and a stormwater treatment bioswale, and these areas would be unavailable for recreational use from the start of construction. An additional 1.2 acres of open space within the western third of the park would be used for construction staging and would be unavailable for recreation for approximately 56 months.

Exhibit 6.4-4. Construction Effects on Parks in the Montlake Area



Pedestrian and vehicle access to the University of Washington Open Space and associated features and facilities (the WAC and the Canoe House to the east of the site) would be provided at all times and there would be no effects on boating access to and from the University of Washington Open Space. Some of the vehicle parking that can be used for access to the University of Washington Open Space, approximately 10 spaces in Husky Stadium Parking Lot E11, would be used for construction staging and temporarily unavailable, but would be restored after construction. Following construction, areas of construction easement would be restored to their current recreation uses.

Construction would generate noise and changes to the aesthetic component of the University of Washington Open Space during the estimated 56 month duration of activity on this site. Noise would be noticeable to open space users as well as recreational bicyclists and pedestrians on Montlake Boulevard, and the loudest work would likely occur during construction of the new bascule bridge span and roadway paving. Although construction activities would generate dust, park effects due to dust would not occur with use of appropriate and required best management practices (BMPs).

Option A

With Option A, 1.1 acres of East Montlake Park would be temporarily affected (Exhibit 6.4-4). In combination with permanent closure of a portion of East Montlake Park and all of McCurdy Park, this would result in closure of over 60 percent of the parks' current area during construction. The temporary construction easement would be used for staging and for construction of the westbound off-ramps and detention ponds. Only the northern portion of East Montlake Park would remain open to the public during construction, and the effects on the recreational uses would be similar to those described for the Preferred Alternative. Construction of the new Montlake bascule bridge under Option A would result in recreation effects at the University of Washington Option Space similar to those described above for the Preferred Alternative.

Option K

Construction activities for Option K would occur over a longer duration than the Preferred Alternative or Option A (an estimated 66 to 70 months). A cut-and-cover tunnel and freeze pit would be constructed in East Montlake and McCurdy parks, creating a greater level of noise, visual quality, and construction traffic effects and possible dust effects because these areas would require the excavation of a substantial amount of soil.

Option K would temporarily affect 0.4 acre of parkland in East Montlake Park (Exhibit 6.4-4). In combination with the permanent acquisition in East Montlake Park and all of McCurdy Park, approximately 80 percent of the parks' area would be closed for the duration of construction. Only a small

area in the northwest corner of East Montlake Park would remain in recreational use. The other construction effects of Option K, including temporary closure of trail access and watercraft launch points, would occur occasionally as with the Preferred Alternative, although most likely for longer periods of time due to the type of construction activities that would occur here (see Chapter 2).

Because of the depth of the Option K tunnel and the supporting infrastructure, the types of construction effects at the University of Washington Open Space would differ from those of Options A and L. A construction easement of approximately 0.5 acre would be required on the site (Exhibit 6.4-4).

Access to Walla Walla Road (which is used to access the WAC and Canoe House) through the Husky Stadium parking lot would be detoured for the duration of tunnel construction. Traffic destined for the E-12 parking lot or Walla Walla Road would be rerouted through the Montlake Boulevard/NE Pacific Street intersection. Much of the E-11 and E-12 parking lots would be used for construction staging; over500 parking spaces would be closed during this time. Access and parking effects on these resources are described in Section 6.1, Transportation.

Tunnel construction would require temporary relocation of the WAC, which would affect the Washington Yacht Club, Sailing Team, Kayak Club (flat and white water), and Union Bay Rowing Club, which operate from that facility. The WAC also rents canoes and rowboats to the general public. Most renters use the canoes to cross the Montlake Cut and access the Arboretum.

Some portions of the University of Washington Open Space, including the East Campus bike route and climbing rock, would not be accessible during construction of the tunnel and the lowered NE Pacific Street/Montlake Boulevard NE intersection.

Option L

Option L would temporarily affect 1.6 acres of area in East Montlake Park (Exhibit 6.4-4). Combined with 4.3 acres of permanent acquisition in East Montlake Park and 1.5 acres in McCurdy Park, this would close over 75 percent of park area for approximately 60 to 66 months during construction. The other construction effects of Option L, including temporary closure of trail access and watercraft launch points, would be similar to those described above for the Preferred Alternative and Option A.

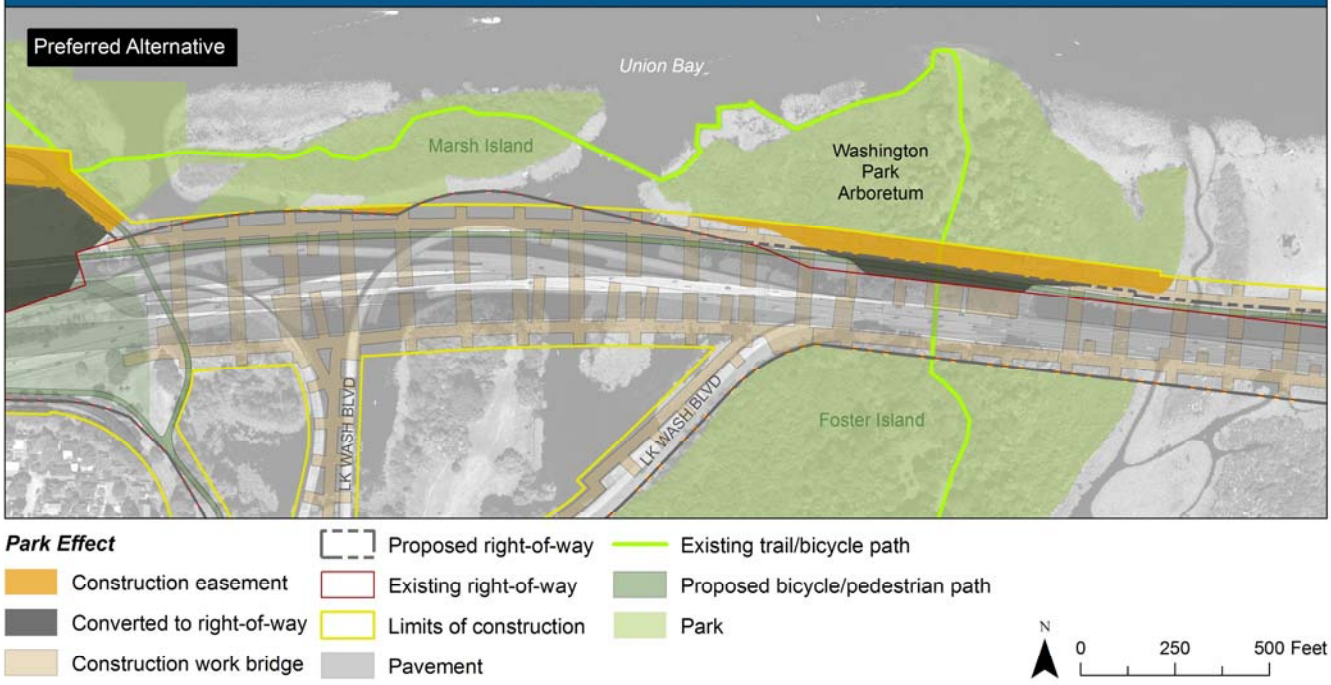
Construction of the new bascule bridge across the Montlake Cut would require a 1.4-acre temporary construction easement through the University of Washington Open Space, which would affect access to the site for the duration of construction. Construction of the bridge span and support

columns would require periodic closure of the WAC, the climbing rock, and the Canoe House (east of the park). Lowering the NE Pacific Street/Montlake Boulevard NE intersection would affect access to Husky Stadium. As under Option K, Walla Walla Road would be detoured through the Husky Stadium south parking lot to the NE Pacific Street/Montlake Boulevard NE intersection. Bridge construction would relocate the climbing rock and portions of the East Campus Bike Route for the duration of construction. Close to 200 parking spaces would be closed in the Husky Stadium parking lot. Access and parking effects are discussed in Section 6.1.

West Approach Area

Under , the Preferred Alternative and SDEIS options, construction of the proposed improvements would require periodic closure of the section of the Arboretum Waterfront Trail crossing underneath SR 520 on Foster Island (Exhibit 6.4-5).

Exhibit 6.4-5. **Construction Effects on the Washington Park Arboretum**



The Preferred Alternative and SDEIS options would also remove the existing R.H. Thomson Expressway ramps. Although removal of the ramps would occur entirely on WSDOT property, adjacent areas would be affected by noise and vibration during their demolition. Dust would be generated during demolition activities, but would be controlled by construction BMPs and would not affect visitors to the Washington Park Arboretum or the Arboretum's vegetation or wildlife. There would be negligible effects on access to the Arboretum from this demolition work.

Throughout the west approach area, WSDOT would use pile-driving techniques to construct temporary work bridges. Pile-driving would take place throughout the established in-water work windows for fish protection indicated in Chapter 3, but would be limited to daytime hours to minimize noise effects. See Section 6.7 for more information on construction noise.

Preferred Alternative

The Preferred Alternative would cross Foster Island within the Washington Park Arboretum on a pier and span bridge. Construction would include work bridges alongside the new SR 520 bridge alignment on Foster Island (see Chapter 3). Construction would require a temporary 1.8-acre easement on Foster Island for approximately 59 months to accommodate work bridges needed to demolish the existing SR 520 and construct the new bridges (Exhibit 6.4-5). While in place, the work bridges would change the views from the Washington Park Arboretum and construction activities, including pile-driving, would generate noise. The canoe and kayak launch point near the north end of Foster Island would remain in use during construction, but paddling would be restricted in the areas where the work bridges are being constructed or while demolition of the existing bridge is occurring overhead.

Connectivity between the ends of the Arboretum Waterfront Trail (in Washington Park Arboretum and East Montlake Park) would be temporarily disrupted at times with the construction of SR 520 over Foster Island. Trail detours during these disruptions could not be provided simply because the existing crossing under SR 520 is the only one in the area and when work is occurring in that area, there would generally not be room for safe passage through the area. However, the closures of the trail would be for less than 6 months and access to the trail would continue to be available from either East Montlake Park or the Washington Park Arboretum at all times as discussed in Chapter 10.

In addition to the construction closures of upland areas at the Arboretum, small boat movements would be restricted beneath the SR 520 bridge and the work bridges in areas where the work bridges are being constructed or while demolition of the existing bridge is occurring overhead. The Preferred Alternative would allow paddling in the waterways south of SR 520 during some portions of the construction period, but movement around Foster Island would be interrupted at times for safety reasons during the approximately 59 month duration of construction in this area. Work bridges would be removed after completion of the permanent structure.

Option A

Under Option A, a pier-and-span bridge would cross Foster Island, similar to the Preferred Alternative. However, Option A would be wider in this area than under the Preferred Alternative. The larger construction footprint on Foster Island would require 2.4 acres of construction easements for

work bridges and trail construction (Exhibit 6.4-6). Unlike the Preferred Alternative, Option A would not allow paddling in the waterways south of SR 520 during construction. All other construction effects would be similar to those described for the Preferred Alternative.

Option K

Under Option K, a land bridge would cross Foster Island, with the roadway lidded by an earthen berm. The Arboretum Waterfront Trail would be reconstructed over the land bridge and on fill material extending to the north end of Foster Island. A total of 5.2 acres of construction easements would be needed on Foster and Marsh Islands for work bridges, trail construction, and fill (Exhibit 6.4-6), but these areas would be revegetated and returned to park use once construction is completed. Construction would be ongoing in this general area for an estimated 70 months.

Option L

A pier and span bridge would cross Foster Island, similar to Option A. However, because SR 520 would be wider in this area than under Option A, there would be a larger construction footprint on Foster Island. This would require 2.3 acres of construction easements for work bridges and trail construction (see Exhibit 6.4-6). Construction is estimated to last for 59 months. These areas would be revegetated and returned to park use once construction is completed.

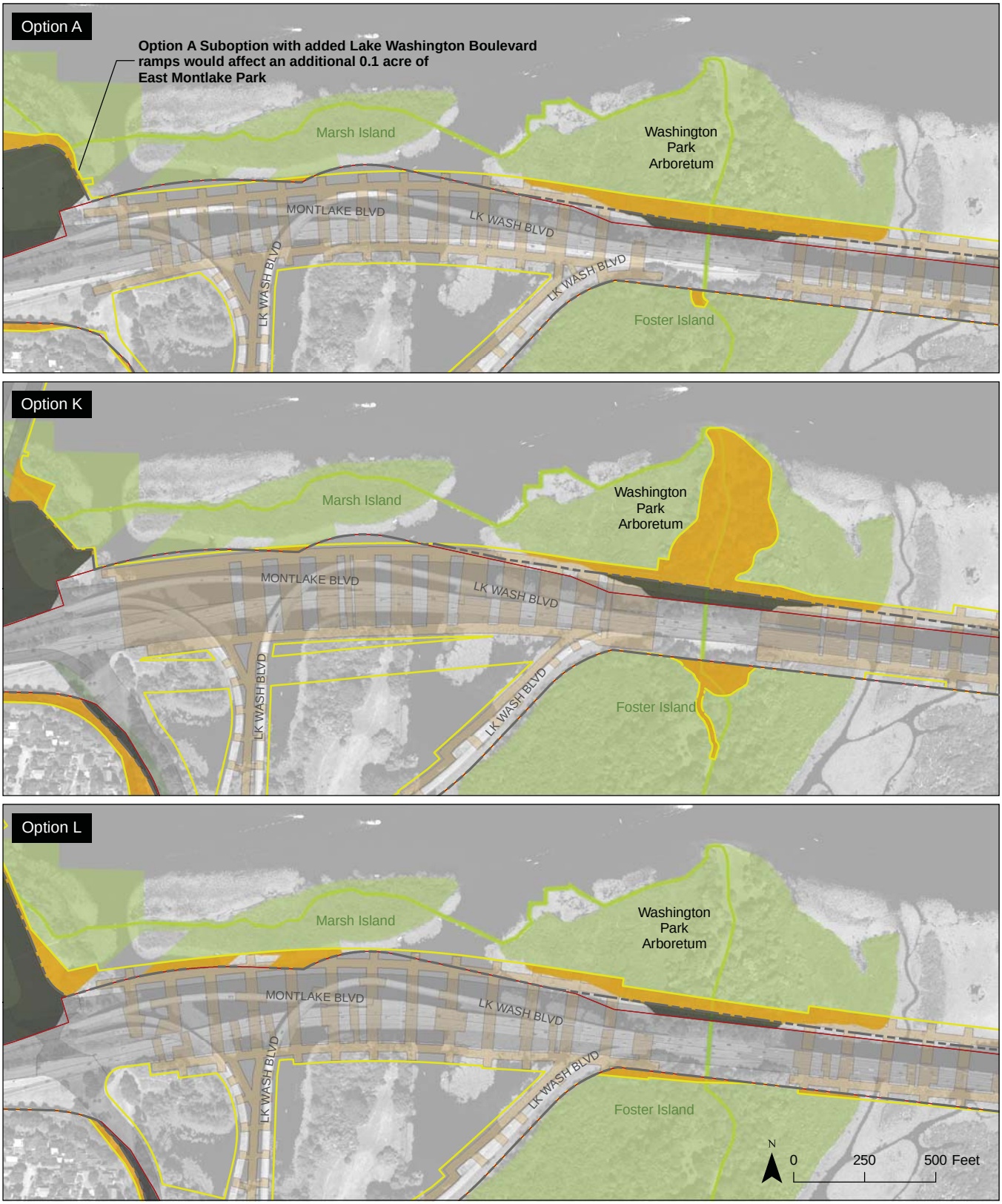
Lake Washington Area

Preferred Alternative and SDEIS Options

Although there are no formally designated recreation facilities on the waters of Lake Washington in the project area, construction activities for the floating bridge would affect people who are swimming or boating nearby. Construction of the new floating bridge and demolition of the existing floating bridge would last up to about 36 months. Construction work bridges and construction equipment in the area would affect views, while some construction noise would be audible to swimmers and boaters in the vicinity. Pile-driving to install the work bridges, demolition of the existing bridge, and construction of the new bridge would produce noise, visual quality, and effects for recreational boaters in the vicinity of the construction.

During construction and demolition of the floating bridge, a navigation channel beneath SR 520 would be provided at all times. See Section 6.14 for construction effects on large vessel movements through the project area. Since publication of the SDEIS, WSDOT has performed additional construction staging review to ensure that deep-water access for larger boats to and from moorages on Lake Washington would be maintained during construction.

Exhibit 6.4-6. Construction Effects on the Washington Park Arboretum



Eastside Transition Area

For the Preferred Alternative and the SDEIS options, no construction would occur within or near any of the Eastside parks. The nearest construction would be restriping of traffic lanes, which would not be expected to have any effect on Wetherill Nature Preserve, Points Loop Trail, Fairweather Park, or Hunts Point Park.

How would the project minimize negative effects on recreation during construction?

Mitigation measures for the identified project construction effects are as follows. WSDOT would:

- Prepare a detour plan in coordination with Seattle Parks and Recreation to address the manner in which the Bill Dawson Trail and users of Montlake Playfield would be rerouted during times of trail closure.
- Prepare a detour plan in coordination with Seattle Parks and Recreation to address the manner in which on-street bicycle traffic and the Ship Canal Waterside Trail would be rerouted during times of trail closure.
- Prepare a detour plan in coordination with the Washington Park Arboretum and Seattle Parks and Recreation to address the manner in which Arboretum Waterfront Trail users and users of Foster Island would be rerouted during times of trail closure.
- Construction activities, including barge traffic in Portage Bay and through the Montlake Cut, would be timed to avoid interference with special recreational boating events such as SeaFair and the week before and week after Opening Day of boating season.
- Limited access clearance for boats moored in South Portage Bay would be maintained under the Portage Bay Bridge work bridges and the existing bridge when possible. If access and traffic could not be maintained, WSDOT would work with boat owners in South Portage Bay to find temporary alternate moorage. Passage for small boats would be maintained through the same areas, except when overhead work or demolition of the existing bridge structure would not allow for safe passage.
- WSDOT, the City of Seattle, the University of Washington, and other appropriate regulatory agencies and stakeholders will determine the best methods for protecting specimen trees and important vegetation in the Arboretum.
- To the extent possible, WSDOT would limit the noisiest construction activities to the least active times at area parks (not weekends or special events).

For Options K and L only, to minimize harm, WSDOT would:

- Assist the University of Washington in identifying the location of temporary facilities for the Waterfront Activities Center during periods of closures and/or relocation.
- Identify a location for replacing the climbing wall, the East Campus Bike Route, and associated pedestrian amenities.

6.5 Visual Quality

Construction equipment would be noticeable throughout the active construction period, whether moving next to the traffic lanes during work hours or parked beside the roadway after hours. Also visible would be the results of ongoing construction and mitigation activities, such as construction bridges, exposed cut areas, stockpiled soil, silt fences and mulched areas, and temporary sedimentation ponds. These sights would be out of character with the project area and would greatly detract from visual quality, but they would not be permanent. WSDOT would remove equipment and restore the areas as soon as construction was complete.

Roanoke Landscape Unit

Construction activities in the Roanoke landscape unit would be visible from a few homes, the upper floors of Seward School, and nearby roadways and surface streets. The 26 months of construction activity associated with mobilization and construction of the new bicycle/pedestrian crossing at East Roanoke Street, eastbound and westbound mainline ramps, and reversible high-occupancy vehicle (HOV) ramp would have a high impact on visual character and quality for all viewers. However, viewpoints with long-distance views across Portage Bay or to the west would be minimally affected by construction in Roanoke because most construction activities would occur along the roadway corridor.

The greatest effect on views would result from large-scale activities that involve heavy equipment and collectively span 26 months. These would include demolition of ramps and bridge overcrossings; construction of new ramps; replacement of bridges or bridge expansion at Roanoke Street, 10th Avenue East, and Delmar Drive East; and construction of the new 10th and Delmar lid.

For SDEIS Options A, K, and L, construction equipment and activities would be visible from homes along I-5 because the newly constructed noise walls along Boylston Avenue and Harvard Avenue in the vicinity of Roanoke Street would be removed to build the I-5 lid. Construction of the Preferred Alternative would require much less time, and less of the existing noise wall would be demolished and replaced because of the smaller enhanced bicycle/pedestrian crossing. The new crossing would be about 30 feet wide and would require much less time, activity, and equipment to construct than the 500-foot-long I-5 lid.

For the SDEIS options, removal of the Delmar Drive East overcrossing and construction of detour bridges would result in the removal of Bagley Viewpoint and the tree buffer below it. Temporary detour bridges during construction of the new structures would be large, complex structures that would clutter views from the roadways and undercrossings. The Preferred

Alternative would not include the long-term closure at Delmar Drive East, and would not include the same kinds of detour bridges as described in the SDEIS. However, construction of the lid and new undercrossings for 10th Avenue East and Delmar Drive East would result in similar visual effects as the SDEIS options.

Construction would remove some trees and shrubs from the I-5 median and in the I-5/SR 520 interchange. Preparation for constructing the 10th Avenue East/Delmar Drive East lid would permanently remove mature roadside trees and shrubs along both sides of SR 520. Views from homes that are currently screened by these trees and walls would then overlook ongoing construction actions and equipment.

Portage Bay Landscape Unit

Construction activities for the Preferred Alternative and all SDEIS options would be visible from most locations around Portage Bay. The greatest change to visual quality would result from the size and complexity of work bridges on both sides of the Portage Bay Bridge. The later construction of the new Portage Bay Bridge would increase the effects.

The combination of the work bridges, falsework, and the phased demolition and reconstruction of the Portage Bay Bridge over the course of approximately 64 to 72 months would result in substantial degradation of visual character and quality of the south part of Portage Bay. The work bridges would block water and ground level views near these structures. The viewers most affected by these changes would be commuters crossing the bridges, residents on houseboats and near the bridge ends, park users at Montlake Playfield, people at the NOAA facility, and boaters at the marinas (Queen City and Seattle yacht clubs).

Heavy earthwork equipment would be required to excavate the bridge piers near Boyer and contour the terrain near Boyer Avenue East and Montlake Playfield for stormwater and landscaping. This equipment would be visible from nearby locations. Vegetation under the west end of the bridge on either side of Boyer Avenue East would be removed, but this area is currently an unmaintained landscape.

Montlake Landscape Unit

Preferred Alternative

Construction of the Montlake interchange and lid and the new Montlake bascule bridge would degrade views for commuters on SR 520, all travelers on Montlake Boulevard, people at NOAA, and residents facing East Montlake Park and SR 520. Construction activities would clutter all views for varying durations, substantially reducing visual quality during these times because of the proximity of the activities to residences and local streets. Equipment and activities would be visible from homes along Montlake

Boulevard and Lake Washington Boulevard, the NOAA campus, portions of the University of Washington southeast campus, and other surface streets near SR 520.

Similar to Option A, considerable earthwork would be undertaken for the Preferred Alternative in the Montlake landscape unit. Clearing and grading for the stormwater ponds at the Museum of History and Industry (MOHAI) site would bring earthwork equipment within sight of some residences in the Shelby-Hamlin area and of users of the Arboretum Waterfront Trail and Ship Canal Waterside Trail. The area south of East Hamlin Street known as the Canal Reserve would also be cleared of vegetation and structures for use in construction staging.

Preparation for construction of the new bascule bridge across the Montlake Cut would require removal of a band of the mature, dense woods along the cut, which would diminish the quality of views, especially for boaters in the Montlake Cut. Preparation for and construction of the new bascule bridge would remove two single-family residences.

Option A

Construction of the Montlake interchange and lid and the new Montlake bascule bridge under Option A would result in effects similar to those described above for the Preferred Alternative. However, under Option A, the visual degradation at the NOAA campus would be more severe because several buildings would be removed and construction activities would be closer to observers on the campus.

Similar to the Preferred Alternative, clearing and grading for the stormwater ponds at the MOHAI site would bring earthwork equipment within sight of some residences in the Shelby-Hamlin area and users of the Arboretum and Ship Canal Waterfront Trails.

Two single-family homes would be removed in preparation for construction of the new bascule drawbridge across the Montlake Cut, similar to the Preferred Alternative.

Widening Montlake Boulevard north of the Montlake Cut would remove a portion of the UW Open Space, including many specimen conifers that now act as an informal gateway to the UW campus and as the ground-level terminus of Rainier Vista. Removal of these conifers would be noticeable to both those familiar with the view and casual viewers. The loss of these trees could change the character of the lower part of the panoramic view. It is also possible that some of the construction activities would be visible from Drumheller Fountain on the UW campus, but neither the removal of the trees nor construction activities would interfere with or degrade views of Mount Rainier from the Rainier Vista.

Option K

Construction activities in the Montlake landscape unit for Option K would be similar to Option A west of Montlake Boulevard, but much more intensive elsewhere because of the excavation needed to build the depressed single-point urban interchange (SPUI) and tunnel and to lower the NE Pacific Street/Montlake Boulevard NE.

Changes to visual quality resulting from construction would be very noticeable at the NE Pacific Street/Montlake Boulevard NE intersection and in the East Montlake Park/MOHAI area.

Excavation, soil hauling, and construction of formwork and a temporary detour bridge would have a very high level of effect on visual character and quality in the East Montlake Park area. However, trail closures or detours would result in fewer users seeing the construction activity. The greatest change to visual quality would result from excavation for and construction of the new SPUI and the tunnel entrances in East Montlake Park and in the south parking lot of Husky Stadium. Excavation of the tunnels under the Montlake Cut would not be visible, but the freezing operation and excavation machinery would be visible for 24 months or more. The depth of the SPUI would necessitate formwork for tall retaining walls around the interchange and columns to support the overhead main line.

KEY POINT

Under Option K, the greatest effect on views would be from the extreme change in landform, and the construction of ventilation towers for the tunnels. A temporary detour bridge south of the existing west approach would add to the clutter.

Excavation, earth-moving equipment, work and detour bridges, and false-work for the tunnels and SPUI would be visible to people in the east Shelby-Hamlin neighborhood, on the Arboretum Waterfront Trail, along the Montlake Cut, and at the UW Waterfront Activities Center (WAC). A temporary detour bridge south of the existing west approach structure could clutter views from and of SR 520 because of its size and complexity. Whether this activity would be visible from Laurelhurst or Union Bay depends on the condition of the shoreline tree buffer. This high level of degradation of visual quality and character from demolition and construction could last for 66 to 70 months.

Excavation for the tunnel would remove the grassy slope of East Montlake Park and could affect character-defining shoreline vegetation that acts as a visual buffer. The loss of tree buffers, the extreme change in landform, and the construction of ventilation towers for the tunnels and pump houses for stormwater would dramatically change the park-like character of this area.

In the NE Pacific Street/Montlake Boulevard NE intersection area near Husky Stadium, excavation for the north entrance of the tunnel and the lowered intersection could remove established landscaping. This would include a portion of the vegetation and specimen trees in the UW Open Space south of the parking lot.

Option L

Construction activities in the Montlake landscape unit for Option L would be similar to those of Option K, except that Option L would have fewer effects on shoreline vegetation but would add large above-ground bridge structures. As with Option K, there would be no effects near the existing Montlake Bridge and the adjacent portion of the Montlake Cut; however, very high levels of change to visual character, quality, and views would occur at the east end of the Montlake Cut, the east Shelby-Hamlin neighborhood, the East Montlake Park area, and the NE Pacific Street/ Montlake Boulevard NE intersection.

Excavation, soil hauling, and construction of formwork and temporary detour bridges would have a very high level of effect on visual character and quality in the east Montlake area. The greatest change to visual quality would result from excavation for and construction of the elevated Montlake SPUI, the depressed main line under the SPUI, and the new bascule bridge over the east end of the Montlake Cut with its approaches in East Montlake Park and the Husky Stadium parking lot.

Construction activities and equipment would be visible to people in the east Shelby-Hamlin neighborhood, on the Arboretum Waterfront Trail, along the Montlake Cut, and in the UW WAC area. Whether this activity is visible from Laurelhurst or Union Bay depends on the condition of the shoreline tree buffer. Degradation of visual quality and character from mobilization, demolition, and construction activities could last for 60 to 66 months.

Visual effects from lowering the NE Pacific Street/Montlake Boulevard NE intersection would be similar to those described under Option K.

West Approach Landscape Unit

Under the Preferred Alternative and all SDEIS options, the greatest temporary change to visual character and quality would result from demolition of the Lake Washington Boulevard ramps to and from the Arboretum and construction and presence of construction and detour bridges because of their size and complexity. Vegetation would be removed in 30- to 60-foot-wide swaths for the work bridges. Subsequent construction of the permanent new west approach bridges would compound the effects. The combination of the construction bridges, detour bridges, finger piers, and the existing and new bridges would result in substantial degradation of visual character and quality of the south part of Union Bay. The structures would block water- and ground-level views for viewers near the structures. The viewers most affected by this change would be commuters crossing the bridges, park users and boaters, and residents in north Madison Park. Views from the Broadmoor Golf Course would be screened most of the year by tall trees along the shoreline.

Preferred Alternative and Option A

Effects of the Preferred Alternative and Option A would be the same as those described in the paragraph above.

Option K

Construction activities would be visible from most locations around the bay. Temporary changes to visual character and quality would be substantial for views from or near the west approach bridges and from Husky Stadium, where Foster Island and the Arboretum ramps are visible from seats in the northeast corner of the stadium. This is a signature view from the stadium, and construction activities would have substantial visual effects on those views. From north Union Bay, visual changes would be moderate or minimal. There would be minimal or barely noticeable effects on distant views (such as from Laurelhurst) or oblique views (such as from Lake Washington).

Construction of the land bridge at Foster Island would probably not be visible from distant viewpoints, such as Laurelhurst, because of shoreline trees to be retained around the perimeter of the site. However, most of the trees and shrubs in the interior of north Foster Island would be cleared for placing fill soil to create the north connection of the land bridge to the tunnel. A swath of trees along the south side of the new tunnel would be removed to allow placement of fill soil to complete the south portion of the land bridge.

This degree of clearing, grubbing, earthwork, and construction would result in a substantial change to visual character and quality. For safety purposes, the area would be closed to park users during construction. Therefore, even though pedestrians would not have access to this area during construction, commuters and particularly boaters and visitors to Husky Stadium would be aware of and sensitive to construction activities.

Earthwork would also be required near McCurdy Park for the cofferdams needed to connect the depressed SPUI and the west approach bridge. This construction activity could have negative visual effects.

Removal of mature poplars and other specimen trees to the east of Lake Washington Boulevard East for the new ramps and turn-around would remove the tree screen that now buffers the view of the roadway and its ramps from several Montlake homes and the boulevard. It would also change the visual character and quality of the historic, tree-lined boulevard. Construction of the multi-lane terraced roadway, without the benefit of a tree screen, would bring excavation, concrete, and pavement equipment into views from the parkway, the WSDOT peninsula, and the Arboretum shorelines.

Option L

Construction activities for Option L would result in visual effects similar to Option K. Visual changes would result from the presence of west approach work bridges, removal of vegetation through the Arboretum, and demolition and removal of the existing Lake Washington ramps.

Although effects described above for Option K's depressed SPUI would not occur for Option L, equipment and formwork for the elevated SPUI would be visible from part of Marsh and Foster islands as well as from some locations south of SR 520. The viewers most affected would be commuters on the bridge, residents near the bridge ends, park users in the Arboretum, and boaters.

Lake Washington Landscape Unit

The greatest change to visual quality in the Lake Washington landscape unit would result from the presence of construction equipment, barges, and tall cranes, and from construction of work bridges because of their collective size and complexity. The combination of the large interim structures and the existing and new bridges would result in a substantial degradation of visual quality for viewers on or near the structures.

The viewers most affected by this change would be commuters crossing the bridges, residents near the east approach in Medina, and boaters near the bridges. Construction equipment and activities would have minimal effect on the visual quality of views from Kirkland or Laurelhurst because of the distance.

Construction of the bridge maintenance facility under the new SR 520 east approach would be less visible because most of the construction is set back from the shoreline. However, the excavation, embankments, and retaining walls would be visible to boaters in the vicinity. Construction of the dock would be visible from the shoreline and possibly from adjacent properties because the dock extends out over the water.

Eastside Transition Area Landscape Unit

The greatest temporary change to visual quality in the Eastside transition area landscape unit would result from the presence of construction equipment and structures for the floating bridge. Barges and boats serving as construction platforms would be part of the near-distance views toward the lake for many homes. Cofferdams and other structures would likely be visible only to boaters and residents standing on their docks. Construction activities would have a very high negative effect on the visual character and quality of views from shoreline and hillside homes in Medina, particularly for residents north of the current floating bridge and east approach.

How would the project minimize negative effects during construction?

Standard BMPs such as construction screening, standardized work hours, and low-impact construction methods, materials, and tools would be used to reduce construction effects on surrounding neighborhoods. The final construction schedule for the project will determine when revegetation and landscaping of areas will occur. Section 5.5 provides more information on the revegetation and landscaping activities that will occur for the project.

6.6 Cultural Resources

Construction of the SR 520 project would occur over a period of years and would impact most historic properties in the area of potential effects (APE) at some level. The proximity of construction activities, the intensity and duration of construction in the area, and the impact on properties' characteristics would combine to result in an adverse effect under Section 106.

KEY POINT

Cultural Resources

The Preferred Alternative and all options would affect adjacent historic properties during construction. These properties could experience negative effects from property acquisitions, construction-related haul traffic, construction noise, and visual effects. The Foster Island NRHP-eligible traditional cultural property (TCP) would also be affected by construction-related noise and activities, as well as restricted access.

The goal of Section 106 is to identify historic properties potentially affected by the undertaking, assess the effects of the undertaking, and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties. In accordance with the Section 106 regulations, WSDOT engaged in a rigorous consultation process to analyze the potential effects on historic properties from project construction. Upon the effects determination, WSDOT and FHWA continued consultations with the Department of Archaeology and Historic Preservation (DAHP), Advisory Council on Historic Preservation (ACHP), affected tribes, and other consulting parties to identify ways to resolve the potential adverse effect. WSDOT and FHWA have committed to avoidance, minimization, and mitigation measures through development and signature of the Section 106 Programmatic Agreement (See the Final Cultural Resources Assessment and Discipline Report in Attachment 7). WSDOT will further minimize construction impacts through the National Environmental Policy Act (NEPA) process.

How would the project affect cultural resources during construction?

Construction of the Preferred Alternative and all SDEIS options would impact a number of historic properties in the APE, and would result in an adverse effect. An adverse effect on historic properties occurs when an undertaking causes a change in the property's characteristics that qualify it for inclusion in the National Register of Historic Places (NRHP). Examples of adverse effects, provided by 36 Code of Federal Regulations (CFR) 800.5, include physical destruction of or damage to all or part of the historic property, change of character of the property's use or of physical features within the property's setting that contribute to its historic significance, and introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

Although some effects would be avoided and minimized throughout the construction period through implementation of a Community Construction Management Plan and use of construction best management practices, not all effects from construction would be avoided. The overall adverse effect will be mitigated in accordance with Section 106, in consultation with the ACHP, State Historic Preservation Officer (SHPO), affected tribes, and the

additional Section 106 consulting parties, as stipulated in the Programmatic Agreement (Attachment 9).

Potential effects on historic properties from construction of the Preferred Alternative and Options A, K, and L are described in more detail in the following sections. Effects of adding the suboptions to Options A, K, and L are discussed under the geographic area in which the suboption would be located. The text is organized by property roughly from west to east. The effects from haul routes are discussed in subsections, as part of the affected geographic area.

I-5 and Portage Bay Areas

Individually Eligible Historic Properties in the Portage Bay/Roanoke Park Area (Outside of the Roanoke Park Historic District)

Historic properties in the I-5 area of the APE have the potential to experience increased noise, fugitive dust, nighttime glare, and possible vibration from the construction activities associated with construction of the new HOV ramp and addition of the enhanced bicycle/pedestrian path over I-5. These same construction effects would affect historic properties during the removal of the 10th Avenue East and Delmar Drive East bridges over SR 520 and construction of the new 10th Avenue/Delmar Drive lid.

The extent of these effects on each historic property would vary due to location and topography, but project construction would affect Fire Station #22, Denny-Fuhrman (Seward) School campus, Talder House, Sugamura House, East Miller Condominium, Wicklund-Jarr House, and Glover Homes Building.

Under the Preferred Alternative and all SDEIS options, the Mason and Kelley houses and the Gunby and Boyd houses would be affected by increased noise, fugitive dust, nighttime glare, and possible vibration during demolition and reconstruction of the Portage Bay Bridge and erecting of the work bridges, including pile-driving for new piers. Fire Station #22, Denny-Fuhrman (Seward) School campus, Wicklund-Jarr House, Glover Homes Building, and Keuss Building may also experience these construction effects, although they are farther away from the Portage Bay construction activities and would experience the effects to a lesser degree.

The work bridges, barges, and heavy equipment used to demolish and construct the Portage Bay Bridge would create new visual effects for historic properties in the area. Under the Preferred Alternative and all options, the properties on the west side of the bay would be especially affected by these visual intrusions. The Kelley House would be particularly affected because one of the work bridges is planned to be at the current location of the Portage Bayshore Condominium docks next door. Upon completion, the work bridges would be removed and the condominium docks would be replaced.

Under the Preferred Alternative and all SDEIS options, some of the vegetative buffer between SR 520 and historic properties would be removed or decreased during construction. For construction of the new roadway and for the lids over the roadway, mature vegetation would be protected and retained to the extent reasonable and feasible. While some existing buffer might be reduced, adding the lid at 10th Avenue East and Delmar Drive East would provide for a new type of buffer from the roadway that would be more extensive than the existing vegetative buffer.

The aforementioned construction impacts of increased noise, fugitive dust, nighttime glare, possible vibration, visual effects, and reduced vegetative buffer would temporarily diminish the integrity of the setting and feeling of the historic properties in the I-5 area, but the effects would not be permanent. The properties would maintain their integrity and the ability to convey their significance.

Options A, K and L included a lid over I-5. Construction of the I-5 lid would also introduce increased noise, fugitive dust, nighttime glare, and possible vibration to historic properties in the APE, although the associated effects would be more severe than those for the enhanced bicycle/pedestrian path included as part of the Preferred Alternative.

Roanoke Park Historic District (ID 37)[1]

Construction of the Preferred Alternative and all SDEIS options would affect the Roanoke Park Historic District. The effects would be similar to those discussed above for the individually eligible historic properties in the area. Increased noise, fugitive dust, nighttime glare, and possible vibration are expected from construction of the enhanced bicycle/pedestrian path, HOV ramp, and 10th Avenue East and Delmar Drive East lid.

Unlike Options A, K and L, the Preferred Alternative would not physically impact the historic district, its sidewalks, or other street features outside WSDOT right-of-way. Under the Preferred Alternative, the 10th Avenue East and Delmar Drive East lid is shifted to the south, and would have less impact on the historic district. The southward shift would leave room to reconfigure the 10th Avenue East and East Roanoke Street intersection without changing the district's sidewalks. The construction activities associated with this reconfiguration would not physically impact the district as the other options would. Additionally, the proposed repaving of Harvard Avenue East included as part of Options A, K, and L has been eliminated in the Preferred Alternative, further decreasing construction effects on the historic district.

[1] The location of each property is shown by identification (ID) number on the exhibits in Sections 4.6 and 5.6. A list of properties by ID number is presented in Table 4.6-1.

The activities related to construction of the new Portage Bay Bridge would introduce increased noise, fugitive dust, nighttime glare, and vibration to the historic district. The Roanoke Park Historic District would experience a change in setting and feeling during the construction period from the visual interruptions of the work bridges and associated construction activities. The visual interruptions would be most prominent for the contributing resources on the east side of the historic district. This effect is consistent under the Preferred Alternative and all options.

The setting and feeling of the Roanoke Park Historic District and its contributing properties would be affected by construction activities, but none of the impacts would be permanent.

Effects from Haul Routes in the I-5 Area

Construction haul routes would expose a number of historic properties in the I-5 area, including the Roanoke Park Historic District, to temporary increases in truck traffic volume, with accompanying potential for increases in fugitive dust, vehicle emissions, and noise. Consequently, the setting and feeling of the historic properties along these haul routes would be intermittently affected by the passing trucks.

The city streets identified as potential haul routes in the I-5 area include Boylston Avenue East, Harvard Avenue East, Boyer/Fuhrman Avenue East, East Roanoke Street, and Delmar Drive East. Actual truck traffic on each of these routes would vary, depending on adjacent construction activities, project areas served, and use as a primary or secondary route. Potential average and peak volumes would vary as well (see the Final Transportation Discipline Report, Attachment 7, for estimates of average and peak volumes along these haul routes). Local jurisdictions can limit the use of nonarterial streets for truck traffic; therefore, efforts were made to identify designated arterial streets for potential use as haul routes. Final haul routes will be identified by the contractor(s) in cooperation with local jurisdictions, and all necessary permits will be obtained as required by law.

WSDOT will continue to work with the Section 106 consulting parties to avoid and minimize the impacts on historic properties from truck traffic on the potential haul routes. Because WSDOT has determined that haul routes would temporarily diminish the integrity of historic properties and could also create quality of life issues, which are addressed under NEPA, the Community Construction Management Plan (CCMP) outlines specific measures to minimize their effects. A draft CCMP is included in Attachment 9 and is also incorporated by reference in the Programmatic Agreement.

NOAA Northwest Fisheries Science Center (ID 56)

Preferred Alternative

Unlike Option A, the Preferred Alternative would avoid demolition of any buildings on the NOAA Northwest Fisheries Science Center campus. Instead, WSDOT would acquire 0.5 acre from the NOAA property, land that contains no buildings. There would be a construction easement on the east side of the NOAA property, and after construction, most of this easement would be permanently acquired for use as a bicycle/pedestrian path.

Construction of the Preferred Alternative and all SDEIS options would require use of a portion of the area currently used as parking for the NOAA facility. Some of the parking lot area is owned by WSDOT, so its use during construction would not be an acquisition of NOAA property. As discussed in Chapter 5, WSDOT is still working with NOAA to clarify property ownership and easements in this area.

Demolition of the existing Portage Bay Bridge and construction of the work bridges and the new Portage Bay Bridge immediately adjacent to the NOAA property would generate additional noise, dust, equipment emissions, and visual effects on the NOAA Northwest Fisheries Science Center. Pile-driving for the construction bridges and use of heavy equipment could cause vibration effects on the property. If not adequately mitigated, these impacts have the potential to disrupt the biological experiments underway in the NOAA fish-rearing facilities and to affect sensitive equipment used for measurement and monitoring.

The setting, feeling, and association of the NOAA Northwest Fisheries Science Center buildings would be diminished during construction as a result of noise, dust, vibration, visual effects, and property acquisition. Measures to minimize and mitigate these effects are included in the Programmatic Agreement.

Option A

Under Option A, much of the South Campus of the NOAA Northwest Fisheries Science Center would be acquired to accommodate the wider footprint of the 7-lane Portage Bay Bridge. A permanent acquisition of 1.2 acres would require demolition of nearly all buildings on the South Campus; an additional construction easement would also be located on the NOAA parcel. If these research facilities were removed, there would no longer be a need for administration buildings. This could cause the remaining NOAA Northwest Fisheries Science Center site, including the historic buildings, to be vacated.

Options K and L

Options K and L would not require permanent acquisition of land adjacent to the NOAA Northwest Fisheries Science Center historic buildings. A

portion of the land at the east end of the NOAA Northwest Fisheries Science Center property would be used for construction staging during Montlake lid construction but would be returned after construction.

Seattle Yacht Club (ID 55)

Construction of the Preferred Alternative and all SDEIS options would increase noise, fugitive dust, nighttime glare, and possible vibration in the Portage Bay area, affecting the historic Seattle Yacht Club. The activities related to the demolition of the existing Portage Bay Bridge and construction of the work bridges and new structure might also interfere with the club's marine activities in Portage Bay. Similarly, temporary supports and barges used to construct the new bascule bridge adjacent to the historic Montlake Bridge might occasionally interfere with the club's activities in the Montlake Cut. However, as stipulated in the Programmatic Agreement, WSDOT will develop a coordination plan with the Seattle Yacht Club to minimize disruption of historically significant activities at the Seattle Yacht Club mainstation and on Portage Bay, the Montlake Cut, and Union Bay during construction.

Both land and water access to the Seattle Yacht Club may be limited during certain periods throughout construction under the Preferred Alternative and all options. Although access to the Seattle Yacht Club would be maintained, the access and usage limitations could impair the Seattle Yacht Club's ability to manage its historic structure and conduct its traditional activities.

Construction of the Preferred Alternative and all options would affect the Seattle Yacht Club, diminishing the integrity of setting, feeling, and association. Measures to avoid, minimize, and mitigate effects from construction of the project on the Seattle Yacht Club are stipulated in the Programmatic Agreement, including a process to address the effects of in-water construction on maritime activities. To further reduce the potential effects on the club, WSDOT has committed to not transport barges through the cut during the week before or week after Seattle Yacht Club's traditional Opening Day ceremonies.

Montlake Area

Montlake Historic District (ID 238)

Construction of the Preferred Alternative and all SDEIS options would result in numerous impacts on the Montlake Historic District and its contributing elements. The construction effects would be similar to those felt by other historic properties within the APE, including increased noise, fugitive dust, glare from lights for nighttime construction, and possibly vibration from demolition and construction. Particularly affected would be portions of the historic district in the Shelby-Hamlin area east of Montlake Boulevard, which would be affected by construction activities in East

Montlake and McCurdy Parks, Montlake lid construction, and Portage Bay Bridge under the Preferred Alternative and all options. Construction of the bascule bridge under the Preferred Alternative and Option A would affect the setting of the northern portion of the district, and bascule bridge construction under Option L would affect the setting of the northeast section of the historic district.

Construction of the Preferred Alternative and all options would result in a number of direct physical impacts, including property acquisitions. Under the Preferred Alternative and Option A, the Montlake Historic District would be directly impacted by the demolition of two residential properties that contribute to the district, 2904 and 2908 Montlake Boulevard NE. No properties from the historic district would be demolished as a result of Option K or L, but construction of these options would be more intensive for the historic properties located in the eastern portion of the district.

As previously discussed, a portion of the NOAA parcel would be temporarily acquired for use as a construction easement under the Preferred Alternative and all options. While the Preferred Alternative and Options K and L would not have a direct impact on any of the NOAA buildings, construction of Option A would require demolition of nearly all of the South Campus buildings. The Canal Reserve Land, a contributing element to the historic district, would be permanently acquired for construction and incorporated into the Montlake lid for all options. During construction, most of the character-defining specimen trees would be removed from this parcel. The Preferred Alternative and all SDEIS options would modify the segment of historic Lake Washington Boulevard that contributes to the historic district. To the south of SR 520, modifications to Lake Washington Boulevard resulting from the Preferred Alternative and Options A and L would be limited to the section between Montlake Boulevard and where Lake Washington Boulevard curves to the south. Under Option K, modifications to the boulevard would extend farther south. The Preferred Alternative and all options would also add additional capacity to Montlake Boulevard north of SR 520.

All of McCurdy Park and part of East Montlake Park would be acquired under the Preferred Alternative and all SDEIS options, and a stormwater facility would be constructed in this area. All options would require a construction easement in East Montlake Park, but would return the area to park use after construction. However, Options K and L would require almost 50 percent more permanent acquisition than that needed for the Preferred Alternative and Option A.

A portion of Montlake Playfield would also be acquired under the Preferred Alternative and all options to allow for construction of work bridges in Portage Bay. These construction easements would largely affect the submerged portion of the Montlake Playfield located north of the Portage

Bay Bridge, but would also have a minor effect on the northeast corner of the park property.

Construction would occur at various places throughout the district, and for all options, a few construction staging areas would also be located within district boundaries. Project construction would also require the removal of some mature vegetation, which would affect the district's setting and feeling.

Despite WSDOT's efforts to avoid and minimize effects from construction, overall construction effects on the Montlake Historic District from the Preferred Alternative and all SDEIS options would diminish the integrity of the characteristics that qualify the historic district for listing in the NRHP. Effects on the Montlake Historic District common to the Preferred Alternative and all SDEIS options include:

- Increase in traffic from haul routes and detours on some streets within the historic district
- Increased noise, dust, traffic, and possible vibrations from construction, and glare from lighting for nighttime construction associated with removal of SR 520 Lake Washington Boulevard and R.H. Thomson Expressway ramps, construction of new ramps, demolition of Montlake Boulevard and 24th Avenue East bridges over SR 520 and construction of a new lid, demolition and construction of the west approach to the Evergreen Point Bridge, and demolition and construction of the Portage Bay Bridge
- Visual and audible effects from construction staging areas in the historic district

Construction-related effects on the Montlake Historic District that would be minimized with selection of the Preferred Alternative include:

- Under Option A, Montlake Place East and 24th Avenue East would be widened to accommodate additional traffic capacity, causing an acquisition of 3,000 square feet of land from seven properties. The Preferred Alternative does not affect these properties. Option A would also demolish selected buildings at NOAA. No buildings at NOAA would be demolished under the Preferred Alternative.
- Under Option K, construction of the traffic turn-around connection would remove existing vegetation that currently serves as a buffer between SR 520 and Lake Washington Boulevard, 26th Avenue East, and the historic properties there. This vegetation would remain intact with the Preferred Alternative.
- Under Option L, most of East Montlake Park would be occupied during construction of the bascule bridge at the east end of the cut. Construction activities would occur in a smaller area of the park under

the Preferred Alternative, and only a portion of the park would be converted for a stormwater facility.

Effects of Suboptions

- Adding the Lake Washington Boulevard ramps to Option A would introduce increased noise and dust, especially for those properties on Lake Washington Boulevard East and 26th Avenue East.
- Adding the eastbound off-ramp to Montlake Boulevard to Option K would result in no measurable difference in the effects described above.
- Adding northbound capacity on Montlake Boulevard to Option L would involve removing three existing historic pedestrian bridges over Montlake Boulevard, widening the roadway to the east, and then reconstructing new pedestrian bridges. All three of these pedestrian bridges are eligible for listing in the NRHP. The demolition and construction could cause noise, fugitive dust, glare from lights for nighttime construction, and possible vibration on adjacent historic properties, including Graves Hall, Bloedel Hall, Winkenwerder Forest Sciences Laboratory, Hewitt Wilson Ceramics Laboratory, Wilcox Hall, More Hall, the University of Washington Club, and McMahon Hall.
- Adding left-turn access from Lake Washington Boulevard to the single-point urban interchange (SPUI) south ramp would have no effects on cultural resources.

Montlake Bridge (ID 54)

Preferred Alternative and Option A

The Preferred Alternative and Option A include a new bascule bridge immediately east of the existing historic Montlake Bridge. Construction of the new bascule bridge would introduce increased noise, fugitive dust, nighttime glare, and possible vibration to the area. The Programmatic Agreement outlines the stipulations necessary to ensure that safeguards are put in place to protect the historic Montlake Bridge and to ensure that it is not physically affected while construction of the new structure takes place.

Options K and L

Option K includes twin tunnels under the Montlake Cut and would not affect this historic bridge, due to the nature of construction for the underground tunnels. The construction effects from Option L would be similar to those of the Preferred Alternative and Option A, but would be further removed from the historic Montlake Bridge and would not affect the Montlake Bridge to the same degree as the other options that include a new bascule bridge.

Montlake Cut (ID 53)

Preferred Alternative and Options A and L

The Preferred Alternative, along with Options A and L, includes a new bascule bridge spanning the official navigation channel in the Montlake Cut.

The cut must be open to ship traffic all year around, and bridge construction would not be allowed to interfere with marine navigation. The only exception to this is a few short periods of time when spans are being erected, requiring the cut to be closed to marine traffic (see Section 6.14, Navigation). However, those closures would be limited to short durations and would not occur during opening weekend of the boating season. As an active and historic navigation channel, the Montlake Cut would not be affected by towing pontoons through it.

Option K

The freezing, boring, and excavation machinery associated with construction of the twin tunnels of Option K would be visible and audible in the cut, but would not compromise its engineering significance or interrupt its function as a navigable waterway.

Canoe House (ID 203)

Preferred Alternative and Option A

Construction of the new bascule bridge under the Preferred Alternative and Option A would introduce increased noise, fugitive dust, nighttime glare, and possible vibration at the historic Canoe House.

Under the Preferred Alternative and Option A, construction of the project would have a visual effect on the Canoe House, as construction of the second bascule bridge, the new floating bridge, and the west approach to the floating bridge would all be visible for the duration of the project.

Construction activities would affect the integrity of setting and feeling of the Canoe House, particularly to the west, in the direction of the new bascule bridge.

Options K and L

The construction effects of increased noise, fugitive dust, nighttime glare, and possible vibration would be more severe under Options K and L than under the Preferred Alternative and Option A, due to the immediate proximity of either the twin tunnels or the new bascule bridge at the east end of the Montlake Cut. Construction of the new floating bridge and west approach would also be visible from the Canoe House throughout construction.

Options K and L would also have an increased visual effect on the Canoe House because construction would be immediately adjacent to the historic property. Additionally, these options would cause an interruption of access to the Canoe House during construction, which would not occur under the Preferred Alternative and Option A.

Lake Washington Boulevard (ID 239)

Preferred Alternative and Option A

Lake Washington Boulevard has been identified as a historic park boulevard, as well as a contributing element to the Montlake Historic District and to the Washington Park Arboretum. The Preferred Alternative and all SDEIS options would have similar effects on this historic linear resource.

Construction of the Preferred Alternative would include using portions of Lake Washington Boulevard from 26th Street to Montlake Boulevard East as a potential haul route and detour route after the SR 520 Lake Washington Boulevard and R.H. Thomson ramps are closed. The setting and feeling of the boulevard could be affected during times of higher traffic volumes required during construction. A staging area located adjacent to Lake Washington Boulevard could also alter the setting and feeling of the roadway for the duration of construction due to continuous use of the staging area by heavy construction vehicles and machinery.

As with all options, the Preferred Alternative makes physical changes to the park boulevard. The Preferred Alternative would remove all or part of one of the Montlake Boulevard medians and would add a new planted median in another location. Additionally, the boulevard would be widened in the section between Montlake Boulevard and where it turns to the south, south of SR 520. Although construction activities would take place on the roadway to make these changes, the historic alignment of Lake Washington Boulevard would be maintained with the Preferred Alternative.

The setting and feeling of the boulevard would be affected by increased traffic, visual effects, and physical construction, but these effects would not diminish the significance of the historic property.

Suboption to A

A suboption of Option A would reconstruct Lake Washington Boulevard on- and off-ramps instead of removing them as the Preferred Alternative and Option A do. The ramp intersection would be moved north of where it is located presently, and Lake Washington Boulevard East would be widened to the north by one lane between Montlake Boulevard and 24th Avenue East. Construction of these ramps would introduce additional noise, dust, and potential vibration to Lake Washington Boulevard.

Option K

Under Option K, Lake Washington Boulevard East would be reconfigured to run one way east and southbound between Montlake Boulevard and East Roanoke Street. Additionally, the park boulevard would no longer connect to the Arboretum, as this portion would be reconstructed on a new alignment with the proposed traffic turn-around. Construction of the traffic turn-around would introduce additional noise, dust, and potential vibration to Lake Washington Boulevard, would remove existing vegetation, and

more importantly, the historic alignment of the park boulevard would be altered.

Option L

Option L would include ramp connections to Lake Washington Boulevard, and a suboption to Option L would include left-turn access to SR 520, with additional lane enhancement where the park boulevard connects to the Arboretum. The historic alignment of the park boulevard would be altered with the construction of left-turn access to SR 520.

Haul Routes

As previously mentioned in the discussion of effects from haul routes in the I-5 area, a number of historic properties in the Montlake District could potentially be affected by temporary increases in truck traffic volume, with accompanying potential for increases in fugitive dust, vehicle emissions, and noise. Consequently, the setting and feeling of the historic properties along these haul routes would be intermittently affected by the passing trucks.

The city streets identified as potential haul routes in the Montlake Historic District include Montlake Boulevard, Lake Washington Boulevard, East Lynn Street, West Montlake Place East, East Montlake Place East, East Roanoke Street, 19th Avenue East, and Boyer Avenue East. Actual truck traffic on each of these routes would vary, depending on adjacent construction activities, project areas served, and use as a primary or secondary route. Potential average and peak volumes would vary as well (see the Final Transportation Discipline Report for estimates of average and peak volumes along these haul routes).

WSDOT will continue to work with the Section 106 consulting parties to avoid and minimize the impacts on historic properties from truck traffic on the potential haul routes. Because WSDOT has determined that haul routes would temporarily diminish the integrity of historic properties and could also create quality of life issues, which are addressed under NEPA, the CCMP outlines specific measures to minimize their effects. A draft CCMP is included in Attachment 9 and is also incorporated by reference in the Programmatic Agreement.

West Approach Area

Washington Park Arboretum (ID 200)

Construction of the Preferred Alternative and all SDEIS options would have an effect on the Washington Park Arboretum. Effects would result from increased noise, fugitive dust, vibration, and visual effects.

Demolition of the Lake Washington Boulevard and R. H. Thomson ramps would affect the park. Although the demolition of the ramps would occur entirely on WSDOT-owned property, this area is within the historic boundaries of the Arboretum and construction activity would increase

noise, fugitive dust, vibration, and visual effects in adjacent park areas and would consequently affect setting and feeling.

During construction, the WSDOT right-of-way area south of SR 520 between the ramps and Lake Washington Boulevard would be a construction staging area. The construction activities taking place in this area would generate noise, dust, and visual interruptions near active park areas for the duration of construction. The construction staging area would create visual and noise effects on the setting and feeling of the park.

During construction, bicycle and pedestrian access to the park would be affected (see Section 6.4, Recreation). Although the canoe and kayak launch point near the north end of Foster Island would remain in use, paddling would be restricted to the waterways within the park.

The effects on the Arboretum from demolition of the ramps, construction of the west approach, construction staging, and reduced access would temporarily affect the setting and feeling of the historic Arboretum, but would not permanently diminish the character-defining features of this historic landscape.

Foster Island

Preferred Alternative

Under the Preferred Alternative, SR 520 would cross the Arboretum at Foster Island with a pier and span bridge that would require acquisition of 0.5 acre of land. Construction activities to build this span would include a work bridge located on the island that would be removed after the permanent structure is complete. The Preferred Alternative and all SDEIS options would affect the Foster Island traditional cultural properties (TCPs) through construction activities and by requiring additional land for the new bridge and for construction easements beyond the permanent right-of-way. Under the Preferred Alternative, the construction easements would be located only on the north side of the existing right-of-way. During construction, access to the north part of the island would be restricted. Options A, K, and L all use the south island to some degree; the Preferred Alternative is the only design that does not use space on the south island.

Under the Preferred Alternative and all options, no construction staging would occur on the island outside of the construction easement. However, construction would generate noise, fugitive dust, and vibration that would likely travel across Foster Island.

Options A and L

For Options A and L, the pier and span bridge over Foster Island would require expansion north of the existing SR 520 alignment in the area that was historically a channel between the north and south islands, by 0.4 and 0.3 acre, respectively. Options A and L would both include 1.6 acres of

construction easement on Foster Island. These construction easements would both extend onto the south island, to varying degrees.

Option K

Under Option K, SR 520 would cross Foster Island beneath a "land bridge" with the right-of-way expanded north of the existing alignment by 0.7 acre. Option K would require 4.5 acres of construction easement on Foster Island for work bridges, trail reconstruction, and fill. The SR 520 right-of-way would be expanded to the north. However, because of land bridge construction south of the existing alignment, Option K would have the potential to interfere with cultural activities that may occur on the southern part of Foster Island. Construction for the land bridge would involve excavation of approximately 2.8 acres to a depth of about 4 feet across Foster Island, grading, a substantial amount of fill, and the loss of all vegetation within the construction area. Option K requires a much more invasive construction approach than the Preferred Alternative, as well as options A and L and would result in a considerable change to the setting of the TCP.

Edgewater Condominiums (ID 226)

The Preferred Alternative and all SDEIS options would result in increased noise at the Edgewater Condominiums from demolition and construction of the new west approach to the Evergreen Point Bridge, as well as potential glare from nighttime construction activities. These construction impacts would also occur during the construction of the work bridges and replacement floating bridge. The setting and feeling of the historic property would be affected by increased noise and glare during construction, but these effects would not diminish the historic integrity of the complex.

Lake Washington Area

The Preferred Alternative and SDEIS options would demolish the Evergreen Point Bridge, which is individually eligible for the NRHP. Physical destruction of the Evergreen Point Bridge would directly and permanently diminish all aspects of this historic property's integrity.

Eastside Transition Area

Under the Preferred Alternative and all SDEIS options, the NRHP-eligible James Arntson House and the WHR-eligible Helen Pierce House could experience moderately increased noise levels, fugitive dust, and possible vibration associated with demolition of the east approach of the Evergreen Point Bridge and pile-driving for construction of the new approach structure. Both structures may also experience fugitive dust and short-term noise associated with construction of the bridge maintenance facility and dock, which would be located approximately 160 feet north of the existing bridge. Most of these effects would occur intermittently, and none would be permanent.

How would the project minimize or mitigate adverse effects on cultural resources during construction?

Even with WSDOT and FHWA's ongoing efforts to avoid effects to the greatest extent feasible, it will not be possible to avoid all effects on historic properties from construction of the SR 520, I-5 to Medina project. Because the project would result in an adverse effect on historic properties, the adverse effect will be mitigated, and the mitigation measures are stipulated in the Section 106 Programmatic Agreement.

The Programmatic Agreement is the primary document that contains stipulations for project-specific mitigation. The Programmatic Agreement is the result of the Section 106 consultation process among SHPO, WSDOT, FHWA, ACHP, affected tribes, and other consulting parties.

As part of the Programmatic Agreement, in consultation with the Section 106 consulting parties, affected community groups, and the City of Seattle WSDOT will develop and implement a CCMP. An outline of the CCMP is included in Attachment 9. The CCMP will contain specific measures designed to protect historic properties in the APE and to address quality of life issues. The CCMP will also be designed as an adaptable plan so that it can handle unanticipated issues that may arise during construction. WSDOT will develop the CCMP as a component of, and tailored to the specific activities included in, all construction contracts that are awarded for the project.

The CCMP addresses a number of construction-related issues, including but not limited to:

- Standard best management practices (BMPs) and WSDOT standard specifications to protect historic properties from excessive noise, vibration, excavation, fugitive dust, lighting, glare, and traffic impacts
- General community impacts from construction activities, including:
  - access by emergency service providers to homes and businesses.
  - maintenance of basic services (e.g., water, gas, electric, Internet) and for timely response in case of accidental interruptions of service as a result of construction activities.
  - Vegetation management, including provisions for:
    i. Protecting trees and other screening vegetation adjacent to construction work areas from construction impacts.
    ii. Replacing removed trees following City of Seattle street tree standards (see Appendix E).
    iii. WSDOT monitoring of contractor adherence to i and ii above.
  - Temporary erosion and sediment control measures to be implemented throughout the construction period.

  - Traffic management measures during construction to keep traffic flowing, limit detour routes through residential areas, and ensure access for residents, etc.

The CCMP will be supported by communication activities that include the following:

- A process for providing up-to-date construction information (schedules, schedule changes, potential delays, current work areas, street closures and detours, results of monitoring, etc.) to the public. Potential notification mechanisms could include a Web site, smart phone application, automated traffic management signs, etc.
- Development of an email list that WSDOT will use to inform communities of upcoming construction. Email notification will include community council officers so that timely information can be distributed through community online forums.
- A single-point communications center to be established for the duration of construction. This would include a 24/7 contact phone number and an email address to which problems, questions, and concerns could be sent. These communications would then be directed to the appropriate jurisdiction or agency for resolution, as appropriate. Questions and concerns will be addressed within 10 working days.
- A process through which the concurring parties to the Programmatic Agreement may receive routine construction updates/outlooks as well as notifications of applicable permit conditions, such as periods when noise variances will be in place.

6.7 Noise

During construction, people living and working near the construction areas would be affected by noise and construction-related vibration from a variety of activities and equipment. The loudest construction-related activities that would also cause the most vibrations would be pile-driving and demolition of existing structures.

How would construction of the project affect noise levels?

Typical construction equipment used for many roadway and structural activities would be required to complete the project. Table 6.7-1 lists equipment typically used for this type of project, the activities they would be used for, and the corresponding maximum noise level under normal use measured at 50 feet.

KEY POINTS

Noise

During construction, people living and working near construction areas would be affected by noise from a variety of activities and equipment. The loudest construction-related noise activities are pile-driving and demolition of existing structures. Typical construction equipment is expected to have a range of 62 to 105 dBA maximum noise level 50 feet from the source.

Major non-impact noise-producing equipment would include concrete pumps, cranes, excavator, haul trucks, loaders, and tractor trailers. Maximum noise levels from this equipment could reach up to 92 dBA at the nearest residences (50 to 100 feet).

Table 6.7-1. Construction Equipment Maximum Noise Levels

Equipment	Typical Expected Project Use	Maximum Noise Level (dBA)[a]
Air compressors	Used for pneumatic tools and general maintenance - all phases	70 - 76
Backhoe	General construction	78 - 82
Concrete pump	Pumping concrete	78 - 82
Concrete saws	Concrete removal, utilities access	75 - 80
Crane	Materials handling, removal, and replacement	78 - 84
Excavator	General construction and materials handling	82 - 88
Forklifts	Staging area work and hauling materials	72
Haul trucks	Materials handling, general hauling	86
Jackhammers	Pavement removal	74 - 82
Loader	General construction and materials handling	86
Pavers	Roadway paving	88
Pile-drivers	Support for structure and hillside	99 - 105
Power plants	General construction use, nighttime work	72
Pumps	General construction use, water removal	62
Pneumatic tools	Miscellaneous construction work	78 - 86
Service trucks	Repair and maintenance of equipment	72
Tractor trailers	Material removal and delivery	86
Utility trucks	General project work	72
Vibratory equipment	Shore up hillside to prevent slides and soil compacting	82 - 88
Welders	General project work	76

[a]Typical maximum noise level under normal operation as measured at 50 feet from the noise source.

State and local regulations restrict the noise from construction activities by imposing different noise limits, depending on type of activity and time of day and property type (less noise is allowable for residential than for commercial or industrial receivers). Table 6.7-2 lists the state-wide Washington Administrative Code (WAC) noise regulations for the three types of receivers. Daytime construction noise is exempt from these regulations, however. Because these regulations are subject to change, the most current versions must be used at the time construction commences within each community. WSDOT would be required to adhere to the construction noise regulations and obtain any site-specific requests for variances or other construction-related noise issues associated with the project.

Table 6.7-2. City of Seattle and Washington State – Maximum Permissible Sound Levels

District of Sound Source	District of Receiving Property within the City of Seattle (Maximum Allowable Sound Level in dBA[a])		
	Residential	Commercial	Industrial
Residential[b]	55	57	60
Commercial	57	60	65
Industrial	60	65	70

[a]Applies to daytime hours of 7:00 a.m. to 10:00 p.m.
[b]The levels are reduced by 10 dBA between the hours of 10:00 p.m. and 7:00 a.m. on weekdays and 10:00 p.m. and 9:00 a.m. on weekends.

The City of Seattle has developed a set of construction-specific allowable noise-level limits that would apply to construction within the Seattle city limits. Unlike the Washington Administrative Code, the Seattle Municipal Code does not exempt daytime construction activities from regulation. WSDOT will work with the City of Seattle and obtain variances as needed for the SR 520, I-5 to Medina project. Table 6.7-2 includes the maximum permissible sound levels depending on the district designations of the sound source and receiving properties (rural, residential, commercial, or industrial).

The City of Medina has adopted regulations that limit construction and development activity as codified in the Medina Municipal Code regarding both noise and limitations on construction and development activity. The Medina Municipal Code has adopted portions of the King County Code by reference. WSDOT will work with the City of Medina to obtain any variances needed for project construction.

Most project construction could be performed within the indicated noise limits shown in Tables 6.7-2 if the work was performed during normal daytime hours. If construction occurred at night, WSDOT would be

required to meet the noise level requirements for night-time construction or obtain a noise variance from the governing jurisdiction.

The noise limits listed in Table 6.7-2 have some exemptions, shown in Table 6.7-3, which are based on the minutes per hour that the noise limit can be exceeded.

Table 6.7-3. City of Seattle and Washington State Exemptions for Noise Exceedances

Statistical Descriptor[a]	Minutes Per Hour	Adjustment to Maximum Sound Level
L_{25}	15 (25% of one hour)	+5 dBA
$L_{8.3}$	5 (8.3% of one hour)	+10 dBA
$L_{2.5}$	1.5 (2.5% of one hour)	+15 dBA

Note: For any source of sound that is periodic, has a pure tone component, or is not measured with an impulse sound level meter, the levels are reduced by 5 dBA. Electrical substations are exempt from this penalty.
[a] L_{25}, $L_{8.3}$, and $L_{2.5}$ are the noise levels that are exceeded 25 percent, 8.3 percent, and 2.5 percent of the time (one hour, in this case).

Impact Construction

Impact construction equipment (e.g., pavement breakers, pile-drivers, jackhammers, and sandblasting tools) may exceed the noise level limits given in Table 6.7-2 in any 1-hour period between 8 a.m. and 5 p.m. on weekdays and 9 a.m. and 5 p.m. on weekends and holidays. The allowable noise limit exceedance also applies to other types of equipment or devices that create impulse or impact noise or that are used as impact equipment, as measured at a property line or at 50 feet from the equipment, whichever is greater. However, the noise limits listed in Table 6.7-4 should never be exceeded without a noise variance and appropriate best management practices (BMPs) in place.

Non-Impact Construction

Major non-impact noise-producing equipment used during construction could include concrete pumps, cranes, excavators, haul trucks, loaders, and tractor trailers. Maximum noise levels could reach 82 to 86 A-weighted decibels (dBA) at the nearest residences (50 to 100 feet) for non-impact construction activities related to site preparation work (see Table 6.7-1). Other less noticeable noise-producing equipment expected to be used during site preparation work includes backhoes, air compressors, forklifts, water pumps, power plants, service trucks, and utility trucks.

Table 6.7-4. City of Seattle Maximum Noise Levels for Impact Types of Equipment

Statistical Descriptor[a]	Noise Level (dBA)	Time Duration Exceedance Prohibited
L_{eq}	90	Continuously
L_{50}	93	30 minutes
L_{25}	96	15 minutes
$L_{12.5}$	99	7.5 minutes[b]

[a] L_{eq}, L_{50}, L_{25}, and $L_{12.5}$ are the equivalent sound level and the noise levels that are exceeded 50 percent, 25 percent, and 12.5 percent of the time.
[b] Provided that sounds levels in excess of 99 dBA are prohibited unless authorized by variance obtained from the Administrator and provided further that sources producing sound levels less than 90 dBA shall comply with the provisions (A) and (B) as follows:
(A) The standard of measurement shall be a 1-hour L_{eq}. L_{eq} may be measured for times not less than 1 minute to project hourly L_{eq}. Reference to 1 hour is for measurement purposes only and will be construed as limiting construction to a 1-hour period.
(B) These provisions will be reviewed periodically by the City to assure that the sound level limits are technically feasible.

The loudest non-impact noise sources during new bridge construction would include cement mixers, concrete pumps, pavers, haul trucks, and tractor trailers. The cement mixers and concrete pumps would be required to construct the superstructure and substructure for the new bridges. The pavers and haul trucks would be used to provide the final surface on the roadway and to construct the transitions from the at-grade roadways to the new structures. Maximum noise levels could range from 82 to 94 dBA at the closest receiver locations.

Demolition

Demolition of the existing structures would require heavy equipment such as concrete saws, cranes, excavators, hoe-rams, haul trucks, jackhammers, loaders, and tractor trailers. Maximum noise levels could reach 82 to 92 dBA at the nearest residences.

Table 6.7-5 identifies the noise levels for each of the four typical construction phases as measured at 50 feet from the construction activity. The construction noise analysis assumed that there would be construction staging areas along the proposed bridges during demolition and construction. The noise levels listed in Table 6.7-5 are the typical maximums and would occur only periodically during the heaviest periods of construction. Actual hourly noise levels could be substantially lower than those stated, depending on the level of activity at that time.

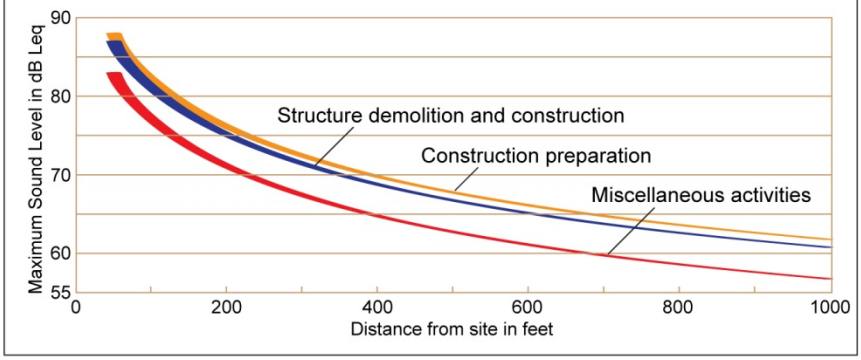
Table 6.7-5. Noise Levels for Typical Construction Phases at 50 Feet from Work Site

Scenario[a]	Equipment[b]	L_{max}[c] (dBA)	L_{eq}[d] (dBA)
Construction preparation	Air compressors, backhoes, concrete pumps, cranes, excavators, forklifts, haul trucks, loaders, water pumps, power plants, service trucks, tractor trailers, utility trucks, vibratory equipment	94	87
Construction of new structures and roadway paving	Air compressors, backhoes, cement mixers, concrete pumps, cranes, forklifts, haul trucks, loaders, pavers, pumps, power plants, service trucks, tractor trailers, utility trucks, vibratory equipment, welders	94	88
Miscellaneous activities, including striping, lighting, and signs	Air compressors, backhoes, cranes, forklifts, haul trucks, loaders, pumps, service trucks, tractor trailers, utility trucks, welders	91	83
Demolition of currently existing structures	Air compressors, backhoes, concrete saws, cranes, excavators, forklifts, haul trucks, jackhammers, loaders, power plants, pneumatic tools, water pumps, service trucks, utility trucks	93	88

[a] Operational conditions under which the noise levels are projected.
[b] Normal equipment in operation under the given scenario.
[c] L_{max} is an average maximum noise emission for the construction equipment under the given scenario.
[d] L_{eq} is an energy average noise emission for construction equipment operating under the given scenario.
Note: Noise levels are combined worst-case levels for all equipment at a distance of 50 feet from work site.

Using the information provided in Table 6.7-5, WSDOT projected typical construction noise levels for several distances from the project work area. Exhibit 6.7-1 shows general noise level versus distance for the phases of construction.

Exhibit 6.7-1. **Hourly Maximum Construction Noise for Different Distances from Construction Site**



Pile-Driving

The loudest noise during construction preparation would come from pile-drivers and vibratory equipment. Pile-driving can produce maximum short-term noise levels of 99 to 105 dBA at 50 feet. Actual levels can vary, depending on the distance and topographical conditions between the pile-driving location and the receiver location. Furthermore, the noise levels for pile-driving depend on the frequency of pile-driving and the number of pile-drivers operating at one time in any one area. In general, pile-driving

would take place throughout the established in-water work windows defined by regulatory permit conditions.

Exhibit 6.7-2 includes a graph of maximum pile-driving noise levels versus distance from 50 to 1,000 feet.

Construction Vibration Effects

Vibration associated with general construction can affect surrounding receivers. Of particular concern are receivers that use vibration-sensitive equipment such as medical or scientific equipment. In the project area, the only such known receiver located close to construction activities is the NOAA Northwest Fisheries Science Center, which uses a variety of specialized equipment for research activities, and conducts research with elements that could be potentially sensitive to nearby construction activities.

Major vibration-producing activities would occur primarily during pile-driving activities (including installation and removal), demolition, and preparation for the new bridges. Activities that have the potential to produce a high level of vibration include pile-driving, vibratory shoring, soil compacting, and some hauling and demolition activities. Vibration effects from pile-driving or vibratory sheet installations or removal could occur within 50 to 100 feet of sensitive receivers. It is unlikely that vibration levels would exceed 0.5 inch per second at distances greater than 100 feet from the construction sites.

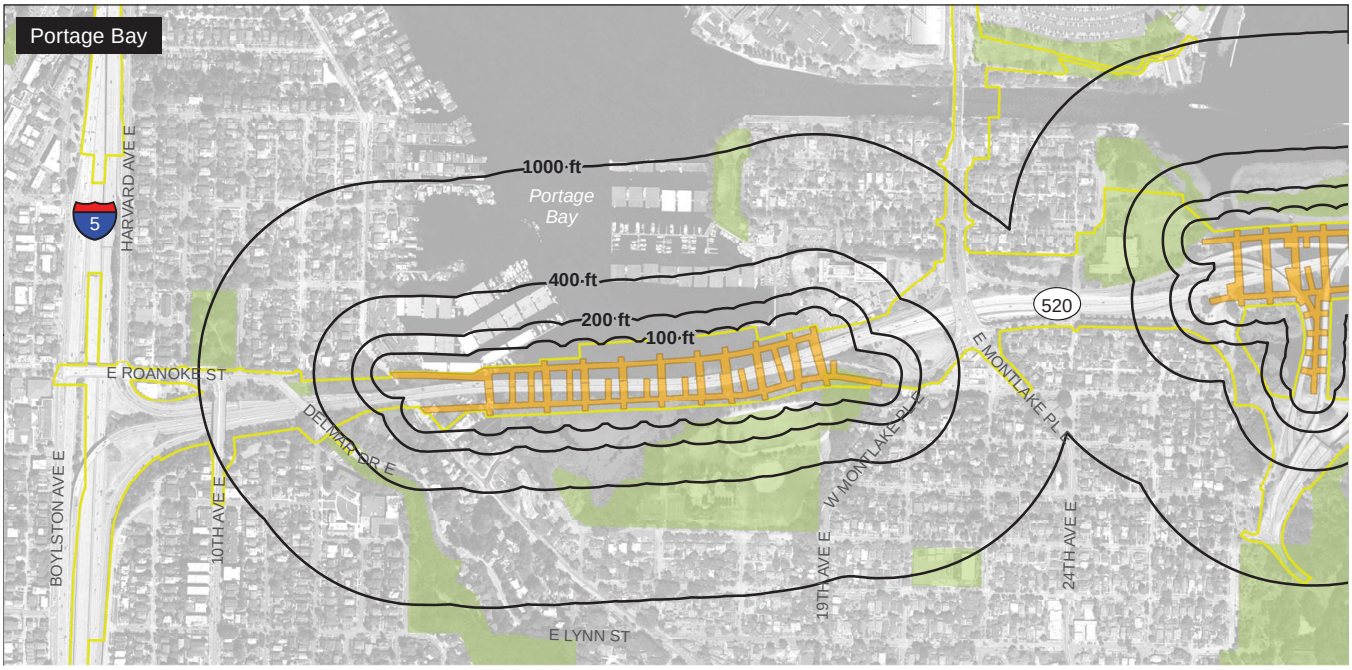
WSDOT is working with NOAA to evaluate the potential effects of pile driving and vibration resulting from project construction, and to identify appropriate minimization and mitigation measures to address adverse effects. WSDOT would ensure that researchers are aware of potential vibration-producing activities near the facility prior to the start of those activities.

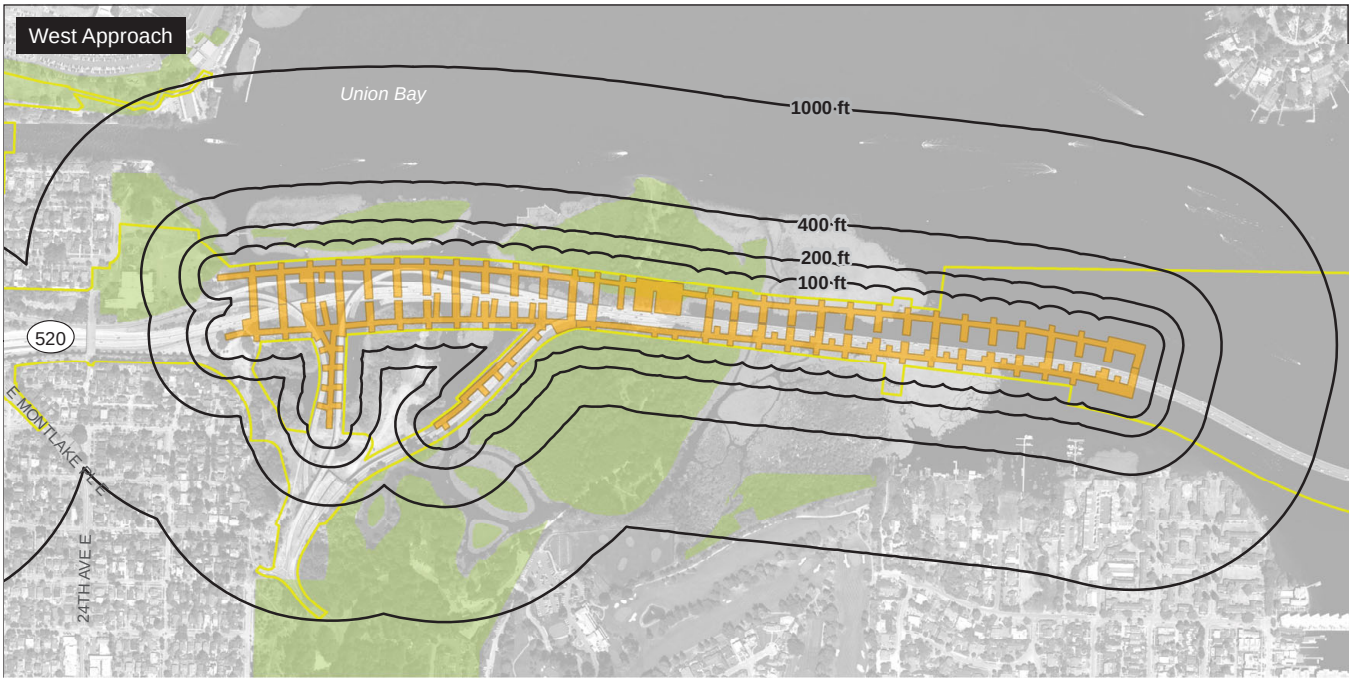
How can the project minimize negative effects during construction?

The project will need to meet the requirements of the City of Medina and City of Seattle noise ordinances and the conditions of any variance that may be obtained. Several construction noise and vibration abatement methods—including operational methods, equipment choice, or acoustical treatments—could be implemented to limit the effects of construction. The methods used might vary in the project corridor, depending on the type of construction. The following list describes some of the more common construction noise and vibration abatement methods that could be used.

- Operation of construction equipment could be limited wherever possible within 500 feet of any occupied dwelling unit during nighttime hours or on Sundays or legal holidays, when noise and vibration would have the most severe effect.

Exhibit 6.7-2. Predicted Pile-Driving Noise versus Distance





Note: Pile-driving activities and locations would be similar for the Preferred Alternative and Options A, K, and L. Predicted Pile-Driving Noise Levels versus Distance (worst case noise levels based on 105 dB max at 50 feed with no additional shielding attenuation) pile-driving noise would occur only for limited durations during the construction period, and would be required to meet the noise control ordinance or have a variance.

Distance contour from pile-driving activities

Limits of construction

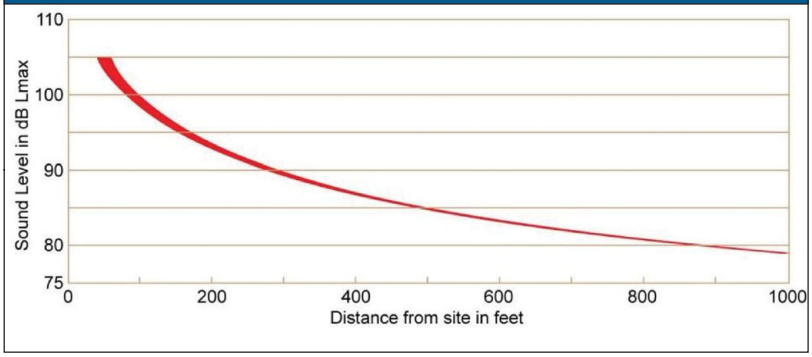
Construction work bridge

Park

N

0 500 1,000 Feet

Typical Maximum Pile-Driving Noise Levels Assuming 105 dB at 50 Feet



- Mufflers would be required on all engine-powered equipment, and all equipment would be required to comply with EPA equipment noise standards.
- WSDOT could limit activities that produce the highest noise levels (such as hauling, loading spoils, jackhammering, and using other demolition equipment) during daytime hours.
- Minimization of the noise associated with pile-driving could include limiting the time the activity could take place.
- Other less effective methods of reducing noise from pile-driving are coating the piles, using pile pads, or using piston mufflers.
- A construction log could be kept for each of the construction staging areas. The log could contain general construction information such as the time an activity took place, type of equipment used, and any other information that might help identify the equipment and activities causing any noise exceedances or generating complaints about noise. Tracking this type of information would help the contractor manage noise effects by pinpointing problematic activities or equipment, and facilitating quick resolution of any issues or exceedances.

A complaint hotline could also be established to investigate noise complaints and compare them to the construction logs. A construction monitoring and compliance program could help to ensure that all equipment met state, local, and manufacturer's specifications for noise emissions. Equipment not meeting the standards could be removed from service until proper repairs were made, and the equipment re-tested for compliance. This procedure could be used for all haul trucks, loaders, excavators, and other equipment that would be used extensively at the construction sites and that would contribute to potential noise effects.

The following is a list of potential noise mitigation measures that could be included in the construction contract specifications:

- Minimize noise by regular inspection and replacement of defective mufflers and parts that do not meet the manufacturer's specifications.
- Install temporary or portable acoustic barriers around stationary construction noise sources and along the sides of the temporary bridge structures, where feasible and practical.
- Locate stationary construction equipment as far from nearby noise-sensitive properties as possible.
- Shut off idling equipment.
- Reschedule construction operations to avoid periods of noise annoyance identified in complaints.
- Notify nearby residents and institutions whenever extremely noisy work would be occurring.

- Restrict the use of back-up beepers during evening and nighttime hours.

Additional noise mitigation measures may be implemented as more details on the actual construction processes are developed and as part of any noise variance that may be required.

WSDOT could require vibration monitoring of all activities that might produce vibration levels at or above 0.5 inch per second whenever there are structures located near the vibration-producing construction activity. This would include pile-driving, vibratory sheet installation, soil compacting, and other construction activities that have the potential to cause high levels of vibration. Virtually no method effectively eliminates vibration effects from construction; however, by restricting and monitoring vibration-producing activities, vibration effects from construction can be kept to a minimum.

6.8 Air Quality

KEY POINTS

Air Quality

Soil-disturbing activities, diesel equipment, traffic congestion, and paving with asphalt would generate emissions that may temporarily affect air quality in the vicinity of the construction activity.

Construction of the new floating bridge and Eastside transition area would result in the highest construction emissions of all areas evaluated along the project corridor.

The SDEIS included a qualitative discussion of construction effects and described common sources of construction emissions, as well as the associated pollutants of concern. During construction, soil-disturbing and demolition activities, diesel equipment, traffic congestion, and paving with asphalt would generate emissions that may temporarily affect air quality in the vicinity of the construction activity.

Since publication of the SDEIS, design detail for the Preferred Alternative (including likely construction schedules) has been advanced sufficiently to allow for a better evaluation of construction effects to air quality. Construction of portions of the Preferred Alternative is anticipated to exceed the five year threshold beyond which a quantitative emissions analysis is required to examine construction effects for conformity purposes (40 CFR Part 93). For the project area, carbon monoxide (CO) would be the pollutant for which the analysis must be conducted. More specifically, under the Preferred Alternative, construction is expected to last longer than five years in the Portage Bay and west approach areas. In response to public comments received on the SDEIS, this FEIS includes a quantitative emissions analysis for all areas of the project and all criteria pollutants.

If an alternative other than the Preferred Alternative is chosen for construction, WSDOT will ensure that an adequate air quality evaluation has been completed as required for the chosen option. The air quality analysis was based on information presented in the Final Transportation Discipline Report (Attachment 7), and on the construction information provided in Chapter 3. For a full discussion of the methodology and data used in this air quality analysis, see the Air Quality Discipline Report Addendum and Errata in Attachment 7, which also documents the CO conformity analysis required for the project.

Transportation Conformity

As required by the transportation conformity rule (40 CFR 93), construction for longer than 5 years triggers the need for a quantitative construction analysis of pollutants for which the area has been designated as nonattainment or maintenance. For the project area, that is carbon monoxide (CO).

Planned transportation projects must demonstrate compliance with the State Implementation Plan by verifying that the projects will not cause a violation, contribute to an existing violation, or delay timely attainment of the federal CO standard. This verification process is referred to as demonstrating transportation conformity. Chapter 4 provides more information on the conformity analysis requirements.

How would construction of the project affect air quality?

Construction activities would generate particulate matter and small amounts of CO and nitrogen oxides (NO_x) at different locations along the SR 520 corridor during the approximately 64 month construction window. If not properly mitigated, fugitive dust would escape from the construction site and from soil blown from uncovered trucks carrying materials. Vehicles leaving the site would deposit mud on public streets, which would become a source of dust after it dries. Construction equipment would emit CO and NO_x. These emissions would be greatest during the excavation phase because most emissions would be associated with removing dirt from the site.

Dust emissions would be associated with demolition, land clearing, ground excavation, cut-and-fill operations, and roadway and interchange

construction. Particulate emissions would vary from day to day, depending on the level of activity, specific operations, and weather conditions. Particulate emissions would depend on soil moisture, the soil's silt content, wind speed, and the amount and type of equipment operating. The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity.

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO and NO_x in exhaust emissions. These emissions would be limited to the immediate area surrounding the construction site, and would contribute a small amount compared to automobile traffic in the project area.

Some construction phases (particularly during paving operations using asphalt) would result in the emission of volatile organic compounds (VOCs) and odorous compounds. Odors might be detectable to some people near the project site, and would be diluted as distance from the site increases.

What are the findings of the quantitative construction analysis?

Full corridor construction would occur over a period of approximately 64 months. Construction activities were considered for the six geographical locations used to describe major components of the project. The durations of construction activities vary by location. Pollutant emissions for the Preferred Alternative during the peak year of construction are summarized in Table 6.8-1. The estimates of fugitive dust emissions were extremely conservative, and likely overestimated the probable annual PM10 and PM2.5 emissions. Without the specific details of day to day construction activities available, the calculations assumed that site grading would occur during every day of construction activity. Detailed construction emission calculations by location and year are included in the Air Quality Discipline Report Addendum and Errata (Attachment 7). The No Build Alternative would not result in any emissions because no construction activities would occur.

There are no state or local guidelines for evaluating the degree of impact from construction pollutant emissions. Table 6.8-1 provides three pieces of information about emissions from construction equipment and construction vehicles. It shows the relative emissions for each construction area, indicates the area with the potential for the greatest emissions, and demonstrates the temporary nature of construction related pollutant emissions. For each geographic area, the year of peak construction emissions occurs during the first full year of activity at that location. Emission factors typically decrease by year as older and less efficient equipment are phased out. The greatest amount of emissions would be produced at the Evergreen Point Bridge and Eastside transition areas

because these locations require the most support equipment, haul truck trips, and worker commute trips. Tug boats used to construct the new floating bridge contribute the majority of estimated NOx and CO emissions.

Table 6.8-1. Air Emissions During Construction (tons per year)

Area	Peak Year	CO	VOC	NOx	PM_{10}	$PM_{2.5}$
I-5/Roanoke area	2017	24.6	3.3	27.1	6.0	2.6
Portage Bay area	2014	23.3	3.2	34.4	7.8	3.2
Montlake area[a]	2014	16.4	2.3	23.1	13.7	4.1
West approach area	2014	24.1	3.3	37.5	8.2	3.4
Lake Washington and Eastside transition areas[b]	2012	65.9	8.4	105.9	15.7	7.8

[a] This area includes the Montlake interchange and bascule bridge.
[b] Construction for these two areas would be closely tied, so air quality effects were evaluated together.

What are the proposed mitigation measures for construction of the project?

For effects during construction, state law requires construction site owners and/or operators to take reasonable precautions to prevent fugitive dust from becoming airborne. Fugitive dust may become airborne during demolition, material transport, grading, driving vehicles and machinery on and off the site, and through wind events. WSDOT will comply with the procedures outlined in the Memorandum of Agreement between WSDOT and the Puget Sound Clean Air Agency (PSCAA) for controlling fugitive dust (WSDOT 1999) and will employ the following types of actions where warranted by site conditions:

- Spray exposed soil with water or other dust suppressant to reduce emissions of PM_{10}.
- Design construction phases to keep disturbed areas to a minimum.
- Use site screening to manage potential transport of fugitive dust.
- Minimize dust emissions during transport of excavated or fill materials by wetting down loads or by ensuring adequate freeboard (space from the top of the material to the top of the truck bed) on trucks.
- Promptly clean up spills of transported material on public roads.
- Restrict traffic onsite to reduce soil upheaval and the tracking of material onto roadways.

- Provide wheel washers to remove particulate matter from vehicles before it is carried offsite.
- Locate construction equipment and truck staging areas away from sensitive receptors as practical and in consideration of potential effects on other resources.
- Cover dirt, gravel, and debris piles as needed to reduce dust and wind-blown debris.
- Street cleaning in immediate area of construction and along haul routes.

Federal regulations have been adopted that require the use of ultra-low-sulfur diesel fuel in on-road trucks, and the use of these fuels for construction equipment as of 2010. These regulations require reduction of the sulfur content of diesel fuel from its current level of 500 ppm to 15 ppm—a 97 percent reduction—and they are intended to result in a decrease in both sulfur dioxide (SO_2) and particulate matter (PM) emissions from these engines. WSDOT encourages its contractors to reduce idling time of equipment and vehicles and to use newer construction equipment or equipment with add-on emission controls.

6.9 Energy and Greenhouse Gases

How would construction of the project affect energy consumption?

Project construction would consume energy during the mining and production of construction materials, during transportation of materials to the project site, and during operation of construction equipment and worker vehicles. In general, the amount of energy consumed is proportional to the cost of building the project. To calculate how much energy would be used for construction of the project, WSDOT applied a construction energy consumption factor, developed by the California Department of Transportation, to the estimated cost of the Preferred Alternative and the SDEIS options (for more details, see the Energy Discipline Report Addendum and Errata in Attachment 7).

KEY POINT

Energy

Option K would require the most energy to construct of all the options, including the Preferred Alternative, due to the size and complexity of the depressed interchange at Montlake Boulevard (the single-point urban interchange or SPUI) and the tunnel underneath the Montlake Cut.

Option K would consume the most energy because of the larger amount of construction activity required for the depressed interchange and tunnel, which is reflected in the higher construction costs. The energy needs are estimates intended to show approximate relative differences among the build options. Actual use could be different based on specific equipment and construction methods. Table 6.9-1 shows the energy use anticipated for the Preferred Alternative and SDEIS options.

Table 6.9-1. Estimated Onsite Energy Use for Construction

Alternative	MBtu
Preferred Alternative	15,006,000
Option A	15,006,000
Option K	34,299,000
Option L	18,781,000

KEY POINT

Greenhouse Gas

During construction, the primary source of GHG emissions would be fuel combustion, with the GHG emissions being proportional to the amount of energy used. The Preferred Alternative and Option A would have the lowest level of construction GHG emissions. Option K has the highest emissions potential at roughly double that of the Preferred Alternative and Option A. Option L would produce approximately 20 percent more emissions than the Preferred Alternative and Option A and less than Option K.

What effect would project construction have on greenhouse gas emissions?

Exhibit 6.9-1 shows the estimated construction greenhouse gas (GHG) emissions for the Preferred Alternative and Options A, K, and L (including pontoon transport) in carbon dioxide (CO_2) equivalents. The emissions estimates include both facility construction activities and towing the pontoons to the site, as well as construction of additional pontoons not covered in the SR 520 Pontoon Construction Project.

DEFINITION

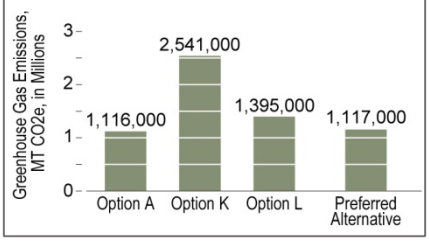
CO_2 Equivalent

CO_2 equivalents provide a universal standard of measurement against which the impacts of releasing different greenhouse gases can be evaluated. Every GHG has a global warming potential (GWP), a measure of the impact that particular gas has on the additional heat/energy that is retained in the Earth's ecosystem through the addition of this gas to the atmosphere.

The Preferred Alternative and Option A would have the lowest level of construction GHG emissions. Construction of Option L (using more energy than Option A to build the above-grade interchange and long

Montlake Cut bascule bridge) would produce approximately 20 percent more emissions than Option A. As Option K would consume the most energy, it would correspondingly have the highest GHG emissions—more than twice the emissions of the Preferred Alternative and Option A—with the larger amount of construction activity required for the depressed interchange and tunnel. The project would result in indirect GHG emissions, which are not released by the project but are nonetheless caused by the project. Greenhouse gases would be emitted during the production and disposal of materials used for project-related construction. For example, emissions would be released during the production of the concrete used in construction and during the manufacture of the equipment used during construction. Emissions would also be released as a result of the actions related to disposal of the concrete from demolished structures. Indirect emissions are also categorized as embodied and lifecycle emissions.

Exhibit 6.9-1. **Project Construction GHG Emissions Comparison**



At this time, there is no consistent and standardized method to calculate specifically the indirect emissions for transportation projects. There are no tools currently available for discerning clearly and meaningfully which emissions are attributable to a specific project and which emissions would have occurred without the project, especially when it comes to the disposal aspect of lifecycle emissions. However, it is important to note that the construction GHG emission levels reported for this project actually do include "embodied" emissions. This is because the construction GHG emissions were determined based on the results of the energy analysis, and the energy analysis was based on applying an energy conversion factor to project costs. The conversion factor used to estimate construction energy includes embodied energy used for manufacturing and transport of materials to the project site. This view of indirect emissions does not rely on an in-depth analysis of predetermined construction techniques and equipment, and actual GHG emissions would depend on the type of equipment used and construction methods chosen.

DEFINITIONS

Embodied Emissions

Embodied emissions are the emissions generated in producing the materials that are used in the construction process and include emissions from sourcing the raw materials from the earth and their conversion into a usable form, including the energy used in processing. Embodied emissions can be thought of as "cradle to site" emissions. For example, the emissions released while mining the coal used to manufacture the steel girders for a bridge would be considered embodied emissions.

Lifecycle Emissions

Lifecycle emissions include emissions released during material production (embodied) and emissions released throughout a facility's lifetime, including demolition and disposal. Unlike embodied emissions, lifecycle emissions account for the durability of a product. Lifecycle emissions are often referred to as "cradle to grave" emissions.

How can the project minimize negative effects during construction?

Building the proposed project would consume large amounts of energy that would no longer be available for other purposes. In developing the construction contract for the project, WSDOT will determine the best measures to be employed during construction to conserve energy. Typical contractual measures include:

- Limiting idling of equipment
- Encouraging carpooling of construction workers
- Locating staging areas near work sites

Because GHG emissions are related to fuel consumption, any steps taken to minimize fuel use would reduce GHG emissions as well.

6.10 Water Resources

Construction effects on surface water bodies were evaluated by determining construction actions that could disturb soil and in-water sediments and by evaluating the potential for accidental spills of hazardous materials. Potential effects on surface water bodies from constructing the Preferred Alternative or the SDEIS options in the study area would be related to the installation, use, and removal of work bridges, construction of the new bridges, and demolition of the existing bridges.

How would construction of the project affect water resources?

Construction activities can affect water quality by increasing turbidity (suspended soils or sediments) in water bodies. Turbidity can harm aquatic life, especially benthic (sediment-dwelling) organisms that are an important part of the food chain. It can result from direct disturbance of sediments through activities like placement of columns or anchors, or from construction-exposed soil eroding during rainstorms and flowing into nearby water bodies. Another potential risk to water quality during construction occurs when pollutants like fuel or lubricants are spilled. Such spills can seriously damage nearby aquatic organisms and habitat.

DEFINITION

Turbidity

Turbidity refers to small particles of sediment suspended in water. It makes water cloudy, limiting light and visibility for aquatic organisms, and can smother gravel and eggs in salmon spawning areas. Construction BMPs are used to control turbidity during in-water work.

What measures would be used to protect water quality during construction?

Construction of the project would require the development and implementation of temporary erosion and sediment control (TESC) and spill prevention, control, and countermeasures (SPCC) plans (WSDOT 2008a). A TESC plan would detail the risk of erosion in different parts of the study area and would specify best management practices (BMPs) to be installed prior to construction activities and periodic maintenance and inspection procedures during construction. It would include environmental standards based on state regulations, such as turbidity and total suspended solids (TSS) levels in stormwater discharged from construction staging and work areas. A SPCC plan would also be prepared to prevent, control, and identify countermeasures for potential spills of hazardous materials during construction, as required by WSDOT Standard Specification 1-07.15(1) (WSDOT 2008d). Additional information on the requirements of SPCC plans is provided in the 2009 Hazardous Materials Discipline Report (Attachment 7). Construction of the Preferred Alternative or the SDEIS options would require compliance with approved TESC and SPCC plans.

The project would also require a concrete containment and disposal plan (CCDP). The CCDP would outline how concrete would be managed, contained, and disposed, and what pH levels would be mitigated to ensure

that pH changes due to concrete construction and demolition activities do not harm aquatic species.

Containment of pollutants during in-water construction is key to maintaining water quality. In addition to the above BMPs, WSDOT would implement the following procedures as appropriate for construction or demolition.

- Floating sediment curtain - This barrier is designed to control the settling of suspended solids (silt) in water by providing a controlled area of containment. This turbidity is usually created by disrupting natural conditions through construction or dredging in the marine environment. The containment of settleable solids is desirable to reduce the impact area.
- Underwater containment system/temporary cofferdam – This system would be implemented to prevent sediment, concrete, and steel debris from mixing with surface waters. Examples could include a temporary cofferdam, an oversized steel casing, or another type of underwater containment system developed by the contractor. This application would allow demolition work to be completed on and around an underwater structure and isolate the work zone. The system would also allow work to be completed at or below the mudline as determined by removal requirements by the state. Construction water and slurry within the containment system could be removed, treated, and pumped to an approved discharge location upon completion of the demolition.
- Construction water treatment systems - These systems consist of temporary settling storage tanks, filtration systems, transfer pumps, and an outlet. The temporary settling storage tank provides residence time for the large solids to settle out. The filtration system is provided to remove additional suspended solids below an acceptable size (typically 25 microns). The pumps provide the pressure needed to move the water through the filter and then to an acceptable discharge location. Once the solid contaminants are filtered out, the clean effluent is then suitable for discharge to a municipal storm drain or an acceptable discharge location. These systems can be located on a work bridge or a barge.

Additional information on in-water construction activities, effects from these activities, and associated BMPs is provided in Section 6.11, Ecosystems.

How would project construction affect groundwater?

Construction of roadways and bridges may temporarily alter the flow of groundwater. For example, groundwater could be affected by the temporary piles being driven into the ground to provide a framework for bridge or wall construction. Piles or shafts act as obstacles that groundwater must

flow around. Such effects are typically minimal and would be temporary in nature.

Another construction activity that could temporarily alter groundwater flow is the use of dewatering wells to lower groundwater levels to allow subsurface construction in a dry environment. The need for dewatering would be relatively minor for the Preferred Alternative and Options A and L. Option K would require substantial excavations below the water table and could consequently involve disposal of large volumes of water. Dewatering for construction of the bridge maintenance facility would be necessary for the Preferred Alternative and the SDEIS options.

KEY POINT

Dewatering

The need for dewatering is expected to be high for Option K because much of the large excavation for the depressed SPUI would occur below the water level.

Groundwater generated from dewatering activities during construction would be stored either in temporary treatment ponds at or near the location of the permanent stormwater treatment wetlands or in portable steel tanks. Water would be stored for a sufficient amount of time to allow particles to settle out, or chemicals could be used to reduce suspended particles to achieve discharge water quality requirements before the water is discharged to an approved location. For more details, see the 2009 Water Resources Discipline Report and the Water Resources Discipline Report Addendum and Errata in Attachment 7.

How can the project minimize negative effects during construction?

WSDOT would minimize adverse effects on surface water bodies during construction by implementing and maintaining water quality BMPs outlined in the approved TESC, SPCC, and CCDP, plans as described above and by following permit conditions.

Even with BMPs, some temporary, short-term water quality effects (principally from increases in turbidity) could occur, particularly during large storm events. However, the magnitude of these effects would be small, and not likely to adversely affect overall water quality within project area water bodies.

6.11 Ecosystems

Installing the construction work bridges and finger piers in Portage Bay and Union Bay and temporarily widening the existing bridge over Portage Bay could affect nearby wetlands. Some construction effects would be the removal of vegetation and shading in these areas and an increased potential for erosion and sediment discharge into the wetlands.

Construction activities in the waters of Lake Washington could have a variety of effects on fish and other aquatic species. These activities include noise and vibration from pile-driving; temporary shading from work and detour bridges; and turbidity resulting from anchor placement and column removal in the lake. Wildlife and habitat may be affected by temporary clearing and shading of vegetation. The Ecosystems Discipline Report Addendum and Errata (Attachment 7) provides a detailed technical discussion on potential effects.

KEY POINT

Wetlands

The Preferred Alternative and SDEIS options include construction bridges, work platforms, staging areas, and construction access roads that would have transient effects on wetlands due to vegetation clearing or shading during the multi-year construction period. The Preferred Alternative would have less filling and clearing effects on wetlands from construction than the SDEIS options, but shading effects to wetlands would be more than Options A and L. Option K would result in more wetlands and wetland buffer being filled and shaded during construction than the other options.

How would construction of the project affect wetlands?

The Preferred Alternative and the SDEIS options include construction work bridges, work platforms, staging areas, and construction access roads that would have effects on wetlands during the multi-year construction period due to vegetation clearing or shading.

Tables 6.11-1 and 6.11-2 summarize construction effects on wetlands and Exhibits 6.11-1 and 6.11-2 illustrate those effects that would occur within the geographic areas. There are no wetlands associated with the I-5 area, floating bridge area, or Eastside transition area, and therefore there would be no effects in these areas.

Table 6.11-1. Wetland and Wetland Buffer Fill or Clearing during Construction (acres)

		Portage Bay Area	Montlake Area	West Approach Area	Total Effect
Preferred Alternative	Wetland	<0.1	<0.1	0.2	0.2
	Buffer	<0.1	0.1	2.9	3.0
Option A	Wetland	<0.1	0	0.6	0.6
	Buffer	0.2	<0.1	2.6	2.8
Option K	Wetland	0	0.5	0.5	1.1
	Buffer	0.1	0.7	2.3	3.2
Option L	Wetland	<0.1	0.1	0.4	0.5
	Buffer	0.1	0.5	2.2	2.8

Note: Totals may not add up due to rounding.

Table 6.11-2. Wetland and Wetland Buffer Shading during Construction (acres)

		Portage Bay Area	Montlake Area	West Approach Area	Total Effect
Preferred Alternative	Wetland	1.8	0.1	4.9	6.8
	Buffer	0.2	0.1	0.8	1.1
Option A	Wetland	1.7	0	4.7	6.4
	Buffer	0.1	0	0.1	0.2
Option K	Wetland	1.8	<0.1	6.4	8.1
	Buffer	0.1	<0.1	0.4	0.6
Option L	Wetland	1.8	<0.1	4.6	6.4
	Buffer	0.1	<0.1	0.1	0.2

Note: Totals may not add up due to rounding.

The total construction effects on wetlands are similar for the Preferred Alternative and Option A. However, there is less clearing and more shade associated with construction of the Preferred Alternative than for Option A. Only Option K has more wetland shading than the Preferred Alternative. Construction of Option K would result in the most wetland area cleared or shaded. The Preferred Alternative would clear more buffer than Options A and L, but less than Option K. The Preferred Alternative would result in more shading of buffers during construction than described for the SDEIS options. The increase in shading from the Preferred Alternative results from the shift of the proposed bridge alignment to the south in Union Bay (west of Foster Island) to accommodate potential future light rail. The shift south pushed the alignment over wetlands, whereas in the SDEIS options, more of the bridge structure was located over open water.

How would construction of the project affect fish resources?

In-Water Work Windows

All in-water construction activities, like pile-driving, would occur during project-specific work windows approved by the regulatory agencies. WSDOT has coordinated with the regulatory agencies and the Muckleshoot Indian Tribe to establish site- and project-specific in-water work windows to minimize the potential for project activities to affect juvenile or adult salmonids.

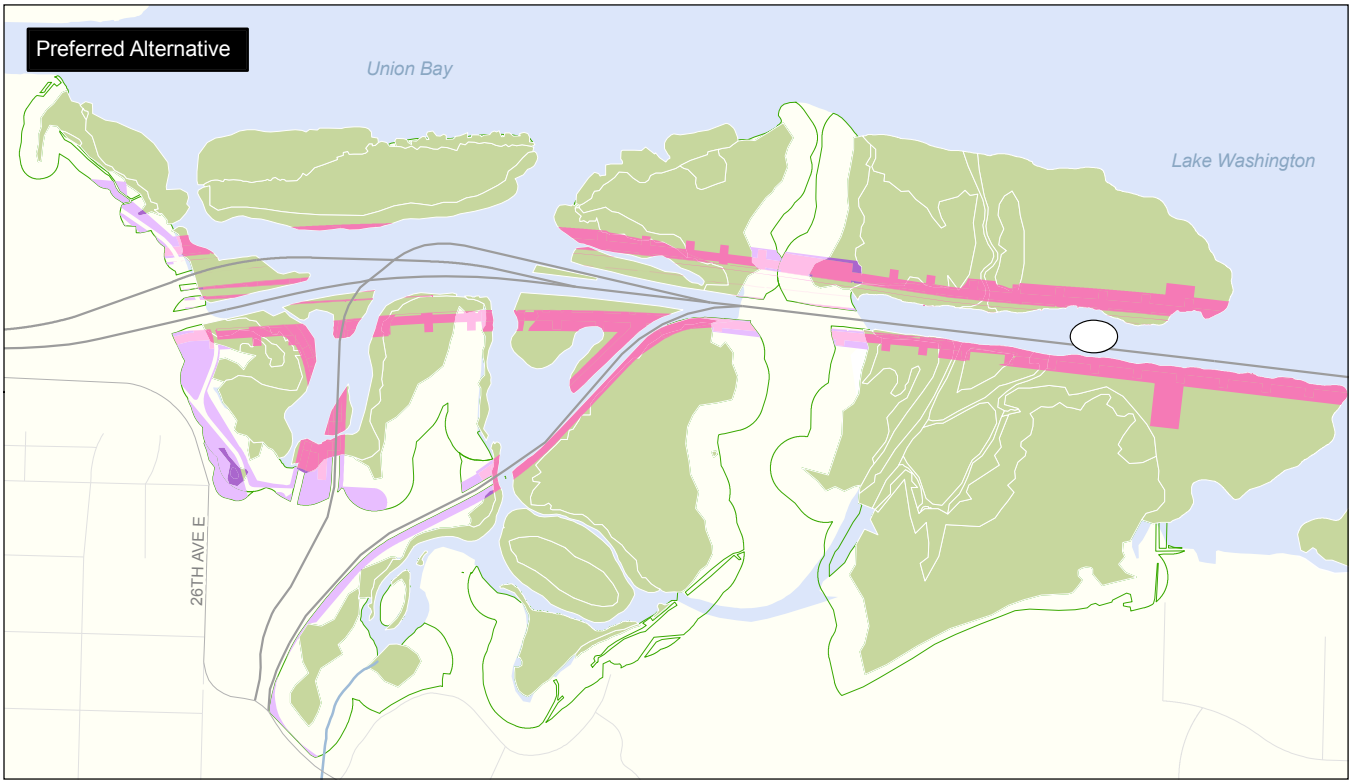
In some instances, project-specific work windows may extend outside the published Washington State Department of Fish and Wildlife (WDFW)-work window. While the work window extension has the potential to expose fish to construction effects, several factors would

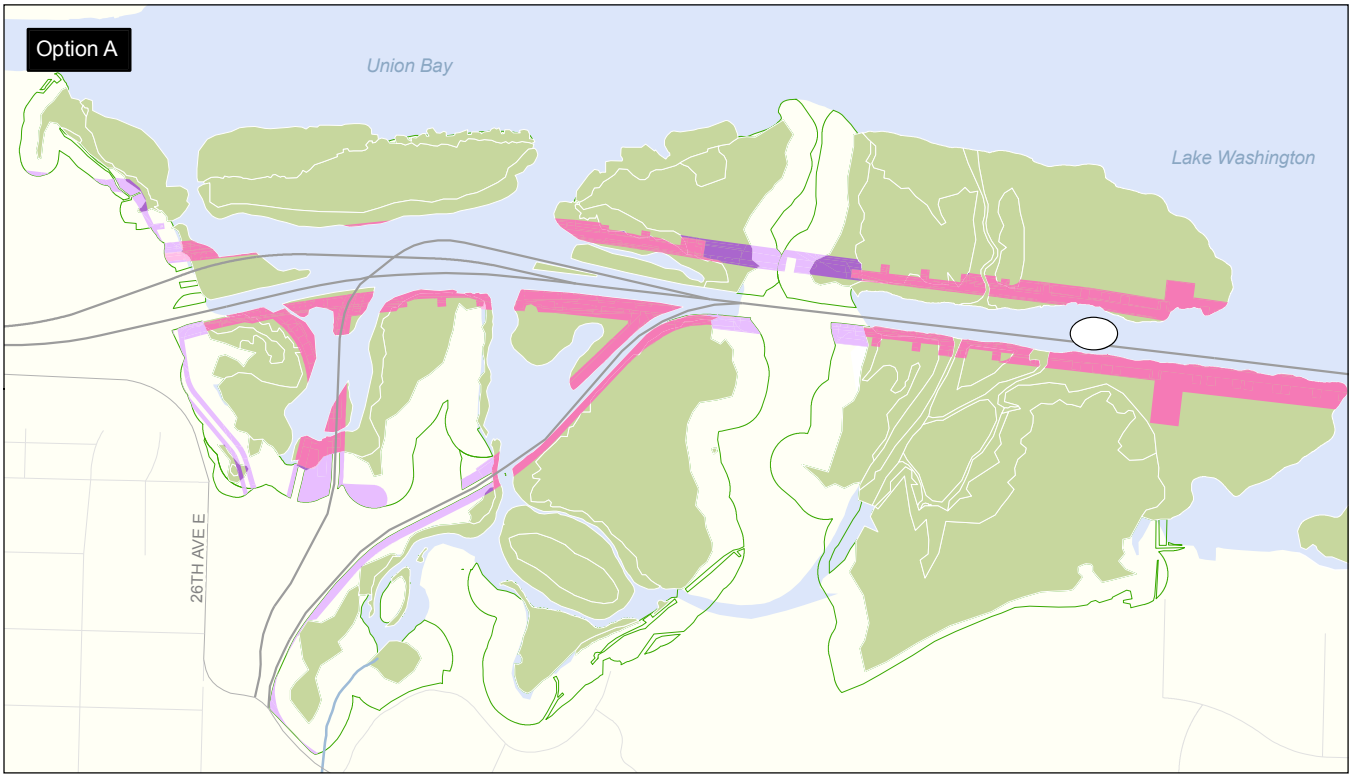
How were shade impacts calculated?

For the EIS analysis, shade effects were calculated by overlaying the construction areas and temporary work bridge structures onto the surveyed wetland boundaries and designated buffers to determine the extent and location of clearing, filling, and shading for the Preferred Alternative and SDEIS options. For the purpose of quantifying shade effects, the analysts calculated only the areas that would be directly under the bridge structures as shaded, and did not try to differentiate between partial shading and total shading. WSDOT worked with resource agencies and the Muckelshoot Indian Tribe Fisheries Division in the Natural Resources Technical Working Group to refine these methods of analysis in order to develop specific mitigation plans and commitments. Therefore, effect analysis for mitigation and permit conditions may vary from the EIS analysis to account for specific resource and permit requirements.

Exhibit 6.11-1. Construction Effects on Wetlands and Buffers in Portage Bay

Exhibit 6.11-2. Construction Effects on Wetlands and Buffers in Lake Washington





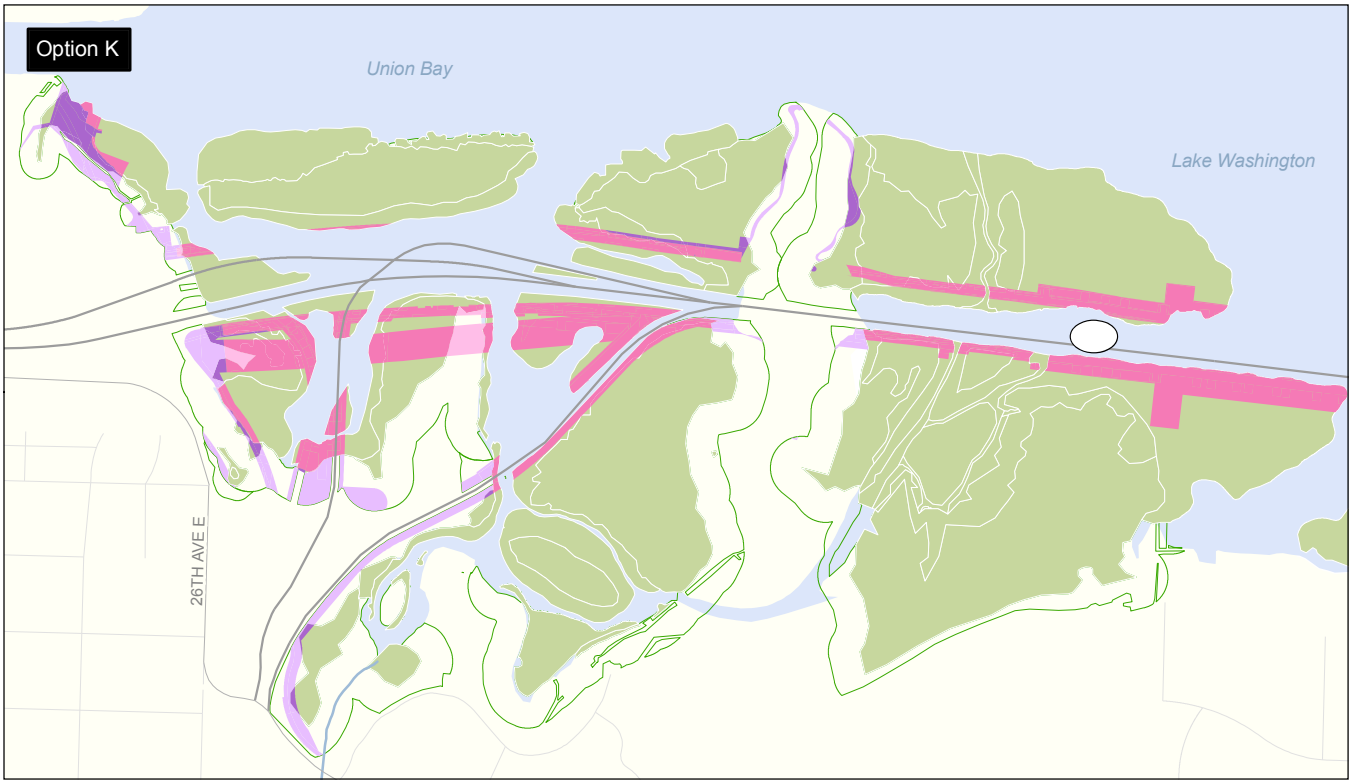
Construction Effect

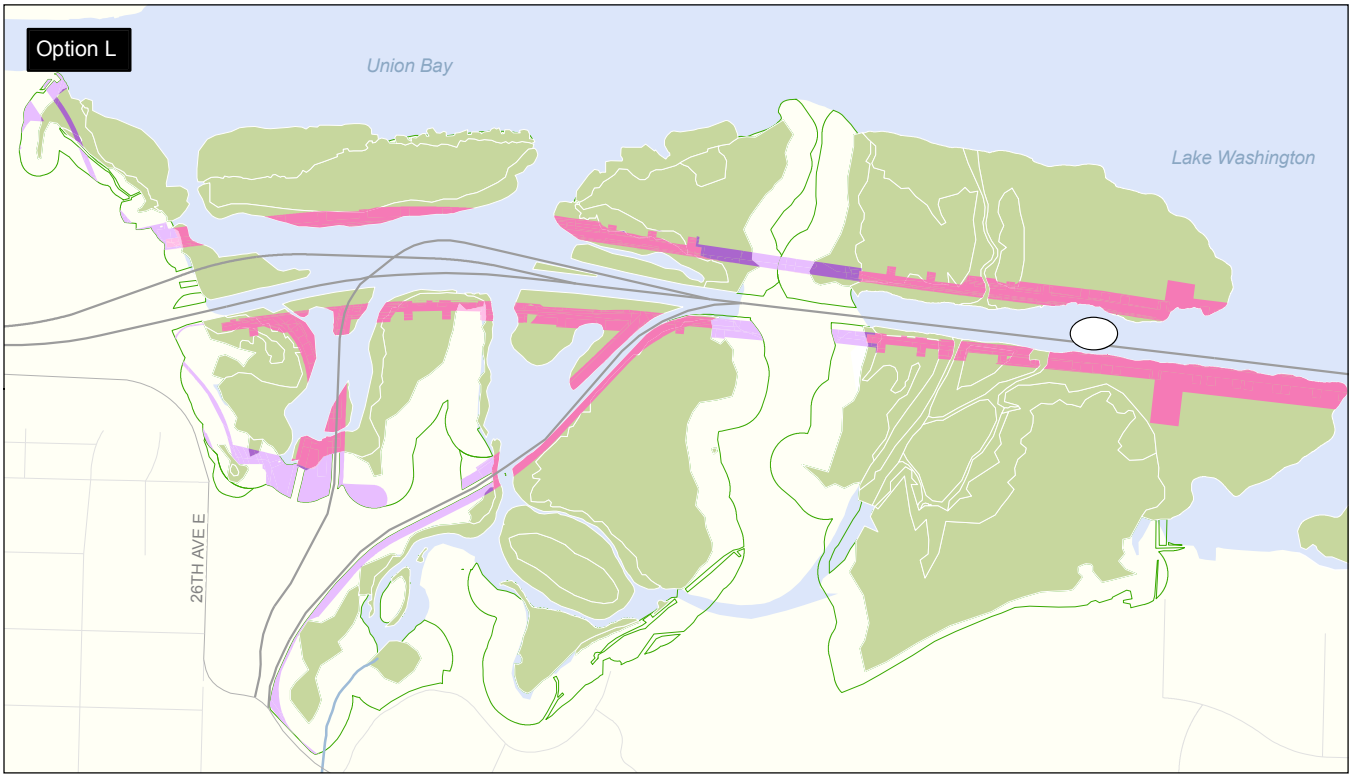
- Affected wetland (fill)
- Affected buffer (fill)
- Affected wetland (shade)
- Affected buffer (shade)
- Wetland
- Wetland buffer

N

0 250 500 Feet

Exhibit 6.11-2. Construction Effects on Wetlands and Buffers in Lake Washington





Construction Effect

- Affected wetland (fill)
- Affected buffer (fill)
- Affected wetland (shade)
- Affected buffer (shade)
- Wetland
- Wetland buffer

N

0 250 500 Feet

contribute to minimizing and reducing those effects. For instance, the proposed work windows continue to exclude months when a majority of juvenile salmonids are expected to migrate into Lake Washington, and few juvenile or adult salmonids are likely to occur in the project area during the construction period. Also, adult salmonids are anticipated to use deep waters, away from construction activities that could induce behavioral effects or injury. And finally, best management practices would minimize the size of the area affected by water quality and sound levels that could cause effects to fish. The following discussion provides more specific detail about potential effects from construction and possible minimization measures.

Pile-Driving

Substantial in-water pile-driving activities would be required for the Preferred Alternative and the SDEIS options to build construction work bridges in shallow-water areas that cannot be accessed by barge. The underwater sound levels generated during pile-driving activities can disturb or alter the natural behavior and habitat of juvenile salmonids and other aquatic species and in some instances cause injury or mortality.

Adult salmonids migrating through the project area to their spawning grounds may be affected by in-water construction activities, particularly pile-driving. Although adult Chinook normally pass through the Ship Canal in 2 or fewer days (Fresh et al. 1999, 2000) and sockeye average 6 days (Newell and Quinn 2005), high summer temperatures and dissolved oxygen levels in the Ship Canal and Lake Union have been shown to delay or alter migration timing and, in extreme conditions, likely contribute to pre-spawn mortality. Elevated in-water noise levels from project construction activities could be an additional stressor on fish, potentially affecting fish migration behavior (timing and routes) in close proximity of pile driving activities. The results of the Test Pile program indicate that fish behavior could be affected within 22 meters, or 72 feet, of active pile driving. However, the migration times of adult salmonids through the Ship Canal are relatively fast, and noise attenuation best management practices (BMPs) would reduce in-water noise considerably.

The type and magnitude of pile-driving effects on fish and other aquatic species depend on a wide range of factors, including the type and size (diameter) of pile, type of pile-driving hammer, pile-driving duration, amount of air in the water, size and number of surface waves, depth of the site, noise attenuation BMPs employed, and the geologic conditions that govern the penetration rate of the pile and the penetration depth required. These variables influence either the magnitude of the initial sound or the attenuation of the sound as it radiates out from the source. The magnitude of potential effects on aquatic species also decreases with range, as sound levels attenuate with distance from the source.

Pile-Driving

Two general types of pile-driving hammers (impact and vibratory) are available and expected to be used for the project. Impact hammers use various mechanical methods to pound the piles into the substrate, while a vibratory pile-driver uses an oscillatory motion and heavy weight to force the pile into the substrate. These differences result in substantially different underwater sound characteristics and potential effects on fish, with vibratory methods having less effect than impact methods.

In October 2009, WSDOT tested various pile-driving methods to better identify anticipated noise levels and test potential mitigation measures. Preliminary results indicate that the use of bubble curtains during construction would result in substantial reductions in underwater noise.

This BMP produces a wall of bubbles around the pile being driven to reflect, absorb, and attenuate the sound energy emanating from the pile.

It is anticipated that at least some of the pile-driving activities can be accomplished using a vibratory hammer to minimize in-water sound levels (see sidebar). However, some impact pile-driving would be needed to achieve adequate load-bearing capacity for the piles. The temporary piles would be removed with a vibratory hammer.

Site-specific evaluations were conducted to assess the sound levels generated by pile-driving in Portage Bay, Union Bay, and Lake Washington for this project. These evaluations helped identify appropriate measures to minimize the potential effects of pile-driving on fish and other aquatic species. Using noise attenuation BMPs, the range of potential injury for juvenile and subadult/adult salmonids is less than 1 meter for a single pile strike (WSDOT 2010h). The distance of potential for injury from cumulative pile strikes for juvenile and subadult/adult salmonids remaining in close proximity for an entire day of pile-driving was about 2 meters (7 feet). Behavioral effects, based on a conservative 150 dBA threshold, would extend for approximately 72 feet in most areas, but could be up to 446 feet in the vicinity of the west highrise. Underwater noise levels from pile-driving for the east approach area are expected to be higher because of local geology. Conservative estimates suggest that underwater noise levels which result in injury or behavioral effects are predicted to extend farther from pile driving-activities in this area. These results have been shared with resource agencies and the Muckleshoot Indian Tribe. Specific in-water construction periods will also be established through the project permitting process, with review by the Muckleshoot Indian Tribe, to minimize potential effects of pile-driving and other in-water construction activities on salmonid species.

Despite noise minimization measures planned for pile-driving activities in the study areas, the number of temporary piles needed for the construction bridges and the overall duration of pile-driving activity would likely have a negative effect on fish and other aquatic organisms in the immediate vicinity of pile driving.

Other In-Water Construction

In addition to the pile-driving activities, in-water construction would also include installing temporary cofferdams to isolate some work areas from the aquatic environment and minimize the overall effects. Cofferdams are generally constructed with steel sheet piling vibrated into the mud with a vibratory hammer—typically to approximately 20 feet below the mud line. The area within the cofferdam is then de-watered to effectively isolate additional construction activities from the aquatic environment. While the cofferdams are intended to minimize biological and water quality effects of construction, the dewatering process can result in stranded fish within the enclosure. To minimize such effects, WSDOT fish handling and exclusion protocols (WSDOT 2009g) and any additional measured specified in the environmental permits for the project would be implemented.

Cofferdam

Cofferdams may be used to provide a dry work area when construction takes place within a water body.

Construction activities would also include replacing upland and in-water permanent bridge support structures (piers). The types of piers used would vary based on geological conditions, groundwater depth, water depth (if the structure is placed in water), and weight of the superstructure and the load it will carry. Substructure foundation types expected for this project include spread footings (upland only), drilled shafts, concrete columns, and water- or mudline shaft caps (see Chapter 3). Regardless of the type of substructure, construction BMPs would be implemented to minimize the potential adverse effects of installing these structures on fish or aquatic habitat.

In-water construction activities may generate turbidity plumes from disturbance of the bottom sediments. Increased turbidity could occur during installation of temporary piles, but turbidity risks are considered more likely to occur during removal of support piles for the temporary work platforms. Turbidity can also be affected by BMPs implemented to offset other construction effects, such as bubble curtains and cofferdams.

Increased turbidity can alter the behavior of aquatic species, impair their ability to capture prey, and in severe cases cause physical injuries such as gill abrasion in fish. However, the relatively calm and protected waters in Portage Bay and Union Bay are unlikely to cause substantial dispersion of any suspended sediment that might occur from construction activities, thereby limiting the overall potential to affect aquatic species or habitat conditions. Turbidity monitoring undertaken during the Test Pile program indicated that turbidity remained low during pile installation and removal with no exceedances of state water quality standards (<5 NTU over background at 150 feet). The depth of Lake Washington would limit the effects of turbidity from placement of the bridge anchors because fewer species are expected to use the deeper areas of the lake. Implementation of appropriate BMPs is also expected to minimize potential effects of any turbidity resulting from construction activities.

After completion of the replacement bridge structures, the existing bridges would be removed. Most of this work would be conducted from the construction work bridges, although some or all of the existing bridge support structures would be cut off at the mud line and would require additional in-water work. Appropriate BMPs would be implemented to minimize any spillage of demolition material into Lake Washington.

Other potential short-term construction effects could include spills of hazardous materials (e.g., oil and gasoline), chemical contaminants, or other pollutants. To reduce potential spills of petroleum and hydraulic fluids in sensitive areas, maintenance or fueling of construction equipment, vehicles, or vessels would not be allowed within 200 feet of the area waterways without the implementation of appropriate spill prevention and control measures. Materials that modify pH—including cement, cement grindings, and cement saw cuttings—would be managed so that they will not

Demolition of Existing Structures

Over-water demolition would require special precautions to prevent debris or concrete-laden water from entering the natural water system. Standard overwater and in-water construction and demolition BMPs would be implemented in accordance with environmental regulatory permit requirements. Therefore, this process is expected to have limited potential to affect either fish or aquatic habitat in the area. BMPs would include use of cofferdams to isolate in-water work areas from the aquatic environment. In-water structures would be demolished to the mud line, leaving foundations below the mudline intact wherever possible.

contaminate surface water runoff or otherwise enter the area waterways. A spill prevention, control, and countermeasures plan and a concrete containment and disposal plan will be developed before beginning construction (see Section 6.10, Water Resources).

KEY POINT

Fish Habitat

All of the options would create larger areas with reduced fish habitat functions, primarily due to increased shading by the work bridges and barges. Compared to the existing structures, the proposed overwater structures are about twice as wide for all options. All options would result in the same area of temporary overwater structure in the Portage Bay Area (3 acres). Option L would result in the most overwater shading in the west approach area. Option K would result in the overall greatest loss of fish habitat due to the filling for the depressed SPUI.

KEY POINT

Lake Bottom Substrate

All options would result in the temporary loss of lake bottom substrate that supports aquatic vegetation as a result of work bridges.

How would construction lighting affect fish and aquatic habitat?

Lighting associated with nighttime highway construction could affect the distribution and behavior of fish, depending on intensity and proximity to the water. Responses to light are not universal for all species of fish. Some species school and move toward light sources: some predatory fish are adapted for hunting in low light intensities, while others are attracted to higher light intensities (Machesan et al. 2005). Artificial lighting could also affect the migration rates of fish passing through the project area. Slower migration rates through the area, when combined with the ambient light levels, could result in greater exposure of fish to predators as well as increased foraging opportunities on prey items such as zooplankton.

In addition, construction lighting would vary depending on seasonal day length and other construction sequencing factors during demolition and construction of the project. It is expected that construction lighting would be used to a greater extent between late summer and early spring, due to the shortened daylight periods. Few juvenile salmonids are expected to occur in the study area during this portion of the year. Therefore, substantial effects from construction lighting are not expected.

The potential effects of construction lighting on fish behavior and predator-prey relationships could be greater in the shallow water areas, which occur in much of the project area, where the light could affect the entire water column. However, construction lighting would be shielded or directed away from the water to the extent practicable. The lighting is also expected to be concentrated in the immediate work areas, decreasing effects from light with distance from the work area. The effects from lighting would be the same for the Preferred Alternative and the SDEIS options.

How would overwater structures affect fish and aquatic resources?

Over-water shading from construction bridges could directly or indirectly affect fish, including native salmonids, by reducing the growth of aquatic vegetation in shallower areas, as well as potentially affecting juvenile salmonid migration and the distribution of predators. However, the influence of shading on fish behavior is complex and varies by width and height of the structures, species, time of year, and other factors.

Additional aquatic habitat shading resulting in similar effects on juvenile salmonids would also occur from construction barges temporarily anchored

in the deeper water areas. Using barges as staging and construction platforms would likely reduce the overall effects of bridge construction because they do not require in-water pile-driving. They would result in only limited disturbance of the substrate, and would remain in any one place for a shorter time than the work bridges.

The Preferred Alternative would require similar construction work bridges as described for the SDEIS options, extending along both sides of the proposed bridge alignment. Since publication of the SDEIS, construction requirements for work bridges have been refined, resulting in a change in assumptions for work bridge heights. Work bridges would likely be approximately 5 to 10 feet above the water, which is 5 feet lower than described in the SDEIS. Work bridge heights would be the same for the Preferred Alternative and the SDEIS options.

Temporary support piles for work bridges would also affect substrate in nearshore areas of Portage Bay and Union Bay. Tables 6.11-3 and 6.11-4 show the area of shading from temporary overwater structure and the number of support piles for the Preferred Alternative and the SDEIS options.

Table 6.11-3. Shading from Temporary Overwater Structures (acres)

	Portage Bay	West Approach	East Approach	Total
Preferred Alternative	3.1	7.4	0.4	10.9
Option A	3.0	7.6	0.4	11.0
Option K	3.0	8.5	0.4	11.9
Option L	3.0	7.0	0.4	10.4

Portage Bay

Effects from shading and temporary support piers would be slightly more for the Preferred Alternative than described for the SDEIS options in Portage Bay. The construction work bridges constructed within Portage Bay would result in approximately 3.1 acres of temporary overwater shading for the Preferred Alternative (Table 6.11-3). Although these work bridges are relatively narrow (typically 30 feet), the combined shading effects of the existing bridge structure, the two work bridges, and the new highway bridge structures could result in shading an area as wide as approximately 350 feet.

The construction work bridge would remain in place for more than 64 months in Portage Bay.

Table 6.11-4. Temporary Support Piles and Affected Area of Substrate

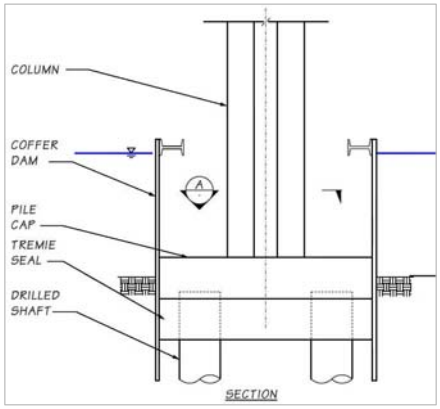
Alternative	Portage Bay	West Approach	East Approach	Total
Preferred Alternative	1,250 (6,250 sq/ft)	2,100 (10,500 sq/ft)	175 (875 sq/ft)	3525 (17,625 sq/ft)
Option A	741 (3,700 sq/ft)	1,987 (9,950 sq/ft)	175 (875 sq/ft)	2,903 (14,525 sq/ft)
Option K	698 (3,490 sq/ft)	2,797 (13,985 sq/ft)	175 (875 sq/ft)	3,670 (18,350 sq/ft)
Option L	704 (3,520 sq/ft)	1,984 (9,920 sq/ft)	175 (875 sq/ft)	2,863 (14,315 sq/ft)

Note: Area calculations were based on 30-inch-diameter piles.

The construction of these construction bridges would require installing hollow steel support piles in Portage Bay (Table 6.11-4). The Preferred Alternative would require about 850 hollow steel piles to support the work bridges in Portage Bay, or about 100 more piles and 500 more square feet than described for the SDEIS options. The piles would be installed in bents (rows) spaced at approximately 30-foot intervals, with 3 to 4 piles per bent. An additional 400 temporary piles would be needed to support falsework for constructing the architectural treatment on the replacement bridge for the Preferred Alternative and SDEIS options. The larger work bridge size is a result of a change in bridge alignment and access requirements for the work bridge in Portage Bay. If these alignment changes were applied to Options A, K, or L, the corresponding increase in work bridge size and pile count would also occur for those designs. All temporary support structures would be removed after completion of the new Portage Bay Bridge.

The affected habitat is not considered preferred or suitable habitat for salmonid species, and the dense vegetation also likely limits the habitat use by other fish species.

The proposed permanent bridge support structures would have drilled shaft foundations (see sidebar illustration). This would minimize potential effects on fish and other aquatic species by eliminating the need for impact pile-driving to construct foundations for the columns. Installation of column shaft cap configurations would require cofferdams, while individual columns could be installed inside a larger diameter sleeve.



Cross Section of Drilled Shaft Cap and Column Configuration

Since publication of the SDEIS, design refinements were made and construction assumptions modified in the Portage Bay Bridge area. For the Preferred Alternative and the SDEIS options, the Portage Bay Bridge would require construction of mudline footings for the three westerly in-water pier bents. The footings would be constructed inside of cofferdams each measuring about 130 feet by 40 feet. These three

cofferdams would occupy a total area of about 0.4 acre of substrate habitat. The SDEIS evaluated 14 smaller (about 37 feet by 37 feet) footings (two per bent), for the 7 western bridge bents, with each footing supporting 2 bridge columns. The new footing design and the three large cofferdams described in this Final EIS would occupy a similar combined area as the smaller cofferdams described in the SDEIS, but the larger cofferdams would substantially decrease the extent and duration of in-water work to install and subsequently remove them.

Montlake Area

Preferred Alternative

Construction activities in the Montlake area that could affect fish and aquatic habitat under the Preferred Alternative would be from building a new bascule bridge across the Montlake Cut. This new bascule bridge would be approximately 60 feet wide, similar to the existing bridge. Construction would be limited to overwater work, although some work (such as the placement of bascule spans) would be done from barges. Most of the activity to construct the bridge supports would occur in upland areas away from aquatic habitat areas, where the potential for effects is expected to be substantially reduced. There would be no construction work bridges and, as a result, no shading.

Implementation of appropriate BMPs would prevent sediment from exposed soil areas or wet concrete from entering Montlake Cut, and WSDOT would install containment systems to prevent debris from falling into the water. No equipment refueling would occur within 200 feet of the embankments. Other standard BMPs for construction activities adjacent to water bodies would also be implemented to further reduce the potential for effects on aquatic habitats and species.

Option A

Effects from Option A in the Montlake area would be similar to the Preferred Alternative.

Option K

Option K would require considerably more in-water and over-water construction in the Montlake area compared to the Preferred Alternative and Options A and L. The roadway through the Montlake area under Option K would be wider than the Preferred Alternative. This increased width is primarily to accommodate the depressed SPUI and the separate access ramps to and from the twin Montlake Cut tunnels. The SPUI would be constructed below the high-water elevation of the lake.

The lower approach elevation in the Washington Park Arboretum would require approximately 328 5-foot-diameter in-water drilled shaft piles, and approximately 2,160 micropiles in the boat section east of the SPUI to support the new roadway. These 10-inch-diameter micropiles would be

supported by the drilled shaft structures. It is assumed that the drilled shafts in the SPUI area would be installed within a large cofferdam encompassing the entire SPUI footprint.

The SPUI would also require extensive ground-disturbing excavation work along the Washington Park Arboretum shoreline and the construction of retaining walls extending out into the water, which would also increase the potential risks of water quality effects from runoff from the extensive area of exposed soils. However, construction BMPs would minimize such risks.

Because the soils beneath the Montlake Cut are soft and high in water content, SEM tunnel construction would require freezing the ground to stabilize the soil prior to tunneling. The work would start from two "freeze pits" at the north and south portals to the SEM tunnels. Pipes to convey a freezing liquid would be inserted all the way around the tunnel circumference at about 5-foot intervals. It would take approximately 6 months for the soil to become sufficiently frozen for work to begin. After the initial freezing has been completed and the frozen barrier is in place, the refrigeration capacity required to maintain the frozen barrier would be substantially reduced. However, the ground freezing activities are unlikely to affect the water temperature in the Montlake Cut because those activities would be sufficiently below the bottom of the cut.

Option L

Under Option L, the Montlake interchange and the Lake Washington Boulevard ramps would be replaced with a new elevated SPUI at the Montlake shoreline. A new bascule bridge would span the east end of the Montlake Cut from the new interchange to the intersection of Montlake Boulevard NE and NE Pacific Street. Similar to the Preferred Alternative, the construction of the bascule bridge would likely result in limited effects on fish and aquatic habitat because the construction activities would require limited in-water work, except for maneuvering and anchoring barges in the Montlake Cut to install the pre-fabricated bridge spans. There would be no construction work bridges and as a result no shading from construction.

West Approach Area

The Preferred Alternative and the SDEIS options would replace the west approach to the Evergreen Point Bridge with a new 6-lane bridge. In-water construction would occur from construction bridges where water depths would allow construction staging from barges. Potential effects associated with project construction in this geographic area would be similar to those described above for Portage Bay. Construction work bridges would remain in place for up to 59 months for the Preferred Alternative, Options A and L, and 70 months for Option K. Construction from barges in the west approach area would occur in a juvenile salmonid migration corridor and could temporarily affect their behavior.

Pile-driving in the waters south of Marsh Island would likely affect only fish in this relatively confined area. The dense aquatic vegetation in this area likely limits the use of this habitat by fish, particularly salmonids. Pile-driving in waters east of Foster Island would affect fish behavior up to 72 feet in most areas but up to 446 feet near the west high rise.

Preferred Alternative

The Preferred Alternative would include approximately 7.4 acres of overwater work bridges in the west approach area. The Preferred Alternative work bridges would require pile-driving an estimated 2,100 in-water support piles occupying about 10,500 square feet of open-water substrate area for 30-inch-diameter piles (see Table 6.11-4). This is similar to the 1,987 piles estimated for Option A.

Option A

Option A would include approximately 7.6 acres of overwater work bridges in the west approach area. The bridges would require the use of 1,987 temporary support piles, which would occupy about 6,241 square feet of lake bed (Table 6.11-4). Construction effects from Option A would be similar to the Preferred Alternative and Option L, but less than Option K.

Option K

In addition to the construction work bridges, Option K would include a 60-foot-wide temporary detour bridge between Foster Island and the eastern shoreline of the Arboretum to bypass traffic around SPUI construction. This temporary detour bridge would be supported by hollow steel piles, similar to the construction of the construction bridges. This over-water structure would be in place for approximately 48 months. The temporary detour and work bridges would require approximately more temporary piles than the other options (Table 6.11-4), occupying approximately 8,786 square feet of lakebed.

Option K would include substantially greater in-water and over-water work compared to the Preferred Alternative and Option A or L. The primary differences in potential effects on fish and aquatic habitat in Option K include the number of pilings needed for in-water and nearshore work bridge and falsework, the number of permanent in-water piers constructed, and the amount of riparian and nearshore areas disturbed.

The construction of Option K would result in 8.5 acres of shading in the west approach area, which is more shading than the other options (see Exhibit 6.11-2).

Option L

The amount of shade and fill from constructing the construction bridges would be slightly less under Option L than the Preferred Alternative and the other two SDEIS options (see Table 6.11-3).

Construction of Option L would require an estimated 1,984 temporary piles to support the work bridges through the west approach area, which is approximately the same as the Preferred Alternative and Option A, but less than Option K. The amount of area occupied by these temporary piles is also very similar to Option A (see Table 6.11-4).

Lake Washington Area

The floating portion of the Evergreen Point Bridge would be the same for the Preferred Alternative and the SDEIS options. It would be built over deep open-water habitat where bridge columns are not feasible, between 160 and 190 feet north of the existing bridge.

Construction of the new floating bridge would occur north of the existing bridge to maintain traffic flow. Construction on the lake would take place from barges and boats. Pontoon installation would begin by connecting the longitudinal pontoons in pairs (see Chapter 3), and then continue by connecting the supplemental stability pontoons to the north and south sides of the longitudinal pontoons. The superstructure for the 6-lane configuration would then be constructed on the longitudinal pontoons, and the structure would be permanently anchored into place. Once traffic had been shifted to the new floating bridge, the existing floating bridge would be demolished. However, there would be a period (12 to 16 months) when two bridge structures would be floating in Lake Washington. The increased structures, as well as the barges and equipment used during construction, would have more intensive effects on fish in the area than the completed bridge would have during operation (for more detailed information about the construction staging and demolition schedule for the floating bridge, see the Construction Techniques and Activities Discipline Report Addendum and Errata in Attachment 7).

Since publication of the SDEIS, the floating bridge design has been further refined, and four more fluke anchors were added to secure the bridge. Approximately 58 anchors would be used to secure the new bridge in place. The two main anchor types are: (1) gravity anchors for harder lakebed materials and sloped areas (near the shores), and (2) fluke anchors for soft bottom sediments and flat areas (middle of the lake). Both types of anchors would be connected to the floating pontoons with steel cables

The installation of new bridge anchors could disrupt lake bed sediments and the organisms living in them. These sediments and organisms would be displaced and the organisms might die or disperse to adjacent areas. However, these effects would be localized and short-term. Water quality in the immediate vicinity of the in-water construction activities could become turbid, although such turbidity would probably not reduce lake productivity or directly harm fish and invertebrates.

The installation of the fluke anchors would likely result in greater turbidity levels than the gravity anchors. However, the expected low currents in the deep portions of the lake would limit the distribution of the turbidity plume and minimize potential effects on fish and other aquatic resources. The additional fluke anchors would result in additional disturbance of the substrate and the organisms living in them during anchor deployment compared to the design described in the SDEIS.

Temporary anchors would be used to hold the pontoons in place before they are finally positioned along the new bridge alignment. These anchors would temporarily disturb the lakebed sediments, and the placement could result in the loss of aquatic organisms living on or in the sediments. However, the temporary anchors would be smaller than the permanent anchors and would be in place only for a short amount of time, so any sediment loss or disturbance would be minimal. No effects to fish are expected from the anchors.

East Approach Area

Construction of the east approach would take place from work bridges and barges. The westbound (north) side of the structure would be constructed first. Cofferdams would be installed, and bridge substructure and superstructure would be built as previously described for the over-water structures.

The construction process would require work bridges and falsework. Approximately 0.4 acre, of open-water habitat would be shaded during construction and operation of work bridges for the Preferred Alternative and the SDEIS options (see Table 6.11-3). Since publication of the SDEIS, additional geotechnical studies in the area found unsuitable lake bed substrate and considerable upwelling along the shoreline, which resulted in a design change for the east approach bridge footings (see Geology and Soils Discipline Report Addendum and Errata [Attachment 7]). Therefore, for the Preferred Alternative, a 9,500-square-foot cofferdam would be installed to construct the two mudline footings to support the substructure and superstructure of the east approach, with one footing for each of the separated structures for the eastbound and westbound traffic. This design change would also apply to the SDEIS options if they were constructed. All other construction activities are similar to those described in the SDEIS. These construction activities could result in the loss of potential sockeye salmon spawning habitat during the construction period. In-water construction activities would occur during project specific approved in-water construction windows, which would minimize the effects on sockeye spawning.

Bridge Maintenance Facility

The Lake Washington area would also include construction of a bridge maintenance facility under the proposed east approach. This facility would

consist of an upland facility constructed in the hillside under the east approach, and a modified T-shaped dock with a 10-foot-wide main stem extending about 100 feet from the shoreline. The dock would be supported on drilled shaft columns, constructed from the same work bridges used to construct the east approach bridge structure.

The new bridge maintenance facility would be built at the same time as the east approach. Permanent and temporary access roads, retaining walls, and the dock substructure would be constructed while the westbound (north) half of the east approach is being built. Construction activities would include excavation and embankment work, retaining wall construction, dewatering, and roadway paving. Appropriate sediment control BMPs would be implemented to prevent the discharge of sediment from the disturbed construction areas into Lake Washington. There would be no effects to fish from construction of this upland facility.

Pontoon Construction and Transport

Pontoon construction activities would occur at existing facilities, operated under specific environmental permits, to minimize potential risks to aquatic species. However, draining of the casting basin facilities, could affect fish or other aquatic species.

The transport of the pontoons to Lake Washington is not expected to measurably affect these aquatic species. Key habitats for many of these species are generally below the water surface or close to shore and well away from the areas directly affected by the transport process. While some individuals or species may use the surface waters in the shipping lanes, the transport of pontoons would not represent a substantial increase over the number of ships (potentially several thousand per year) that travel through the Strait of Juan de Fuca, the outer coast, Puget Sound, or the Lake Washington Ship Canal. Therefore, the risk of collisions or injury to any of these species would be negligible.

Commencement Bay, designed as Salmon Management Area 11A, is within the federally adjudicated "usual and accustomed" fishing grounds of the Puyallup Tribe of Indians. WSDOT has been in contact with the Puyallup Tribe and will continue to coordinate with them as the project construction schedule develops. WSDOT does not expect that operating the Concrete Technology Corporation (CTC) facility would affect usual and accustomed tribal fishing, and will consult with the Puyallup Tribe to ensure that pontoon launching and towing are coordinated to avoid adversely affecting tribal fishing activities.

How would project construction affect federally and state listed fish species?

SR 520 Corridor

The above sections described the potential construction effects on fish resources, including habitat of ESA-listed fish species. These effects include direct behavioral disturbances from construction activities, as well as indirect effects from construction-related habitat alterations. Based on these potential effects, the project has the potential to negatively affect individual fish in the Lake Washington watershed—including the ESA-listed Chinook salmon, steelhead, and bull trout—by altering a portion of their rearing and migration habitat during construction (see Table 6.11-5). These changes could result in reduced survival, growth, of some ESA-listed fish. However, the project is not expected to adversely affect overall salmonid populations or evolutionarily significant units (ESUs) in the watershed. This conclusion is supported by the USFWS Biological Opinion concerning bull trout and NMFS has issued similar conclusions for other listed fish species (Attachment 18). There would be no substantial differences between the Preferred Alternative and the SDEIS options regarding the effects of construction on ESA-listed fish species.

There are no state-listed fish species in the SR 520 Corridor.

Pontoon Construction and Transport

Pontoon construction and transport activities may affect Endangered Species Act- (ESA) listed fish species, including Chinook salmon, boccacio, yelloweye rockfish, canary rockfish, green sturgeon, and eulachon (Table 6.11-5). Construction activities would occur at existing facilities permitted for such uses, and established shipping lanes would be used to transport the pontoons to Lake Washington. However, casting basin operations such as draining and gate operations at either of the potential supplemental stability pontoon construction sites are expected to require fish handling and may result in fish mortality for various life stages of listed-fish species (Table 6.11-5).

How would construction of the project affect wildlife and habitat?

The Preferred Alternative and the SDEIS options could affect wildlife by removing vegetation and wildlife habitat, increasing shading, and adding noise disturbance during construction. Lighting associated with nighttime highway construction could also disturb wildlife.

For the Preferred Alternative and the SDEIS options, most vegetation clearing for construction would occur in the west approach area, and Urban Matrix would be the most commonly affected habitat type (Table 6.11-6).

KEY POINT

Wildlife Habitat

The preferred alternative and all SDEIS options would affect wildlife by removing vegetation and wildlife habitat, and increasing shading. Although, habitat quality is generally low for the Urban Matrix cover type, urban-adapted species such as black-capped chickadees, American robins, and eastern gray squirrels would be affected. Option K would result in the greatest loss of wildlife habitat during construction.

Option A would result in the least clearing of vegetation for construction. The Preferred Alternative would result in more clearing than Options A and

Table 6.11-5. Potential Construction Effects of the Project on Federally ESA-Listed Fish Species in the Study Area

Species	Federal Status	Suitable Habitat Existence	ESA Effects Determination[a]	Rationale for ESA Effects Determination
Bull trout (*Salvelinus confluentus*)	Threatened	Suitable habitat for foraging and migrating bull trout in Lake Washington Puget Sound, and Grays harbor	LAA[b,c]	Individual bull trout might be injured or harmed from pile-driving, habitat and water quality changes or fish-handling (if trapped in basin)
Chinook Salmon (*Oncorhynchus tshawytscha)*	Threatened	Suitable habitat for foraging, rearing and migrating Chinook in Lake Washington and Puget Sound	LAA	Individual Chinook might be injured or harmed from pile-driving, or habitat and water quality changes
Steelhead (*Oncorhynchus mykiss)*	Threatened	Suitable habitat for foraging, rearing and migrating steelhead in Lake Washington and Puget Sound	LAA	Individual steelhead might be injured or harmed from pile-driving, or habitat and water quality changes
Boccacio (*Sebastes paucispinis*)	Endangered	Suitable foraging and rearing habitat in Puget Sound	NLAA[b]	Larval and early juvenile life stages may be injured or harmed during facility gate operations
Yelloweye rockfish *(Sebastes ruberrimus)*	Threatened	Suitable foraging and rearing habitat in Puget Sound	NLAA	Larval and early juvenile life stages may be injured or harmed during facility gate operations
Canary rockfish (*Sebastes pinniger)*	Threatened	Suitable foraging and rearing habitat in Puget Sound	NLAA	Larval and early juvenile life stages may be injured or harmed during facility gate operations
Green sturgeon (*Acipenser medirostris*)	Threatened	Uses Grays Harbor for rearing, feeding and holding. Suitable foraging, rearing and migrating habitat along, coastline and in Puget Sound	NLAA[c]	Individuals might be injured or harmed from fish-handling (if trapped in basin).
Eulachon (*Thaleichthys pacificus)*	Threatened	Suitable foraging, rearing and migrating habitat in Grays Harbor, coastline and Puget Sound	NLAA[c]	Individuals might be injured or harmed from fish-handling (if trapped in basin).

[a] This determination is supported and documented in the November 2010 Biological Assessment for the SR 520 I-5 to Medina Bridge Replacement and HOV Project.
[b] May Affect, Likely to Adversely Affect (LAA) and May Affect, Not Likely to Adversely Affect (NLAA)
[c] This determination is provisional and only applies if the Grays Harbor facility is used to construct supplemental stability pontoons.

L but less than Option K. Construction work bridges would also result in shading and Option K would have the most shading, primarily because of the construction detour bridge (Table 6.11-7). The Preferred Alternative would have more shading than Options A and L. The increase in shading is primarily a result of shifting the roadway south in Union Bay (west of Foster Island) to accommodate future light rail. This shift moves the roadway from over open water (which is not considered a habitat loss for wildlife) to over open wetlands.

Table 6.11-6. Vegetation Removal for Construction by Geographic Area (acres)

	I-5 Area	Portage Bay Area	Montlake Area	West Approach Area	Floating Bridge Area	Total Effect
Preferred Alternative	3.0	0.6	2.4	6.7	1.6	14.4
Option A	2.9	0.8	0.9	6.4	1.4	12.4
Option K	2.9	1.3	4.7	4.5	1.4	14.9
Option L	2.9	1.3	3.2	5.1	1.4	14.0

Table 6.11-7. Shading from Construction by Cover and Habitat Type (acres)

Area, Cover Type, and Habitat Type	Preferred Alternative	Option A	Option K	Option L
Parks and Other Protected Areas	2.2	0.8	2.4	1.2
Open Water	4.7	5.2	5.6	4.7
Urban Matrix	0.9	0.4	0.6	0.5
Total	7.8	6.4	8.7	6.6

Similar levels and durations of noise from construction activities under the Preferred Alternative and the SDEIS options could temporarily affect bird species, including nesting and foraging waterfowl and bald eagles near the Arboretum.

Noise disturbance from construction activities could occur over approximately 72 months for the Preferred Alternative. Noise and associated construction activity can disturb wildlife by causing stress and altering behavior patterns and, therefore, interfering with activities such as reproduction and feeding. The degree of disturbance would depend on noise level, timing, and duration of construction and outfitting activities, as well as the sensitivity of the individual animals. In general, most wildlife species found in areas adjacent to the project site are adapted to urban

conditions and highway noise. However, loud construction activities could displace some animals or discourage them from using adjacent habitats.

Any pontoons stored in water for a period of time would provide a hard structure in an aquatic environment that could serve as habitat for invertebrates and fish. WSDOT would monitor the pontoons for aquatic species growth, particularly invasive species. If necessary, WSDOT would clean the pontoons prior to towing to prevent the transport of invasive species. No substantial aquatic species growth would likely occur during towing, and any incidental marine fouling organisms would die and decompose once the pontoons are towed into the freshwater lake environment.

Seattle Project Area

For the Preferred Alternative and the SDEIS options, the average noise levels near wildlife habitat along SR 520 (within 100 feet) would rise during general construction. Noise levels would decrease with distance from the construction area. In most cases, noise levels at distances of 750 to 1,000 feet from areas of active construction would be similar to existing noise levels.

Pile-driving in the Portage Bay and the Washington Park Arboretum areas is anticipated to raise noise levels. See Section 6.7 and the Noise Discipline Report Addendum and Errata (Attachment 7), for more details on construction noise. Noise from construction could cause wildlife to avoid this area during construction. Option K may have more noise associated with general construction than the Preferred Alternative and Options A or L because of the construction of the detour bridge over Union Bay to divert mainline traffic. In addition, pile-driving could increase noise in an area that waterfowl and bald eagles use for foraging during the day. This could displace bald eagles and waterfowl during foraging.

Lake Washington and Eastside Transition Area

Noise in the Lake Washington and Eastside Transition area would consist of general construction noise and could temporarily disturb bird species as described above for the Seattle area.

The bridge maintenance facility would be constructed from the eastern shoreline and a small area of shoreline habitat would be cleared during construction. Noise from construction could cause wildlife to avoid this area during construction.

How would project construction affect federally and state listed wildlife species?

SR 520 Corridor

Construction of the Preferred Alternative and the SDEIS options would have no effects on wildlife species protected under ESA or state lists, because none occur in along the SR 520 corridor. Bald eagles, which are protected by the Bald and Golden Eagle Protection Act, may be affected by construction activities as discussed above.

Pontoon Construction and Transport

Pontoon construction at the CTC site in the Port of Tacoma would not affect ESA-listed wildlife species because none occur on or close to the existing construction facilities. However, suitable nesting and foraging habitat for marbled murrelet occurs in the vicinity of the potential supplemental stability pontoon construction site in Grays Harbor. There is a small possibility that individuals could be exposed to noise and other effects during construction of pontoons at this site.

In addition, three marine mammals could be exposed to effects from construction of pontoons in Grays Harbor. Southern resident killer whale, stellar sea lion, and humpback whale feed or visit offshore coastal waters and could venture into Grays Harbor (Table 6.11-8). The conclusions of the NOAA NMFS Biological Opinion regarding these three species are included in Attachment 18.

Several federally protected wildlife species may occur in marine waters along the pontoon transport route (Table 4.11-2). Key habitats for many of these species are generally close to shore and well away from the shipping lanes where pontoon transport would occur. Some individuals may use areas farther offshore, primarily for foraging. However, pontoon towing activities are not expected to affect most ESA-listed species that could occur along or within the towing routes (shipping lanes). Only southern resident killer whale may be affected by pontoon transport.

Pontoons would be towed from Grays Harbor to Lake Washington in established towing lanes within 7 to 10 miles offshore at a slow speed, resulting in as many as 33 tow/barge transits. ESA-listed marine mammal

species would occur in low densities in this area and would therefore be unlikely to encounter a tug/barge associated with the proposed project.

The transport of pontoons would not represent a substantial increase over the number of ships (potentially several thousand per year) that travel through the Strait of Juan de Fuca and the outer coast. Increased ship traffic associated with pontoon transport would not be expected to result in a noticeable increase in the amount of noise and disturbance to these

Table 6.11-8. Potential Effects of the Project on Federally ESA-Listed Wildlife Species in the Study Area

Species	Federal Status	Suitable Habitat Existence	ESA Effects Determination[a]	Rationale for ESA Effects Determination
Southern resident killer whale (*Orcinus orca*)	Endangered	Occasionally seen in waters offshore of Grays Harbor; Suitable foraging and rearing habitat primarily in Puget Sound	NLAA	Discountable possibility that individuals could be exposed to effects from pontoon construction; Limited incidence of interaction with pontoon towing activities
Marbled murrelet (*Brachyramphus marmoratus)*	Threatened	Suitable foraging and nesting habitat in Grays Harbor	NLAA[c]	Discountable possibility that individual murrelets could be exposed to effects from pontoon construction
Steller Sea Lion (*Eumetopias jubatus*)	Threatened	Individuals may venture into Grays Harbor; Suitable foraging and migration habitat along outer coast and in Puget Sound	NLAA[c]	Discountable possibility that individuals could be exposed to effects from pontoon construction; Insignificant occurrence in pontoon towing area
Humpback Whale (*Megaptera novaeangliae)*	Endangered	Individuals may venture into and feed in Grays Harbor; Suitable foraging and migration habitat along outer coast	NLAA[c]	Discountable possibility that individuals could be exposed to effects from pontoon construction; Insignificant occurrence in pontoon towing area

[a] This determination is supported and documented in the November 2010 Biological Assessment for the SR 520 I-5 to Medina Bridge Replacement and HOV Project.
[b] May Affect, Not Likely to Adversely Affect (NLAA)
[c] This determination is provisional and only applies if the Grays Harbor facility is used to construct supplemental stability pontoons.

species. The risk of collisions with any of these species would be negligible. All the ESA-listed birds and marine mammals can fly or swim quickly away from any oncoming vessels except leatherback sea turtles, which are slow swimmers. Given the rarity of this species in Washington waters, the likelihood of a leatherback sea turtle encounter is low.

In the unlikely event of an interaction, any disturbance would be short-term and localized, with no lasting effects. Vessel strikes of marine mammals are extremely unlikely because the barge-sized vessels are slow moving, follow a predictable course, and should be easily detected and avoided by marine mammals. Potential effects from vessel strikes are therefore discountable.

Pontoon transport is not likely to adversely affect southern resident killer whales or its critical habitat. The vessel traffic associated with pontoon transport is minor in comparison to overall shipping traffic in the whales' habitat area and would not result in measureable decreases in availability of prey.

No state-listed wildlife or marine mammals are expected to occur in the pontoon construction and transport areas.

How can the project minimize negative effects during construction?

Standard over-water and in-water construction and demolition BMPs would be implemented in accordance with environmental regulatory permit requirements and WSDOT specifications. Specific in-water construction time periods would also be established through the project permitting process to minimize potential effects of pile-driving and other in-water construction activities on salmonid species.

During column and bridge construction, BMPs would be used to avoid unintentional effects on habitat and water quality. Cofferdams, shaft castings, or other appropriate measures would be used to isolate work areas from open-water areas, particularly for concrete pouring activities, and work bridges would be used to minimize the use of barges in shallow water areas. Bibs would be used to contain falling debris during construction of the new bridge decking and demolition of the existing decking. A temporary erosion and sediment control plan, a spill prevention, control, and countermeasures plan, and a stormwater pollution prevention plan would be developed and implemented.

Appropriate BMPs and noise attenuation methods will be developed in coordination with the regulatory agencies, the Muckleshoot Indian Tribe, and environmental permitting processes, and implemented to minimize potential effects of pile-driving activities.

Other BMPs could include:

- Avoiding or minimizing any spillage of concrete or other construction material into the water
- Avoiding or minimizing direct lighting effects from entering Lake Washington from construction activities by adjusting the angle of the lights and/or using bulbs in a non-white light spectrum
- Operating construction equipment from work bridges and barges where possible to minimize ground disturbance when working in or near sensitive areas
- Restoring cleared areas to preconstruction grades and replanting the areas with appropriate native herbaceous and woody species after construction

What mitigation is proposed for effects that are not avoidable?

Areas affected by construction of the SR 520, I-5 to Medina project would require mitigation. Through the NRTWG, WSDOT engaged regulatory

agencies and the Muckleshoot Indian Tribe in developing appropriate mitigation for project construction effects. Wetland mitigation ratios were derived using standard ratios in the joint guidance (Ecology, USACE, and EPA 2006a), plus modifiers agreed to by the agencies with jurisdiction over wetlands and the Muckleshoot Indian Tribe. Mitigation specific to construction effects on wetlands (Table 6.11-9) would be mitigated at one or more mitigation sites listed in Section 5.11. The Conceptual Wetland Mitigation Plan (Attachment 9 to this Final EIS) presents wetland mitigation in more detail.

Table 6.11-9. Wetland Construction Effects and Required Mitigation (acres)

Wetland Effect	Affected Area[a]	Mitigation Area[b]
Long Term Temporary Fill	0.2	0.6
Long Term Temporary Clearing	2.8	7.7
Long Term Temporary Shading	5.3	7.8
Total	**8.3**	**16.1**

Note: Totals may not add up due to rounding.
[a] Wetland effects areas are based on the Draft Conceptual Wetland Mitigation Plan, February 2011.
[b] Mitigation areas are based on applying a modified standard ratio for rehabilitation (Ecology et al. 2006a). Mitigation using creation would be at approximately ½ of the area shown in this table, and mitigation using enhancement ratios would require twice the areas shown. Modified mitigation ratios were developed in consultation with and with the approval of the NRTWG at the NRTWG meeting 9/30/10.

The Conceptual Aquatic Mitigation Plan (Attachment 9 to this Final EIS) describes mitigation for aquatic resources effects. Temporary project effects that would likely require compensatory mitigation include partial shading and fill from the construction work bridges and falsework, which could increase predator use. These temporary effects would have the largest effect on juvenile Chinook as they migrate toward the Ship Canal in the shallow nearshore, where these work bridges are proposed to occur. Mitigation for these effects would occur at one or more of the mitigation sites identified in Section 5.11.

Additional mitigation measures include restoration of the areas affected by construction activities areas as follows:

- Replanting temporarily affected wetlands and riparian habitat with native vegetation after construction
- Planting native shade-tolerant vegetation in areas under the completed elevated roadway and ramps, where feasible and practical
- Mitigating wildlife habitat areas in accordance with the City of Seattle regulations and Washington Park Arboretum policies.

6.12 Geology and Soils

Construction of the Preferred Alternative and Options A, K, and L would encounter a number of potential geologic hazards along the corridor, which would be considered during design. These hazards include areas susceptible to erosion, steep-slope and landslide hazard areas, loose soil conditions, and seismic risk. Corridor topography would also be affected by the project to varying degrees, depending on the option. This chapter discusses potential construction effects of the Preferred Alternative and the SDEIS options on geologic and soil conditions along the SR 520 corridor.

KEY POINT

Geology and Soils

The Preferred Alternative and Options A, K, and L would require excavation and grading for cuts and fills, and/or installation of bridge and retaining wall structures. Option K would require substantially more cubic yards of excavation and fill material than the Preferred Alternative and Options A and L, and the sequential excavation method used for tunneling would require ground freezing, which involves some risk of freeze pipe leakage or rupture into the surrounding soil.

What are the effects on geology and soils during construction?

Earthwork Quantities

Construction of the SR 520 roadway would involve topographic grade changes that require cuts and fills, and/or installation of bridge and retaining wall structures. With the exception of the depressed single-point urban interchange (SPUI) in Option K, the topographic changes to the corridor would be relatively small since the widened roadway would follow the same corridor as the existing roadway. In addition, the overall project footprint would be minimized by using walls to retain most fills and cuts.

Option K would involve substantially greater amounts of excavation than the Preferred Alternative and Options A and L for construction of a depressed SPUI and tunnel under the Montlake Cut. The footprint of SR 520 would be minimized to the extent possible for the Preferred Alternative and each option by using retaining walls to contain and support areas where earthwork occurs. Earthwork quantities (cut and fill volumes) provide a relative measure of the amount of topographic change. Table 6.12-1 identifies the total estimated excavation volumes and new material for construction elements along the corridor for each option. The total estimated excavation would be substantially greater with Option K, but the number of walls and area of new bridges would be similar to the other options.

Most of the native materials that would be excavated along the project alignment would contain too much silt and clay to be reusable. It is assumed that most material used for construction would be imported aggregate.

Erosion and Sedimentation

Under the Preferred Alternative and all options, construction would include the risk of erosion from exposed soils, landslides during slope excavation, and ground settlement in liquefaction zones. Clearing protective vegetation, fill placement, grading, and spoils removal or stockpiling during

construction would allow rainfall and runoff to erode soil particles. Temporary erosion and sedimentation control (TESC) measures would be employed to prevent erosion from affecting nearby water bodies. Contaminated soils encountered would require special handling, transport, and disposal at offsite locations, as appropriate.

Table 6.12-1. Estimated Excavation and Fill Quantities (cubic yards)

Project Effect	Project Totals[a]			
	Preferred Alternative	Option A	Option K	Option L
Total estimated excavation volume	177,700	340,000	1,300,000	450,000
Total imported fill (total volume of embankment)	205,000	86,000	320,000	52,000

[a] Total excavation is the sum of estimated roadway excavation quantities and structure excavation quantities. Quantities for suboptions would not vary measurably from these totals.
Sources: HDR Inc. et al. (2009a); Construction Techniques and Activities Discipline Report Addendum and Errata (Attachment 7); Geology and Soils Discipline Report Addendum and Errata (Attachment 7).

Construction Dewatering

Many excavations for bridge and retaining wall footings would require dewatering. Dewatering of excavations located below the groundwater table can produce quantities of sediment-laden water. Water in contact with concrete curing adds to the risk of water quality contamination. Dewatering could potentially result in the settlement of nearby structures if proper considerations are not given to the effects of potential changes in the water table, which is near the surface in many areas including the Arboretum. Roadway design and construction methods would take the water table into account to avoid the potential for such effects. Any contaminated groundwater would be treated prior to disposal. Construction dewatering could cause ground settlement, which could affect nearby structures or utilities in the zone of influence. Dewatering systems can be designed to limit the potential for damage from ground settlement. During extensive dewatering operations, WSDOT would monitor ground movement so that dewatering could be stopped or revised prior to causing damage to adjacent facilities.

The large excavations required for the Montlake interchange for Option L, and tunnel sections for Option K would require disposal of large volumes of groundwater and also increase the risk of contamination or settlement of adjacent soils. Deep pile walls would be required, and alignment problems or unanticipated obstructions could cause leaks that would be much more difficult to mitigate than at shallower depths.

Construction dewatering would be required for excavation of the bridge maintenance facility building foundations, as well as for two adjacent walls

and the nearby spread footing foundation for one of the east approach piers. Some metals contamination was found in unfiltered groundwater samples from the area, so testing and possibly treatment could be required prior to groundwater discharge. Filtered samples of the groundwater had either very low or nondetectable metals levels, so treatment would most likely be limited to sediment removal, which is a standard discharge requirement even without contamination. Special disposal would be required for contaminated sediments.

Geologic Hazards

In general, areas mapped as seismic hazards associated with liquefaction also coincide with areas of settlement hazard. The eastern end of the Portage Bay Bridge and the west end of the west approach structure cross potentially liquefiable areas, which would require soil stabilization or ground improvement. Soft soils extend to depths of up to 100 feet in Portage Bay, and groundwater is encountered at or within a few feet of the ground surface within and adjacent to Portage Bay, Union Bay, and Lake Washington. These conditions would require deep foundations and construction of work trestles for construction access. Areas underlain by loose, compressible sediments, particularly peat and lake deposits in Lake Washington and Union Bay could also be subject to ground settlement. These soft soils would require the use of special construction procedures; for example, pile supports would be used in many places during construction. Bridge structures would be designed to current seismic standards.

Under Option K, sequential excavation methods for the tunnel require that the ground be reasonably stable for tunneling. Dewatering of the extensive water-bearing sand layers and lenses anticipated would not be possible. Ground freezing appears to be the most reasonable ground stabilization alternative. Ground freezing on a curved alignment approximately 760 feet long would be difficult and would involve horizontal directional drilling methods to drill the holes for individual freeze pipes, installing the freeze pipes, waiting for ground freezing to occur, excavating the tunnel bore, and installing tunnel lining. These activities are estimated to take up to 30 months. In addition to the conventional disturbance of construction and fuel usage by heavy equipment, operation of the freezing system would be very energy-intensive and involve some risk of freeze pipe leakage or rupture into the surrounding soil.

Construction of the bridge maintenance facility on the Eastside would cut through landslide-prone soils into an existing slope. Evidence of slope creep and minor surficial slope movement was observed on the steep slope between Lake Washington and the existing east bridge abutment; however, deep-seated slope instability was not observed.

Supplemental geotechnical explorations reported in 2010 indicated that there are elevated groundwater heads at the bottom of proposed excavations near the proposed east approach and bridge maintenance facility. Temporary dewatering would be required during construction. Groundwater testing in the maintenance building/east approach area has detected some metals levels in three wells that exceed the Model Toxics Control Act (MTCA) Method A cleanup levels. For a discussion of the testing, treatment, and disposal of potentially contaminated water encountered in this area during construction, see Section 6.13, Hazardous Materials.

How would the project minimize negative effects during construction?

A TESC plan will be required to adequately and systematically identify and minimize project risk. The purpose of the TESC plan is to clearly establish when and where specific best management practices (BMPs) will be implemented to prevent erosion and the transport of sediment from a site during construction. The TESC plan sheets will show the BMP locations and other features such as topography and sensitive area locations for multiple project stages. Potential BMPs are as follows:

Temporary Erosion and Sediment Control Plan

A TESC plan includes all physical and procedural BMPs for preventing erosion and turbid discharges throughout a project and during construction.

- Maintaining vegetative growth and providing adequate surface water runoff systems
- Using quarry spalls and, possibly, truck washes at construction vehicle exits from the construction site
- Regularly sweeping and washing adjacent roadways
- Constructing silt fences downslope of all exposed soil
- Using quarry spall lined temporary ditches, with periodic straw bales or other sediment catchment dams
- Providing temporary covers over soil stockpiles and exposed soil
- Using temporary erosion-control blankets and mulching to minimize erosion prior to vegetation establishment
- Constructing temporary sedimentation ponds for removal of settlable solids prior to discharge
- Limiting the area exposed to runoff at any given time
- Frequently watering exposed surface soils to minimize visible dust

Where construction dewatering could result in settlement that might damage adjacent facilities, mitigation could include the following:

- Reinjecting the pumped groundwater between the dewatering wells and the affected facility
- Using construction methods that do not require dewatering

6.13 Hazardous Materials

Hazardous materials vary in the degree of their potential to affect a roadway project during construction. Some of the variables include the types of hazardous materials present at a given site, the distance of the site from the roadway footprint, and whether contamination is contained or has the potential to spread into the surrounding environment.

How would construction of the project affect hazardous materials?

Construction effects of the Preferred Alternative and Options A, K, and L could include encountering contaminated soil, sediment, and groundwater; generating hazardous building materials through demolition; encountering underground storage tanks (USTs) or leaking underground storage tanks (LUSTs); creating accidental spills; and addressing worker safety and public health issues.

KEY POINT

Hazardous Materials

The Preferred Alternative and Options A, K, and L could encounter contaminated soil, sediment, and groundwater; create accidental spills and release hazardous materials; demolish structures that contain hazardous materials; and encounter underground storage tanks.

A primary goal in preventing effects from hazardous materials would be to prevent contaminated material or groundwater from being released or spreading into the surrounding environment. Demolition of older buildings, such as the Museum of History and Industry (MOHAI), could disturb hazardous materials like asbestos, lead-based paint, and polychlorinated biphenyls (PCBs), all of which were commonly used prior to the 1970s. Maintaining public and worker safety would be a top priority.

Table 6.13-1 shows which hazardous material sites could affect, or be affected by, project construction. All potentially contaminated sites would be managed using standard hazardous materials mitigation measures, which address procedures, investigations, and mitigation for construction activities such as demolition, decommissioning USTs, handling and disposing of contaminated soils and water, spill prevention, and worker safety and public health. These are included in the Hazardous Materials Discipline Report Addendum and Errata (Attachment 7). Three potentially contaminated areas, including the Montlake Landfill, the Miller Street Landfill, and the sediments in Lake Washington, Union Bay, and Portage Bay, are discussed below in more detail because they could pose unique concerns.

Contaminated Soil and Groundwater

As compared to Option A, the Preferred Alternative would not remove the Montlake 76 gas service station or any buildings on the NOAA Northwest Fisheries Science Center property (two contaminated or potentially contaminated sites affected by Option A). Since there is no known release reported at the Montlake 76 station parcel and no building demolition and decommissioning of the USTs would occur, the risk for encountering hazardous material at or near this site is greatly reduced.

Table 6.13-1. Hazardous Material Sites Potentially Affected by Construction

Site Name[a]	Potential to Affect Project
Shell Oil Products	Contaminated groundwater could affect Option L.
Village Autocare	Contaminated groundwater could affect Option L.
Montlake Landfill	Construction of Option K would occur within 1,000 feet of the landfill boundary requiring methane gas mitigation. Adding the suboptions to Option L would result in construction on Montlake Boulevard north of the Montlake Cut. This construction would occur within 1,000 feet of the landfill boundary requiring methane gas mitigation.
NOAA Northwest Fisheries Science Center	Contaminated soil and groundwater could affect Option A.
Montlake 76 Station	Contaminated soil and groundwater could affect Options A, K and L.
Seattle Fire Station 22	Contamination, if present, could affect all options.
Exxon Mobil	Contaminated groundwater could affect construction of Option A.
Circle K Station #1461	Contaminated groundwater could affect construction of Option A.
Miller Street Landfill	Construction of the Preferred Alternative and Options A, K, and L would occur within the former Miller Street Landfill.
Lake Washington, Union Bay, and Portage Bay	Contaminated sediments in these water bodies could affect the Preferred Alternative and Options A, K, and L.
Bridge maintenance building/east highrise area	Contaminated groundwater could affect construction of the Preferred Alternative and Options A, K, and L.

[a]Site locations are shown on Exhibit 4.13-1.

Note: Adding the potential suboptions to Option A, K, or L would result in no measurable difference in the effects described above, except as described for the Montlake Landfill.

Similarly, because no buildings would be removed at the NOAA Northwest Fisheries Science Center property, hazardous building materials would not be generated as a result of demolition. The petroleum-contaminated soil under the foundation of the laboratory building and around the pipeline, if present, will remain in place and will not require special disposal. Contaminated groundwater was reported to be cleaned up in 2003, although this was not confirmed during the Department of Ecology file review. Nonetheless, the risk for encountering contaminated material at or near this site during construction activities is greatly reduced. The risk for acquiring cleanup liability due to acquisition of potentially contaminated sites is reduced under the Preferred Alternative.

The limits of construction for the Preferred Alternative would not require construction easements on East Montlake Place East, where the Circle K Station No. 1461 and Exxon Mobil are located. The Circle K Station site would potentially have been affected by Option A because of the presence of contaminated groundwater that may have migrated to the north, towards the construction zone. However, under the Preferred Alternative, construction activities are not planned in the area south of East Roanoke

Street. Therefore, contaminants originating from this site are not expected to be encountered during construction activities. Similarly, contaminants originating from the Exxon Mobil site are also not expected to have an effect on construction activities under the Preferred Alternative.

Groundwater testing in the maintenance building/east approach area has detected some metals levels in three wells that exceed the Model Toxics Control Act (MTCA) Method A cleanup levels. Groundwater pumped from this area and any other areas of suspected groundwater contamination will have to be tested and possibly treated prior to disposal. Potential treatment methods are likely to include settlement and filtration to remove turbidity.

Montlake Landfill

The Montlake Landfill could be affected under Options K and L, in addition to the other sites discussed above. It is estimated that the Montlake Landfill is bounded by Montlake Boulevard to the west, NE 45th Street to the north, Mary Gates Memorial Drive NE to the east, and Wahkiakum Lane and Union Bay to the south (University of Washington Montlake Landfill Oversight Committee 2009).

Under Option K, a tunnel would be constructed under the Montlake Cut to move traffic to Montlake Boulevard NE and NE Pacific Street. According to the Montlake Landfill Project Guide (University of Washington Montlake Landfill Oversight Committee 2009), new projects within 1,000 feet of the landfill boundary, would need methane gas mitigation or would need to demonstrate that the project does not require a methane mitigation system. The project would comply with applicable regulations, guides, and management plans.

Miller Street Landfill

Construction staging and other construction activities for the Preferred Alternative and Options A, K, and L would occur near the Miller Street Landfill. Methane gas is not expected to be a significant issue at the Miller Street Landfill during construction based on the age of the landfill site. Overall, the risk is low that hazardous materials may be encountered during construction because the site was formerly a domestic landfill.

Sediments in Lake Washington, Union Bay, and Portage Bay

Existing sediment data for Lake Washington and Portage Bay suggest that there are relatively low concentrations of pollutants. Lake Union sediment contaminant concentrations are slightly higher. There may be a risk of encountering contaminated sediment during construction based on the existing limited sediment quality data. Contaminated sediment, if found, would be disposed of at an approved upland facility such as a hazardous or non-hazardous landfill, depending on the level of contamination. The sediments would not be reused or disposed of in open water.

Sediment would be removed during excavation for bridge column footings. Contaminated sediment, if found, would impose limits on reuse and disposal options. Approximately 110,000 cubic yards of in-water sediment would be removed under the Preferred Alternative, approximately 85,000 cubic yards under Option A, approximately 101,000 cubic yards under Option K, and approximately 85,400 cubic yards under Option L.

The estimated volume of 101,000 cubic yards under Option K would not include the soil generated as part of the sequential excavation method tunnels under Montlake Cut. Soil generated as part of the sequential excavation method (SEM) tunnels excavation would not be expected to be contaminated because these are native soils, and it is assumed they have not been affected by development.

Hazardous Materials Spills

Other potential short-term construction effects that may occur include spills of hazardous materials (such as oil, gasoline, and hydraulic fluid), chemical contaminants, or other materials, such as concrete-laden water. This effect is of particular concern for demolition or construction activities over water.

Control of hazardous materials is a standard provision in construction contracts and permits and would be addressed with best management practices. WSDOT would prepare a spill prevention, control, and countermeasures plan before starting work.

How could the project minimize negative effects during construction?

Environmental regulations require that project owners use appropriate techniques to manage contaminated soil and groundwater, strictly manage and control hazardous wastes, and adhere to established criteria for transporting hazardous substances. Other measures WSDOT would use to minimize the potential for contaminant release during construction include:

- Conducting assessments of sites where contamination may be present to identify the presence and extent of any contaminants.
- Locating underground storage tanks and fuel lines before construction to reduce the potential for breakage and resulting spills.
- Surveying structures that would be demolished to determine whether they contain hazardous building materials like asbestos, lead-based paint, and PCBs.
- Specifying construction techniques that minimize disturbance to areas where contamination may exist.

- Complying with Section 620.08 of WSDOT's Environmental Procedures Manual (WSDOT 2008da), which provides standard protocols for dealing with hazardous materials during construction.
- Preparing an spill prevention, control, and countermeasures (SPCC) plan and a stormwater pollution prevention plan (SWPPP) to prevent the release of pollution and hazardous substances to the environment.

6.14 Navigation

Construction of the Preferred Alternative and all options would affect navigation as a result of work bridges in Portage Bay and in the west approach area (Table 6.14-1). The presence of work bridges would limit recreational use of this part of the study area during the multi-year construction periods.

KEY POINT

Navigation

The west and east navigation channels of the Evergreen Point Bridge would each be closed for up to 7 months spread out over the duration of construction. During these closures there would be other openings of varying heights available.

The Preferred Alternative and Options A and L would require complete closure of the Montlake Cut for a total of 6 days of closure spread over a period of at least 9 days for installation of the new bascule bridge.

How would construction of the project affect navigable waterways?

Construction work bridges in the Portage Bay and Arboretum shoreline areas would prohibit the use of recreational vessels such as canoes or kayaks in these areas. The west approach work bridges would extend from the east shore of Union Bay near Montlake, across the water to Foster Island, then east to where Lake Washington is approximately 16 feet deep. Vessels would still have access to the docks on the north shore of Madison Park.

Table 6.14-1. Construction Effects on Navigation, Preferred Alternative and Options A, K, and L

Area	Approximate Duration of Construction	Effects
Portage Bay Bridge	64 to 72 months	Work bridges would restrict vessel access in the immediate vicinity of the bridge. Limited and, at times, no vessel access underneath the work bridge.
Montlake Cut [a]	31 months	Complete closure of a portion of the Lake Washington Ship Canal for two 24-hour periods and two weekends, for a total of 6 days of closure spread over a period of at least 9 days. An additional 6 weeks of limited navigation restrictions may be necessary, depending on the final treatment of the bridge deck (grated versus concrete).
West Approach Area and West Navigation Channel	57 months	Closure of navigation channel for a total of 158 days spread out over the duration of construction in this area, during which the east navigation channel would be open. Restrictions to Arboretum shoreline access.
East Navigation Channel	37 months	Closure of navigation channel for a total of 214 days spread out over the duration of construction in this area, during which the west navigation channel would be open.

Notes:
Construction durations include testing of new systems and facilities, but do not include mobilization or closeout activities. Mobilization includes material procurement, preparing construction staging areas, and moving equipment to the site. Closeout includes demobilization of staging areas.
The existing Evergreen Point Bridge drawspan would be permanently removed once pontoons for the new floating bridge are anchored.
[a]This effect applies to the Preferred Alternative and Options A and L only.

Portage Bay

Construction work bridges in Portage Bay would restrict the use of recreational vessels such as canoes or kayaks in the immediate vicinity of the work bridges and would limit access to and from south Portage Bay. Navigation would be restricted underneath the work bridges. Private moorage slips in south Portage Bay and several Queen City Yacht Club slips may be unavailable for use during construction. WSDOT will work with the individual owners and tenants whose moorage or boat access are affected by construction work bridges. See the Land Use, Economics, and Relocations Discipline Report Addendum and Errata (Attachment 7) for further discussion. See the Recreation Discipline Report Addendum and Errata (Attachment 7) for a discussion of recreational boating.

Montlake Cut

Installation of the bascule bridge components spanning the Montlake Cut would require complete closure of that portion of the Lake Washington Ship Canal for two 24-hour periods and two weekends, for a total of 6 days of closure spread over a period of at least 9 days. During the closures, barges would be used to install the bridge spans, which might require use of barge/tug combinations to hold the barges in place during construction. These combinations would be necessary in cases where barges cannot anchor in the Montlake Cut because of concrete at the edges of the Montlake Cut.

If final bridge design includes a concrete deck, the deck would be poured and cured after the bridge spans were erected. Each bridge span would be poured separately, and each span would require a 3-week curing period, during which time the span would be closed and passage would be restricted to one-half of the Montlake Cut for vessels with a vertical clearance of more than 46 feet.

West Approach

Navigation would be restricted underneath the work bridges in Union Bay and Lake Washington. Where feasible, WSDOT would provide limited navigation passage underneath the work bridges in the Arboretum area to provide canoe and kayak access to the Arboretum shoreline. However, recreational vessels may be restricted from passing under the work bridges. Vessels would still have access to the docks on the north shoreline of Madison Park. Work bridges in the west approach area and any barges for construction staging of the floating bridge would be located within the limits of construction defined for the project.

Evergreen Point Bridge Navigation Channels

The west and east navigation channels of the Evergreen Point Bridge would be closed during some construction periods for the Preferred Alternative

and Options A, K, and L. Table 6.14-2 shows expected closures of the east and west transition spans, based on additional construction scheduling and sequencing information that was developed after publication of the SDEIS. During these closures, other openings of varying heights would still be available for vessels to pass under the bridge. WSDOT would maintain at least one of the two navigational channels open at all times.

Table 6.14-2. East and West Channel Closures during Construction of the Preferred Alternative and Options A, K, and L

Year	West Navigation Channel Days of Closure	East Navigation Channel Days of Closure
2012	56	105
2013	48	68
2014	14	10
2015	32	31
2016	8	0
Total	158	214

Note: Construction durations include testing of new systems and facilities, but do not include mobilization or closeout activities. Mobilization includes material procurement, preparing construction staging areas, and moving equipment to the site. Closeout includes demobilization of staging areas.

How would the project minimize negative effects during construction?

Construction of the new floating bridge would be staged so that the west and east navigation channels would not be closed on the same days. A "Local Notice to Mariners" would be distributed electronically by the Coast Guard to alert local commercial and recreational boating communities. The notice would allow all potentially affected vessels time to relocate temporarily to prevent their being blocked during the replacement bridge construction period.

6.15 Pontoon Production and Transport

As previously discussed, the SR 520, I-5 to Medina project would replace the Evergreen Point Bridge as a 6-lane bridge with four general-purpose lanes, two HOV lanes, and wider shoulders. The number of pontoons required for this design includes 21 longitudinal pontoons, 2 cross pontoons, and 54 supplemental stability pontoons. If the Evergreen Point Bridge does not suffer catastrophic failure prior to reconstruction, the SR 520, I-5 to Medina project would use the 33 pontoons built and stored as part of the SR 520 Pontoon Construction Project, and construct an additional 44 supplemental stability pontoons to satisfy the 6-lane bridge design requirements. This EIS evaluates constructing the additional pontoons at the Concrete Technology Corporation (CTC) facility, the Grays Harbor pontoon construction facility, or the Port of Tacoma facility. Pontoon types, construction activities, construction sequencing, and towing are discussed in Chapter 3 of this Final EIS. The following sections discuss the effects anticipated from transporting pontoons built in Grays Harbor under the Pontoon Construction Project to the bridge location on Lake Washington, additional pontoon construction at the CTC site in the Port of Tacoma as well as the new facility at Grays Harbor, and transport of the newly constructed pontoons to Lake Washington.

In addition, the SR 520 Pontoon Construction Project Final EIS (WSDOT 2010g) evaluated the effects of pontoon construction activities at the casting basin facilities in Grays Harbor and the CTC site. As described in that Final EIS, the SR 520 Pontoon Construction Project evaluated pontoon construction activities as these sites for potential effects on cultural resources eligible for listing under Section 106 of the National Historic Preservation Act. No potential effects on eligible resources were identified. Pontoon construction activities at either or both of these two facilities for the SR 520, I-5 to Medina project would be similar in nature and duration and could be expected to result in similar effects, and are incorporated into this Final EIS by reference.

What effects would pontoon transport have on the environment?

One of the first construction activities to replace the floating portion of the Evergreen Point Bridge would be to transport to Lake Washington the longitudinal, cross, and supplemental stability pontoons stored in Grays Harbor. These pontoons would be towed in established crabber-tow boat lanes to minimize any potential conflicts with commercial crab fishing off the Washington coast. Ocean-going tugs towing pontoons would follow crabber-tow boat lanes approximately 7 to 10 miles offshore along the coast, enter the Strait of Juan de Fuca, and pass through Puget Sound (see Exhibit 3-14). Once in Puget Sound, pontoons built at any location would

then be towed to the Ballard Locks and into Lake Washington. Pontoons built at CTC and Port of Tacoma would be towed through Puget Sound to the Ballard locks, and into Lake Washington.

Any pontoons stored in water for a period of time would provide a hard structure in an aquatic environment that could serve as habitat for invertebrates and fish. WSDOT would monitor the pontoons for aquatic species growth, particularly invasive species. If necessary, WSDOT would clean the pontoons prior to towing to prevent the transport of invasive species. No substantial aquatic species growth would likely occur during towing, and any incidental marine fouling organisms would die and decompose once the pontoons are towed into the freshwater lake environment.

Tugboat operations associated with pontoon transport have the potential to affect aquatic habitat. Pontoons would be towed from the casting basin to the launch channels and out into open water using tugboats. Short-term disturbances to soft sediment and increases in turbidity caused by propeller wash from tugboats may occur at that time. Tug propeller wash would be directed either toward the launch channel or the existing navigation channel.

If a new facility at Grays Harbor is used, it may require maintenance activities in the launch channel that would be used to float pontoons out of the casting basin and into open water. Underwater currents and other natural processes would deposit sediment in the dredged portion of the launch channel that would occasionally need to be removed by dredging. The dredged materials from the launch channel would be removed to an approved disposal site. Launch channel maintenance dredging would be the only activity that affects the geology or soils during pontoon construction in Grays Harbor. If dredging is required, WSDOT would obtain all necessary permits and approvals, and employ all best management practices (BMPs) needed to minimize effects on the aquatic environment.

Pontoon towing would occur from industrial waterfront areas adjacent to shipping channels where similar operations regularly occur. Thus, tugboat operations associated with transport of pontoons would not measurably alter existing conditions and would have a minimal effect on fish and aquatic habitat compared to existing vessel traffic.

Towing activities could temporarily disturb marine wildlife from noise and the physical movement of towing pontoons. However, if the Grays Harbor site is used, the number of pontoon towing trips would not add substantially to the number of ships (potentially several thousand per year) that travel up the coast today. The tow trips for transporting the pontoons would not be expected to result in a noticeable increase in the amount of in-water noise disturbance.

In Puget Sound, the Coast Guard regulates vessel traffic, monitoring and directing vessel movements to maintain safety and to minimize shipping interruptions and delays. It is unlikely that transport of pontoons to or through Puget Sound would result in any substantial interruption of vessel movement or frequency.

Pontoons would be moved into the Lake Washington Ship Canal via the large locks; the small locks would still be available for vessel passage during that time. Pontoon movement would occur from January through the end of October. For pontoons with no bridge structure on them, drawspan bridges in Ballard, Fremont, University, and Montlake would likely not require opening to accommodate pontoon movement through the Lake Washington Ship Canal. Pontoons that have been outfitted in Puget Sound prior to towing to Lake Washington could need up to 30 feet of clearance, which may require opening the Fremont Bridge on as many as 16 occasions over the course of 2 years. Currently, the Fremont Bridge opens on average of 35 times per day. Because of the infrequent nature of bridge opening needed for pontoon towing, effects from this activity are likely to be negligible.

Approximately 23 pontoons could be towed to an outfitting location at an existing waterfront industrial facility within Puget Sound prior to transport to Lake Washington. Outfitting would take place at established industrial port locations typically used for operations such as large marine vessel moorage and repair. Pontoons would be moored at these locations in order to construct bridge columns and bridge superstructure on the surface, which could take up to 4 months to complete. Once complete, the pontoons would be towed through Puget Sound to the Ballard Locks, through the Lake Washington Ship Canal, and out into Lake Washington for inclusion in the new floating bridge.

Table 6.15-1 shows the estimated diesel fuel consumption and energy use required to transport the pontoons from their construction and moorage locations in Grays Harbor and Puget Sound to the project site. For this analysis, it was assumed that 56 pontoons would be towed one at a time by one tug from Grays Harbor to Lake Washington and 21 pontoons would be towed one at a time by one tug from their location in Puget Sound to the floating bridge construction site. An additional tug would be required to navigate the pontoons through the Ballard Locks and Lake Washington Ship Canal.

The estimated energy consumed during the construction of the 44 supplemental stability pontoons is approximately 1.5 million British thermal units (MBtu), which is 54 percent of the total energy needed to construct the floating bridge portion of the SR 520, I-5 to Medina project.

Table 6.15-1. Estimated Diesel Fuel Consumption and Energy Use during Transport of Pontoons

Route	Number of Trips	Estimated Miles per Trip	Estimated Total Miles	Estimated Avg. mph	Estimated Operating Hours	Diesel Fuel Consumption[a] (gallons)	MBtu[b]
Grays Harbor[c] to SR 520	56	254	14,224	3	4,741	711,150	99,000
Puget Sound to SR 520	21	35	735	3	245	36,750	5,000
Additional Tug for Locks	77	10	770	2	385	57,750	8,000
Total	154	N/A	15,729	N/A	5,371	805,650	112,000

[a] Fuel consumption of 150 gallons per hour based on delivery tow estimate for SR 520 pontoon tow (WSDOT 2005).
[b] Conversion rate: One gallon of diesel = 139,000 Btu.
[c] If Grays Harbor site is constructed.

Several federally protected wildlife species may occur in marine waters along the pontoon transport route (see Table 4.11-2). Key habitat elements for many of these species are generally close to shore and well away from the shipping lanes where pontoon transport would occur. Some individuals may use areas farther offshore, primarily for foraging. The transport of pontoons would not represent a substantial increase over the number of ships (potentially several thousand per year) that travel through the Strait of Juan de Fuca and the outer coast. Increased ship traffic associated with pontoon transport would not be expected to result in a noticeable increase in the amount of noise and disturbance to these species.

Pontoons tow at walking speeds and the risk of collisions with any of these species would be negligible. All the Endangered Species Act (ESA)-listed birds and marine mammals can fly or swim quickly away from any oncoming vessels except leatherback sea turtles, which are slow swimmers. Given the rare occurrence of this species in Washington waters, the likelihood of a leatherback sea turtle encounter is low.

Pontoon transport is not expected to result in effects on critical habitat for southern resident killer whales. As noted above, the vessel traffic associated with pontoon transport is minor in comparison to overall shipping traffic in the whales' habitat area.

Pontoon transport scheduling would be coordinated with the Seattle Yacht Club so that towing of the pontoons does not interfere with the traditional Opening Day ceremonies through the Montlake Cut or other important social maritime activities associated with the Seattle Yacht Club in the cut or in Portage Bay.

Overall, no effects on the human or natural environments are expected from transporting pontoons from Grays Harbor and Puget Sound to Lake Washington.

What effects would pontoon production have on the environment?

In general, WSDOT's use of CTC and continued use of the Grays Harbor pontoon construction facility to construct supplemental stability pontoons for the SR 520, I-5 to Medina project is not expected to alter the character of the human or natural environment because the activities would be consistent with ongoing activities at these locations. Pontoon construction activities at both locations would produce beneficial economic effects because WSDOT would be providing business to each facility, and this would help the construction contractor and the casting basin facilities sustain employment and increase revenue. No effects on public services or utilities are expected to either location because using the casting basins would not alter their ongoing industrial uses or increase demand on any public service or utility. Because the existing facilities would have enough capacity to support pontoon construction, public services would not be disrupted by construction of new public services or utilities. Land use would not change at either location because the pontoon construction activities would not alter the use or operations of either facility. The adjacent and nearby properties have industrial land uses, and those land uses would not be altered by WSDOT's use of the facilities. The following discussion describes anticipated construction effects unique to each facility.

Port of Tacoma and CTC

Some of the 44 supplemental stability pontoons would be constructed at the CTC casting basin facility located on the Blair Waterway in Commencement Bay near Tacoma. This facility is within an approximately 3-square-mile area of land zoned for industrial use, and is surrounded on all sides by commercial, industrial, and shipping facilities. CTC has well-established haul routes to main highways and heavy truck traffic is typical at this location due to the shipping facilities. The nearest noise-sensitive properties are a group of single-family residences approximately 1.25 miles from the site.

WSDOT does not expect that building pontoons at the CTC site would result in any new effects on Blair and Hylebos waterways and Commencement Bay because the operation would be required to comply with the current stormwater discharge permit conditions and any expected conditions of the renewed permit for this location. Permit conditions would require any stormwater discharge to meet water quality criteria so that contaminated stormwater is not discharged into the Blair Waterway and Commencement Bay. Casting basin operations would require work areas to be thoroughly cleaned and pressure-washed after each set of pontoons is complete. Wash water would be collected and treated by facility water quality treatment systems before being discharged to receiving waters. All water collected on the site would be handled and treated in accordance with

state water quality requirements. No effects on groundwater from pontoon construction would be expected because no dewatering would be necessary at this already fully developed casting basin facility.

Additional potential effects on water quality could include the spill of hazardous materials (for example, oil and gasoline), chemical contaminants, nutrients, or other materials into waters in the casting basin vicinity. Control of hazardous materials is a standard provision in construction contracts and permits and would be addressed with BMPs. WSDOT would require a spill prevention, control, and countermeasures plan to be in place prior to commencing operations. Also, if an oil or contaminant spill were to occur from the tugboat during removal and transport of the pontoons, U.S. Coast Guard regulations would be followed and the vessel's spill response plan would be implemented.

Because WSDOT's proposed use of the CTC facility is consistent with the site's current industrial purpose and design, using the CTC site would not produce additional adverse operational effects at the site related to hazardous materials.

Air quality effects could occur during pontoon construction activities. Onsite operation of heavy-duty construction equipment would generate exhaust emissions containing pollutants such as carbon monoxide (CO), nitrogen oxide (NO_X), volatile organic compounds (VOCs), sulfur dioxide (SO_2), particulate matter of 10 microns or less (PM_{10}), and particulate matter of 10 microns or less ($PM_{2.5}$). An onsite concrete batch plant could produce PM_{10} and $PM_{2.5}$ emissions. Offsite vehicle trips made by employees and supply trucks to and from the sites would generate additional vehicle exhaust emissions. Tugboats would generate exhaust emissions during pontoon transport similar to that of other heavy-duty diesel equipment. Best management practices such as reducing equipment idling time and using newer equipment with emission controls may be employed to reduce project emissions. Per the transportation conformity rule (40 CFR 93), construction lasting less than 5 years does not require a quantitative emissions analysis. Pontoon construction would only last for 2 to 3 years; therefore effects on air quality resulting from the project would be temporary.

As described in the SR 520 Pontoon Construction Project Final EIS, Commencement Bay is a migratory pathway for anadromous salmonids from the Puyallup River and Hylebos and Wapato Creeks. However, casting basin operations at CTC could affect on fish, including ESA-listed species. Although the casting basin sites are expected to trap fish during gate opening and closing operations, WSDOT would attempt to limit the need to handle fish during dewatering by allowing water (and fish) to exit the basins without pumping, to the maximum extent possible. Appropriate fish-handling protocols would be implemented to remove fish prior to pumping out the remaining water in the casting basin, avoiding mortality from fish

entrapment and stranding at the CTC facility. This facility is currently operational and permitted for existing uses.

Commencement Bay, designated as Salmon Management Area 11A, is within the federally adjudicated "usual and accustomed" fishing grounds of the Puyallup Tribe of Indians. WSDOT has been in contact with the Puyallup Tribe and will continue to coordinate with them as the project construction schedule develops. WSDOT does not expect that operating the CTC facility would affect usual and accustomed tribal fishing, and will consult with the Puyallup Tribe to ensure that pontoon launching and towing are coordinated to avoid adversely affecting tribal fishing activities.

With no wetlands in the Port of Tacoma and CTC construction area, pontoon construction in this location would not directly affect wetlands.

Some pontoons may need to be moored temporarily in Puget Sound after construction to accommodate outfitting or schedule considerations. As many as seven pontoons could be moored at one time for up to 6 months. Temporary moorage in Puget Sound would occur at an existing facility used for mooring large vessels. If pontoons are moored for more than 6 months in waters that could foster organism growth on the surface of the pontoons, the pontoons would be cleaned prior to transport.

Grays Harbor

The remaining supplemental stability pontoons needed could be constructed at the Grays Harbor pontoon construction facility. The potential Grays Harbor facility is located in Aberdeen in an established industrial area. Land use near the facility is primarily commercial and industrial, and construction of the pontoons would be consistent with ongoing activities at this location. Noise-sensitive properties located within 500 feet of the site are well shielded from the casting basin by existing commercial structures. Noise levels at these properties during operation of the casting basin are expected to correspond to those of a typical office environment.

Effects of pontoon construction on water quality, hazardous materials, and air quality at Grays Harbor would be the same as described for the CTC facility.

Activities associated with pontoon launching from the casting basin in Grays Harbor could affect treaty fishing and temporarily displace Quinault Indian Nation fishers from some Grays Harbor fishing locations. WSDOT would minimize potential effects by coordinating directly with the Quinault Indian Nation and tribal managers to limit pontoon launching activities during periods of active treaty fishing.

While pontoons are being constructed, all pumps or outlets, if used to convey water between the site and fish-bearing waters of Grays Harbor,

would be screened according to NOAA Fisheries (NOAA Fisheries 1997) and WDFW standards (per Revised Code of Washington [RCW] 77.57.070, RCW 77.57.010, and RCW 77.57.040). The access gate from the harbor to the casting basin would be closed during pontoon construction. Since the casting basin would connect to Grays Harbor via the launch channel, fish could potentially enter the basin with each gate opening. These fish could become trapped when the casting basin is flooded and then stranded after the gate is closed and the basin is emptied for the next pontoon-building cycle. WSDOT would monitor the casting basin during draining operations. Any fish collected in the casting basin would be herded gradually, in a controlled manner, to a fish collection box, and released into Grays Harbor using protocols consistent with NOAA Fisheries, U.S. Fish and Wildlife Service (USFWS), and Washington State Department of Fish and Wildlife (WDFW) requirements.

A short-term disturbance to soft sediment and an increase in turbidity, caused by propeller wash from tugboats, could occur when moving the pontoons out of the casting basin. However, the Grays Harbor facility is located in an area with a high existing baseline for sedimentation; thus, tugboat traffic would not substantially increase turbidity levels above existing conditions. The site is adjacent to the Grays Harbor navigation channel; therefore, moving and transporting the pontoons (which could only occur two to three times per year at most) would have only minimal and unmeasurable effects on fish and aquatic habitat compared to existing vessel traffic in the navigable waterway.

As discussed in Chapter 4, bull trout and green sturgeon occur in the Grays Harbor area. Construction of the supplemental stability pontoons is not expected to result in adverse effects on these listed species. Key habitat elements for these species are generally close to shore and well away from the shipping lanes where pontoon transport would occur.

Estuarine wetlands located along the shoreline of either side of the launch channel at the Grays Harbor facility would not likely be directly affected by pontoon construction activities. However, these estuarine wetlands could be affected by propeller wash from the tugboats required to move pontoons out of the casting basin. The tugboats could increase wave action and erosion to the estuarine emergent wetlands along the site's shoreline, and pontoon towing activities could deposit sediment on the vegetation of these wetlands. Because pontoon towing cycles are short (one tidal cycle) and would only occur about two to three times each year, these effects would likely be negligible.

The Grays Harbor facility would already be constructed and operating. The SR 520, I-5 to Medina project's use of this facility to build pontoons would be consistent with construction activities taking place at that facility. Wildlife would likely not be present at this site during pontoon construction activities, although any wildlife using patches of habitat in adjacent areas

might be subject to construction noise disturbance. Pontoon construction at this location would not affect the Grays Harbor National Wildlife Refuge because the construction site is over 5 miles away from the refuge. Given that pontoon construction activities will already be taking place at this location, constructing additional supplemental stability pontoons at Grays Harbor would not result in effects on wildlife or habitat.

Building pontoons at the Grays Harbor facility would not affect geology and soils because pontoon construction activities at this facility would not require any upland earth-moving activities since it would be already operating in place.

As many as 11 pontoons could be outfitted at existing industrial port facilities within Puget Sound and Grays Harbor. Outfitting could take up to 4 months and would involve activities consistent with regular operation of these facilities. WSDOT expects that standard containment protocols and spill response plans would be adopted and followed and that no new effects would result from pontoon outfitting at these locations.

6.16 Construction Phase 1: Floating Bridge and Landing

As discussed in Chapter 2, if funding is severely limited, the easternmost portion of the corridor, consisting of the floating bridge and landings, may be built before the rest of the project (Construction Phase 1). To address the potential for phased construction, this section of the Final EIS evaluates construction of the floating bridge and landings separately as a subset of the "full build" analysis. The evaluation is qualitative in nature and assumes that the floating bridge and landings would be the only project components in operation until the rest of the project has been funded and built. Since all improvements needed for the first phase are within the overall footprint of the facilities to be provided by full buildout, the discussion on differences in effects focuses on the timing of construction rather than the extent of impacts.

Transportation

Most of the construction conditions reported in section 6.1 are associated with construction of the Portage Bay bridge, Montlake interchange, and west approach. Construction Phase 1 would not substantially affect traffic operations, transit, nonmotorized facilities, or parking. Construction trucks would be present on the roadways at eastside locations as described in section 6.1. Trucks would access the worksite on the east side of Lake Washington and most are assumed to travel from the east, although some trucks from Seattle would be likely to reach the site along SR 520 and the Evergreen Point floating bridge.

Construction effects in Seattle associated with improvements between I-5 and the west approach bridge would be deferred until a later phase. The volumes of trucks described at locations on Seattle streets would not be present during Phase 1. Existing transportation facilities in Seattle would remain in operation, including the SR 520 ramps at Lake Washington Boulevard, the Montlake Freeway Transit Station, and nonmotorized paths in the project vicinity.

Land Use and Economic Activity

Land Use

Phase 1 would include construction of the new Evergreen Point Bridge and placement of the new anchors in Lake Washington. Construction activities on the Eastside would be for the bridge maintenance facility and mainline improvements near Evergreen Point Road, with activities in those areas as described in Section 6.2. No buildings would be removed during this first phase of construction.

Most of the work on the floating span and interim connection bridge would occur from barges. As a result, land use effects in the Seattle portion of the project area during construction would be limited to visual effects and potentially some construction noise for land uses within view of the floating bridge.

Land use effects for construction of the corridor improvements in the I-5, Portage Bay, Montlake, and west approach areas would be the same as described in section 6.2, but would occur later in time as a result of full buildout.

Economic Activity

Construction-related effects on local businesses under Phase 1 would be considerably less than those described for full buildout. Since on-land construction would be limited to Medina, where the land uses are almost exclusively residential, it is not anticipated that access to businesses would be affected by the project.

Construction Phase 1 would result in fewer direct, indirect, and induced jobs than estimated for full buildout, and construction-related spending would occur at a lower magnitude and over a longer period of time than if the corridor were constructed within the single 5- to 7-year timeframe anticipated if full funding were available.

Social Elements

Neighborhoods, Public Service Providers, and Utilities

Construction Phase 1 would have few effects on the Eastlake, North Capitol Hill, Portage Bay/Roanoke, Montlake, University District, and Madison Park neighborhoods compared to full buildout. Noise, and visual clutter could affect neighborhoods with direct views of the construction activity on Lake Washington. Parts of Medina close to the SR 520 alignment, especially waterfront residents, would also experience these effects.

The potential for construction effects on fire, emergency medical, and police services under the Construction Phase 1 would be less than described for the full build. Response times in Medina could potentially be affected by detour routes and increased congestion during construction of the Evergreen Point Bridge and east approach. However, because the full corridor would not be under construction during a single time period, any effects would be of a lower magnitude. Effects on Eastside utilities would be similar to those described in Section 6.3; Phase 1 is not expected to affect utilities in Seattle.

Effects on Low-income, Minority, and LEP Residents

As described in Section 6.3, construction of the floating bridge and landings would affect tribal fishing in the usual and accustomed fishing areas of the Muckleshoot Indian Tribe. During the construction period, construction barges would be occupying areas of the lake that would otherwise be available for fishing; in addition, there would be periods of time when the existing bridge, the new bridge, and marine construction equipment would all be present in the lake. WSDOT is consulting with the Muckleshoot Tribe on appropriate mitigation for impacts during both construction and operation.

Recreation

Phase 1 would require no construction easements or closures of parks during construction. Effects on Bagley Viewpoint, Montlake Playfield, East Montlake Park, McCurdy Park, and the Arboretum would occur later in time as a result of full buildout, as would effects on private boat moorage in Portage Bay (see Section 6.4).

Visual Quality

Construction Phase 1 would change the visual quality in the Lake Washington and Eastside transition areas due to the presence of construction equipment, barges, and tall cranes, and from construction work bridges because of their collective size and complexity. The presence of this equipment would substantially degrade the visual quality of viewers on or near the structures. Construction of the bridge maintenance facility under the new SR 520 east approach would be less visible because most of the construction is set back from the shoreline (see Section 6.5). Smaller visual changes would occur for some residents of Laurelhurst and Madison Park, who would be able to see construction activities on the lake from a distance. The Roanoke, Portage Bay, Montlake, and west approach landscape units would not be affected until full buildout.

Cultural Resources

Construction Phase 1 would result in the demolition of the National Register of Historic Places- (NRHP) eligible floating bridge. Effects on other historic properties in the project area would occur later in time as a result of full buildout (see Section 6.6).

Noise and Vibration

Construction noise during Phase 1 would be most noticeable along the Medina shoreline and to recreational boaters. Construction activities for the floating bridge may also be audible to some residents of Laurelhurst and Madison Park. The Eastlake, North Capitol Hill, Portage

Bay/Roanoke, Montlake, and University District neighborhoods are not expected to experience construction noise effects associated with Phase 1.

Air Quality

Construction Phase 1 would result in a lower magnitude of air pollutant emissions from construction activities as compared to full build, with effects generally localized in the Eastside and Lake Washington portions of the project area.

Energy and Greenhouse Gas Emissions

Phase 1 would result in less energy use and greenhouse gas emissions from construction activities than the full build. However, additional mobilization and demolition would be required, which is likely to cause some increase in total project energy use and greenhouse gas emissions compared to continuous project construction. Because energy consumption during construction is calculated as a function of project costs, any increases in project cost as a result of deferring construction would also increase estimated energy usage.

Water Resources

The in-water work required for Construction Phase 1 would be of a lesser magnitude than the full build. However, the floating bridge and east approach would still require a major in-water construction effort. As described in Section 6.11, construction best management practices (BMPs) would be used to help prevent pollutants in runoff from construction areas from reaching surface water bodies. In-water sediment containment measures, such as cofferdams, would also be used where lakebed disturbance would occur in nearshore areas during construction of the east approach.

The interim connection bridge between the new floating span and the existing west approach would require two periods of work in the same area of the lake: first to construct the connection bridge, and later to remove its superstructure and build the new west approach superstructure on the previously placed columns. Reuse of these columns would minimize in-water work and sediment disturbance, but building in phases would entail greater overall disruption than continuous construction.

Ecosystems

Wetlands

Construction Phase 1 would result in no construction effects on wetlands because there are no wetlands in the Lake Washington or Eastside transition areas (see Section 6.11). The majority of wetlands and buffers occur in the Portage Bay and west approach areas and would be affected at the time of full buildout.

Fish

The in-water work for the floating bridge and east approach structure would include the placement of anchors for the floating bridge and the columns for the east approach. Both of these activities could result in direct disturbance of sediments. However, the depth of Lake Washington would limit the effects of turbidity from placement of the bridge anchors because fewer species are expected to use the deeper areas of the lake. BMPs would be used to contain sediments during column placement for the east approach, and special care would be taken to avoid disturbance to the sockeye spawning area located under the existing approach structure.

As noted in the Water Resources discussion, the interim connection bridge between the new floating span and the existing west approach would require two periods of work in the same area of the lake: first to construct the connection bridge, and later to remove its superstructure and build the new west approach superstructure on the previously placed columns. Reuse of these columns would minimize in-water work and sediment disturbance, and WSDOT would observe in-water work windows during both construction periods. Nevertheless, building in phases would entail greater overall disruption than continuous construction and would extend the duration of effects on fish and other aquatic resources.

Wildlife and Wildlife Habitat

Phase 1 would result in the loss of mostly open water habitat in the Lake Washington or Eastside transition areas. This type of habitat is most notable for waterfowl use. Impacts and mitigation would be as described for these areas in Section 6.11. The highest quality habitat for wildlife in the project area is located in the Portage Bay, west approach, and Montlake areas of the SR 520 corridor and would not be affected until full buildout.

Geology and Soils

The magnitude of construction activity with the potential to result in erosion, sedimentation, or water quality contamination effects would be smaller during Phase 1 than if the full corridor were under construction during concurrent time periods. Effects would be as described in Section 6.12.

Hazardous Materials

Construction Phase 1 would affect groundwater near the maintenance building/east approach area. Groundwater pumped from this area and any other areas of suspected groundwater contamination would have to be tested and possibly treated prior to disposal. Potential treatment methods are likely to include settlement and filtration to remove turbidity.

Construction Phase 1 would not affect any identified hazardous materials sites in the project area. As described in Section 6.13, a number of sites in the Seattle portion of the project area would be affected during full buildout (see Exhibit 4.13-1). These sites would be affected later in time as part of the full buildout.

Navigable Waterways

During Phase 1 construction, the west transition span would remain at its current height of 44 feet, the drawspan would be removed, and the east transition span would be raised to 70 feet, as described in Section 6.14. The presence of barges and construction activities in the floating bridge and east approach areas may result in occasional temporary disruption to recreational boating.

6.17 Summary of Effects During Construction

Table 6.17-1 summarizes the construction effects of the 6-Lane Alternative options on each element of the environment. Table 6.17-2 lists the quantifiable effects (those effects that could be estimated as measurable quantities, e.g., acres). Effects from adding the suboptions to each option are shown in parentheses in Table 6.17-2.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Transportation	
The Preferred Alternative and SDEIS options would have similar construction effects on transportation through most of the project area, with differences in the vicinity of the Montlake Boulevard interchange. Options K and L would result in more effects than the Preferred Alternative and Option A because of the amount of truck traffic required for construction of the new single-point urban interchange (SPUI) and the traffic effects during the closure of NE Pacific Street.	
Road Closures and Detours	
The Preferred Alternative and SDEIS options would close the Lake Washington Boulevard ramps for some period of time during construction. The ramp closures would mostly affect local street operations and are not expected to have a substantial effect on SR 520 operations. Traffic that currently uses the Lake Washington Boulevard ramps would be detoured to use the ramps at Montlake Boulevard. A number of improvements would be made to the ramps at Montlake Boulevard in order to accommodate the detour traffic. The design and the new construction sequencing for the Preferred Alternative have eliminated the need for the closure of Delmar Drive East.	
Options K and L	Options K and L would close NE Pacific Street for 9 to 12 months. During this closure, detour traffic would use the Montlake Boulevard NE/NE Pacific Place intersection (600 feet to the north) to make any turning movements. Several improvements would be made to the intersection to accommodate the additional detour traffic. Even with these improvements, the intersection would operate at level of service (LOS) F.
Haul Routes	
The Preferred Alternative and SDEIS options would require construction-related truck traffic on local streets. Most of the construction truck trips on local streets would use Montlake Boulevard to access SR 520. A few other arterials would be affected, and the estimated number of truck trips along these arterials would be relatively low compared to overall arterial volumes.	
Option K and L	Options K and L would use East Shelby Street and East Hamlin Street as haul routes during construction. During peak construction periods there could be as many as 5 to 20 trucks per hour, depending on which option is selected.
Parking	
The effects at most locations would be similar under the Preferred Alternative and Options A, K, and L including Bagley Viewpoint (10 spaces), along 24th Avenue East (5 spaces), and along Lake Washington Boulevard (35 spaces). The Preferred Alternative and SDEIS options would also affect parking in the University of Washington (UW) E-11 and E-12 lots, the National Oceanographic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center, the Museum of History and Industry (MOHAI), and the WSDOT public lot on East Lake Washington Boulevard though the effects would differ with each option. MOHAI operations would not be affected because operations would be moved prior to the start of construction.	
Preferred Alternative	The Preferred Alternative would remove 10 spaces at the UW E-11 and E-12 lots; 50 spaces at NOAA Northwest Fisheries Science Center; 124 spaces at MOHAI; and 12 spaces at the WSDOT public lot on East Lake Washington Boulevard.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options	
Option A	Option A would remove 55 spaces at the UW E-11 and E-12 lots; 95 spaces at NOAA Northwest Fisheries Science; 124 spaces at MOHAI; and 12 spaces at the WSDOT public lot on East Lake Washington Boulevard.
Option K	Option K would remove 550 spaces at the UW E-11 and E-12 lots; 50 spaces at NOAA Northwest Fisheries Science Center; 150 spaces at MOHAI; and 24 spaces at the WSDOT public lot on East Lake Washington Boulevard.
Option L	Option L would remove 210 spaces at the UW E-11 and E-12 lots;50 spaces at NOAA Northwest Fisheries Science Center; 150 spaces at MOHAI; and 24 spaces at the WSDOT public lot on East Lake Washington Boulevard.
Pedestrian and Bicycle	
The Preferred Alternative and SDEIS options would close the 24th Avenue East bridge and the Bill Dawson Trail for most of the construction duration, leaving only Montlake Boulevard open to pedestrian and bicycle traffic. Bicycle and pedestrian access may be restricted to one side of Montlake Boulevard.	
Transit	
The Preferred Alternative and SDEIS options would permanently close the Montlake Freeway Transit Station and relocate transit stops on Montlake Boulevard.	
Options K and L	Options K and L would temporarily relocate several transit stops on NE Pacific Street and Montlake Boulevard.
Mitigation	Because final construction staging and schedules have not yet been determined, WSDOT will continue to coordinate with local and regional transit agencies regarding future transit service effects The Preferred Alternative and SDEIS options would include staging plans with specific restrictions on construction methods and prescribed work times for construction to avoid peak travel periods. Various work zone management techniques may be implemented including traveler information systems, incident management systems, active traffic management, construction worker shuttle service, special event strategies, and transportation demand management. The Preferred Alternative and SDEIS options would include temporary capacity improvements at the Montlake Boulevard interchange to accommodate changes in traffic patterns during construction. Options K and L would include temporary changes to the Montlake Boulevard/NE Pacific Place intersection to accommodate traffic during the closure of NE Pacific Street.
Land Use and Economic Activity	
Construction would occur within existing WSDOT right-of-way, adjacent to SR 520, to the extent possible. However, in some places within the project area, land now used for other purposes would be used for construction purposes. Construction easements would affect a portion of the Seattle Fire Station 22 property on East Roanoke Street. During construction, the station would be fully operational, access would be maintained, and emergency response would not be affected. The boat slips on the south side of the Queen City Yacht Club and at the Bayshore Condominiums would be removed to accommodate construction of the Portage Bay Bridge. These moorages would be replaced after construction was completed. The positive effects of construction-related jobs, spending (e.g., project spending and spending by construction workers), and resulting sales tax revenues would be widely dispersed through the local and regional economies.	
Preferred Alternative	Construction easements in the Montlake area would be most similar to Option A, except that the Preferred Alternative would not remove the Montlake 76 gas station.
Option A	Option A would permanently remove the Montlake 76 gas service station on Montlake Boulevard East at the SR 520 ramps. Although some of the parcel would be converted to WSDOT right-of-way, most of the parcel would be used for construction staging, vacated by WSDOT after construction, and available for development after construction.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Options K and L	Options K and L would relocate the UW's Waterfront Activities Center (WAC) throughout the construction duration. The loss of parking near Husky Stadium could inconvenience UW Medical Center employees, event attendees, and campus visitors.
Mitigation	WSDOT will coordinate with business owners for alternative access and appropriate signage. The temporary loss of boat moorage at Queen City Yacht Club and the Bayshore Condominiums would be mitigated through relocation or other options to be identified. WSDOT would coordinate with the UW on the temporary relocation of functions of the WAC (Options K and L) and reduced parking availability and associated revenues at Husky Stadium lots (the Preferred Alternative and SDEIS options). Specific mitigation measures have not been determined at this time.
Social Elements	
The Preferred Alternative and SDEIS options would affect adjacent neighborhoods during construction. These neighborhoods could experience negative effects from detours, haul truck traffic, relocated bus stops, and utility service disruptions. Construction would also increase noise, dust, and visual clutter in residential, business, and park areas adjacent to construction zones. These effects could reduce residents' quality of life and limit connections to community resources, patronage at neighborhood businesses, or use of recreational amenities. Partial closures of sidewalks, bicycle paths/routes, trails, and park areas could discourage neighborhood activity and use of community resources. The Preferred Alternative and SDEIS options would have similar effects except in the Montlake and UW south campus areas, where the scale and intensity of construction would differ. The scale and intensity of construction-related effects within these areas would be greatest with Option K. Effects on the University District and Montlake neighborhoods would be similar for Options K and L. Construction effects would include longer and more intense noise, dust, vibration, construction traffic, and visual changes due to construction of the tunnel (Option K) or new bascule bridge and SPUI ramps (Option L). Construction in this area would last 6½ years with Option K and 5 years with Option L. Closure of NE Pacific Street associated with Options K and L could affect response times and emergency access to UW Medical Center. The construction limits of the Preferred Alternative and all SDEIS options would be within the usual and accustomed fishing areas of the federally recognized Muckleshoot Indian Tribe. Transporting pontoons from Grays Harbor to the Port of Seattle would only have a minimal effect on access to tribal fishing grounds, as the travel route already experiences a good deal of vessel traffic.	
Mitigation	WSDOT will continue to work with the project area neighborhoods to keep residents informed of project changes, and to develop neighborhood-specific measures to address anticipated construction effects. WSDOT is developing a community construction management plan to keep residents informed and to help minimize the effects of construction activities on affected communities. A traffic management plan would be prepared that would identify measures and practices to minimize construction effects on local streets, transit and transit users, property owners, and businesses (see Section 6.1, Transportation). WSDOT is coordinating with the Muckleshoot Tribe to identify important access points to usual and accustomed fishing areas where proposed structures would be built. There would be additional coordination to avoid construction conflicts with tribal fishers harvesting salmon in Portage Bay, Union Bay, and Lake Washington. WSDOT will work with utility service providers to prepare a consolidated utility engineering plan consisting of key elements such as existing locations, potential temporary locations, and potential new locations for utilities; to prepare sequenced and coordinated schedules for utility work; and to develop detailed descriptions of any service disruptions. WSDOT will work with affected communities to provide advance notice of any service disruptions.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Recreation	
The Preferred Alternative and SDEIS options would affect adjacent parks during construction. These parks could experience negative effects from property acquisitions, construction-related truck traffic, construction noise, and visual clutter. The Preferred Alternative and SDEIS options would affect East Montlake Park, McCurdy Park, and the University of Washington recreation facilities. The scale and intensity of construction near these parks would vary among the options, with increased noise, dust, and traffic in and around the park areas. The Preferred Alternative and SDEIS options would permanently close McCurdy Park and a portion of East Montlake Park. The Preferred Alternative and SDEIS options would also use a portion of the UW campus for construction and staging. The Preferred Alternative and SDEIS options would require periodic closure and detours of the Ship Canal Waterside Trail, trail access from Montlake Boulevard, trail access in East Montlake Park, and the Arboretum Waterfront Trail. The kayak and canoe launch point at East Montlake Park would also be periodically inaccessible.	
Preferred Alternative	The Preferred Alternative would result in 7.4 acres of construction effects on area parks.
Option A	Option A would result in 5.9 acres of construction effects on area parks.
Option K	Option K would result in 9.0 acres of construction effects on area parks.
Option L	Option L would result in 6.9 acres of construction effects on area parks.
Mitigation	Best management practices would be implemented to protect recreational resources from construction-related effects such as dust, vibration, glare, and accidental damage from construction equipment. Detour routes and traffic control measures would be implemented to provide access to University of Washington recreational activities. Construction closures would be timed to minimize effects during major events. WSDOT, the City of Seattle, the University of Washington, and appropriate regulatory agencies would evaluate how best to protect specimen trees and important vegetation in the Arboretum.
Visual Quality	
The Preferred Alternative and SDEIS options involve large-scale construction activities using heavy equipment. Vegetation removal would occur along the corridor and mature roadside trees and shrubs along both sides of SR 520 would be affected. Views from homes currently screened by these trees would then overlook ongoing construction. Construction equipment and activities would be visible from homes along roadways and surface streets. Construction activities would also be highly visible from the Seattle Yacht Club, the Montlake Cut, Montlake Boulevard, and UW southeast campus. All in-water and upland activities associated with replacing the Portage Bay Bridge would result in substantial degradation of visual character and quality of the south part of Portage Bay. The viewers most affected would be motorists crossing the bridge, residents on houseboats near the bridge ends, park users at Montlake Playfield, and boaters at the Queen City and Seattle yacht clubs. The Preferred Alternative and SDEIS options would require a considerable amount of earthwork for widening SR 520 and grading for the stormwater ponds, which would affect residences in the Shelby-Hamlin area and users of the Arboretum and Ship Canal waterfront trails. Construction work bridges would also clutter views, especially for boaters in the Montlake Cut and SR 520 motorists, both of whom would be sensitive to visual quality. The Preferred Alternative and SDEIS options include work bridges that would be highly visible at breaks in the tree line in the Arboretum. Barges and tall cranes would stand out and further diminish visual character and quality. Temporary changes to visual character and quality would be high for views from or near the west approach bridges and from Husky Stadium, where Foster Island and the Arboretum ramps are visible from seats in the northeast corner of the stadium.	
Preferred Alternative	The Preferred Alternative would construct a new bascule bridge across the Montlake Cut. Construction would require the removal of a band of mature, dense woods along the cut, which would diminish views. The removal of two single-family homes and vegetation would also eliminate a buffer for nearby homes. Construction in the Montlake area would last 4 years.
Option A	Option A would construct a new bascule bridge across the Montlake Cut. Construction would require the removal of a band of mature, dense woods along the cut, which would diminish views. The removal of two single-family homes and vegetation would also eliminate a buffer for nearby homes. The greatest effect on views and visual quality would be due to reconstruction of the Montlake interchange adjacent to the NOAA campus and to homes along Lake Washington Boulevard. Construction in the Montlake area would last 4 years.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Option K	Option K would require extensive excavation for construction of the tunnel, SPUI, and tunnel entrances in East Montlake Park and in the south parking lot of Husky Stadium. The greatest effect on views would be from the extreme change in landform and the construction of ventilation towers for the tunnels. A temporary detour bridge south of the existing west approach would add to the clutter. This high level of degradation of visual quality and character from demolition and construction could last up to 7 years in this area.
Option L	Option L would require excavation for the construction of the elevated SPUI, the depressed main line under the SPUI, and the new bascule bridge over the east end of the Montlake Cut and associated approaches. Very high levels of change would occur at the east end of the Montlake Cut, the east Shelby-Hamlin neighborhood, and East Montlake Park area. This high level of degradation of visual quality and character from demolition and construction in this area could last up to 5 to 6 years.
Mitigation	Per the WSDOT Roadside Classification Plan, The Preferred Alternative and SDEIS options would landscape areas within the right-of-way and construction easements with vegetation similar to the vegetation removed, especially along Lake Washington Boulevard, Montlake Boulevard, and through the Washington Park Arboretum. Areas disturbed during construction would be revegetated where natural habitat, vegetation, or neighborhood tree screens were removed. These places are under Portage Bay Bridge in Roanoke Park and through Montlake, in particular at the NOAA Northwest Fisheries Science Center, East Montlake Park, Foster Island, and the Arboretum. The MOHAI site and the remaining portion of East Montlake Park would be redesigned in cooperation with Seattle Parks and Recreation. Foster Island would require restoration including shoreline and buffer restoration. Mitigation would be extensive under Option K due to the footprint required for the land bridge and associated earthen berm.
Cultural Resources	
Construction of the Preferred Alternative and all SDEIS options would impact a number of historic properties in the area of potential effect (APE), and would result in an adverse effect. Although some effects would be avoided and minimized throughout the construction period through implementation of a Community Construction Management Plan and use of construction best management practices, not all effects from construction would be avoided. The overall adverse effect will be mitigated in accordance with Section 106, in consultation with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officer (SHPO), affected tribes, and the additional Section 106 consulting parties, as stipulated in the Programmatic Agreement (Attachment 9 of the Final EIS).	
Mitigation	Even with WSDOT and FHWA's ongoing efforts to avoid effects to the greatest extent feasible, it will not be possible to avoid all effects on historic properties from construction of the SR 520, I-5 to Medina project. Because the project would result in an adverse effect on historic properties, the adverse effect will be mitigated, and the mitigation measures are stipulated in the Section 106 Programmatic Agreement. The Programmatic Agreement is the primary document that contains stipulations for project-specific mitigation. The Programmatic Agreement is the result of the Section 106 consultation process among SHPO, WSDOT, FHWA, ACHP, affected tribes, and other consulting parties. As part of the Programmatic Agreement, in consultation with the Section 106 consulting parties, affected community groups, and the City of Seattle WSDOT will develop a Community Construction Management Plan (CCMP). The CCMP will contain specific measures designed to protect historic properties in the APE and to address quality of life issues. The CCMP will be designed as an adaptable plan so that it can handle unanticipated issues that may arise during construction. An outline of the CCMP is included in Attachment 9.
Noise	
During construction, people living and working near construction areas would be affected by noise from a variety of activities and equipment. Construction phases that include preparing for new structure construction, roadway paving, and structure demolition would result in noise levels ranging from 83 to 94 dBA at 50 feet from the construction site. Pile-driving would be the loudest single source of noise during construction preparation. The equipment would include vibratory and impact equipment that can produce short-term noise levels of 99 to 105 dBA at 50 feet. Noise levels can vary depending on	

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

the distance, topographic conditions between the pile-driving location and receiver, frequency of pile-driving, and the number of pile-drivers operating at one time. The loudest construction-related noise activities are pile-driving and demolition of existing structures. Typical construction equipment is expected to have a range of 62 to 105 dBA maximum noise level 50 feet from the source. Major non-impact noise-producing equipment includes concrete pumps, cranes, excavators, haul trucks, loaders, and tractor trailers; maximum noise levels could reach up to 92 dBA at the nearest residences (50 to 100 feet). State regulations restrict noise from construction activities by imposing noise limits based on the type of activity, time of day, and property type with less noise allowed for residential than for commercial and industrial receivers. Vibration from general construction can affect receivers that use vibration-sensitive equipment such as medical or scientific equipment. The only such known receiver located close to construction activities is the NOAA Northwest Fisheries Science Center, which uses equipment sensitive to vibration in its research. Major vibration-producing activities would occur primarily during demolition and preparation for the new bridges. While pile-driving or vibratory sheet installation may occur within 50 to 100 feet of sensitive receivers, it is unlikely that vibration levels would exceed 0.5 inch per second at distances greater than 100 feet from the construction sites.	
Mitigation	WSDOT would follow state noise control regulations and other methods of mitigating noise such as limiting construction hours within 500 feet of any occupied dwelling to minimize effects on receivers. Several construction noise and vibration abatement methods—including operational methods, equipment choice, or acoustical treatments—could be implemented to limit the effects of construction. The methods used might vary in the project corridor depending on construction criteria.
Air Quality	
Soil-disturbing activities, diesel equipment, traffic congestion, and paving with asphalt would generate emissions that may temporarily affect air quality in the vicinity of the construction activity. Engine and motor vehicle exhaust would result in emissions of volatile organic compounds (VOCs), nitrogen oxide (NO_x), particulate matter (PM_{10}, $PM_{2.5}$), and air toxics. Air quality would be most affected in areas close to the active construction sites. Depending on the option selected, the project could take up to 7-1/2 years to build, which will require the project to be evaluated for conformity with the State Implementation Plan for carbon monoxide emissions.	
Mitigation	WSDOT would comply with procedures outlined in the Memorandum of Agreement between WSDOT and the Puget Sound Clean Air Agency for controlling fugitive dust. WSDOT encourages contractors to reduce idling time of equipment and vehicles and to use newer construction equipment and equipment with add-on emission controls.
Energy and Greenhouse Gases	
During construction, the primary source of greenhouse gas (GHG) emissions would be fuel combustion with the GHG emissions being proportional to the amount of energy used and also expressed in project costs. Unintentionally released fugitive gases, such as coolant leaking from air conditioners, is not included in the analysis. The analysis assumes diesel fuel only (no electricity or gasoline) to be conservative and is intended to show relative differences between the options.	
Preferred Alternative	Onsite construction energy requirements for Option A would be 15,006,000 MBtu and for pontoon transport would be 108,000 million British thermal units (MBtu). Construction of the Preferred Alternative would emit 1,116,000 metric tonnes (MTs) CO2e of GHG.
Option A	Onsite construction energy requirements for Option A would be 15,006,000 MBtu and pontoon transport would be 108,000 MBtu. Option A would have the same level of construction GHG emissions as the Preferred Alternative.
Option K	Option K has the largest onsite construction energy consumption estimate of 34,299,000 MBtu, which is about double that of Options A and L. Energy required for pontoon transport would be the same as Option A. Option K has the highest GHG emissions potential at roughly double that of Option A.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Option L	Onsite energy consumption estimate is 18,781,000 MBtu. Energy required for pontoon transport would be the same as Option A. Option L would produce approximately 20 percent more emissions than Option A, but less than Option K.
Mitigation	Measures to conserve energy could include limiting idling equipment, encouraging carpooling of construction workers, and locating staging and material transfer areas near work sites.
Water Resources	
The primary concern for water quality during construction is increased turbidity in water bodies. From the land-based activities the most likely source would be from construction-exposed soils eroding during rainstorms and flowing into nearby water bodies. For water-based activities the most likely source would be from direct disturbance of sediments through activities such as pile-driving, column construction, and temporary barge anchor placement. Other potential risks are spills of pollutants such as fuel and lubricants, and localized changes in water quality from concrete construction and demolition. Construction of the roadway near Montlake and the bridge maintenance facility may temporarily require dewatering of groundwater, but these effects would be localized and temporary.	
Preferred Alternative and Options A and L	The need for dewatering is expected to be relatively minor.
Option K	This option would require substantial excavations for the depressed SPUI with much of it likely to be below the water table. This would require substantial dewatering and the disposal of a large volume of water.
Mitigation	WSDOT would minimize adverse effects on surface water bodies during construction by implementing water quality pollution control measures outlined in the required temporary erosion and sediment control (TESC), spill prevention, control, and countermeasures (SPCC), and concrete containment and disposal (CCDP) plans and by following permit conditions. Potential sedimentation effects during construction would be minimized through the use of appropriate construction best management practices (BMPs). Erosion and sediment control measures could include mulching, matting, and netting; filter fabric fencing; quarry rock entrance mats; sediment traps and ponds; surface water interceptor swales and ditches; and placing construction material stockpiles away from streams. A TESC plan would be prepared and implemented to minimize and control pollution and erosion from stormwater. Erosion and sediment control BMPs would be properly implemented, monitored, and maintained during construction. Groundwater generated from dewatering activities during construction would be stored either in temporary treatment ponds or at the location of the permanent stormwater treatment wetlands or in portable steel tanks. Water would be stored for a sufficient amount of time to allow particles to settle out or could be treated by chemical or mechanical filtration to reduce suspended particles to achieve discharge water quality requirements before the water is discharged to an approved location.
Ecosystems	
The Preferred Alternative and SDEIS options include construction work bridges, work platforms, staging areas, and construction access roads that would have transient effects on wetlands due to vegetation clearing or shading during construction. Option K would have the greatest effect on wetlands during construction. The Preferred Alternative and the SDEIS options would create areas with reduced fish habitat functions, primarily due to increased shading by the work bridges and barges during construction. The Preferred Alternative and SDEIS options would result in the same area of temporary overwater structure in the Portage Bay area (~ 3 acres). Option A would result in the most overwater shading in the west approach area. Option K would result in the overall greatest loss of fish habitat due to the filling for the depressed SPUI. All of the options would result in noise from construction activities that could affect wildlife species by causing stress and altering behavioral patterns. Construction activities could also affect wildlife by removing vegetation and wildlife habitat and increasing shading through the use of work bridges. Although, habitat quality is generally low for the Urban Matrix cover type, some urban-adapted species such as black-capped chickadees, American robins, and eastern gray squirrels would be affected. Option K would result in the greatest loss of wildlife habitat during construction.	

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Wetlands	
Preferred Alternative	Preferred Alternative would fill 0.2 acre of wetland and 3.0 acres of wetland buffer. Preferred Alternative would shade 6.8 acres of wetland and 1.1 acre of wetland buffer.
Option A	Option A would fill 0.6 acre of wetland and 2.8 acres of wetland buffer. Option A would shade 6.4 acres of wetland and 0.2 acre of wetland buffer.
Option K	Option K would fill 1.1 acres of wetland and 3.2 acres of wetland buffer. Option K would shade 8.1 acres of wetland and 0.6 acre of wetland buffer.
Option L	Option L would fill 0.5 acre of wetland and 2.8 acres of wetland buffer. Option L would shade 6.4 acres of wetland and 0.2 acre of wetland buffer.
Mitigation	Mitigation specific to construction effects on wetlands would occur at one or more of the five mitigation sites listed in Section 5.11. The Conceptual Wetland Mitigation Plan (Attachment 9 to this Final EIS) presents wetland mitigation in more detail.
Fish Resources	
Pile-Driving and Loss of Substrate: The Preferred Alternative and SDEIS options would require substantial in-water pile-driving to construct construction work bridges in shallow-water areas that cannot be accessed by barge. The underwater sound levels generated during pile-driving activities can disturb or alter the natural behavior and habitat of fish and other aquatic species and in some instances cause injury or mortality. Option K would require considerably more in-water and over-water construction in the Montlake and west approach areas compared to Options A and L. The depressed SPUI would be constructed below the high-water elevation of the lake. The loss of 2.7 acres of aquatic habitat is considered permanent, so it is not included in the construction effects quantities. The Preferred Alternative and SDEIS options would result in the loss of lake bottom substrate that supports aquatic vegetation as a result of work bridges. In addition to the work bridges, in-water construction would also include installing temporary cofferdams.	
Preferred Alternative	Preferred Alternative would require 3,525 piles and affect approximately 17,625 square feet of substrate.
Option A	Option A would require 2,903 piles and affect approximately 14,525 square feet of substrate.
Option K	Option K would require 3,670 piles and affect approximately 18,350 square feet of substrate.
Option L	Option L would require 2,863 piles and affect approximately 14,315 square feet of substrate.
Shading of Aquatic Habitat: The Preferred Alternative and SDEIS options would increase shading from the work bridges and could reduce the distribution, density, and/or growth rate of aquatic vegetation in the shadow of these structures.	
Preferred Alternative	Preferred Alternative would shade 10.9 acres of aquatic habitat.
Option A	Option A would shade 11.0 acres of aquatic habitat.
Option K	Option K would shade 11.9 acres of aquatic habitat.
Option L	Option L would shade 10.4 acres of aquatic habitat.
Mitigation	The Preferred Alternative and SDEIS options would implement standard overwater and in-water construction and demolition BMPs in accordance with environmental regulatory permit requirements. Specific in-water construction time periods would also be established through the project permitting process to minimize potential effects of pile-driving and other in-water construction activities on aquatic species. During column and bridge construction, contractors would use BMPs (e.g., cofferdams and construction work bridges) to avoid unintentional effects on habitat and water quality. Cofferdams or other appropriate measures would be used to isolate work areas from open-water areas,

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

	particularly for concrete pouring activities, and work bridges would be used to minimize the use of barges in shallow water areas. Bibs would be used to contain falling debris during construction of the new bridge decking and demolition of the existing decking. As noted above, temporary erosion and sediment control measures, a stormwater pollution prevention plan, and a spill prevention, control, and countermeasures plan would be developed and implemented. Appropriate BMPs and sound attenuation methods will be developed in coordination with the regulatory agencies and environmental permitting processes, and implemented to minimize potential effects of pile-driving activities. Temporary project effects that would likely require compensatory mitigation include partial shading and fill from the construction work bridges and falsework, which could increase predator use. Mitigation for these effects would occur at one or more of the seven mitigation sites identified in Section 5.11. The Conceptual Aquatic Mitigation Plan (Attachment 9 to this Final EIS) describes mitigation for aquatic resources effects**.**
Wildlife and Habitat	
Loss of Wildlife Habitat: For the Preferred Alternative and SDEIS options, most vegetation clearing for construction would occur in the west approach area, and Urban Matrix would be the most commonly affected habitat type.	
Preferred Alternative	Preferred Alternative would remove 14.4 acres of wildlife habitat, composed of mostly the Urban Matrix cover type.
Option A	Option A would remove 12.4 acres of wildlife habitat, composed of mostly the Urban Matrix cover type.
Option K	Option K would remove the most wildlife habitat (14.9 acres), composed of mostly the Urban Matrix cover type in the Montlake and west approach areas.
Option L	Option L would remove 14.0 acres of wildlife habitat composed of mostly the Urban Matrix cover type.
Mitigation	WSDOT will continue to work with City of Seattle, University of Washington, and the Arboretum Foundation to develop mitigation planting strategies to offset construction effects on shoreline habitat in Portage Bay and Union Bay.
Geology and Soils	
The Preferred Alternative and SDEIS options would require excavation and grading for cuts and fills, and/or installation of bridge and retaining wall structures. Other than the depressed SPUI and tunnel for Option K, the topographic changes within the corridor would be minor. Dewatering may be required in excavations. Water quality issues could arise from needing to discharge large quantities of sediment-laden water. Dewatering may result in settlement of nearby structures if the water table level is not taken into consideration. The groundwater level is near the surface in many areas, including the Arboretum.	
Preferred Alternative	The Preferred Alternative would result in an estimated 340,000 cubic yards (cy) of excavation and 86,000 cy fill material. The overall constructability risk based on geologic criteria for this option is low to moderate.
Option A	Option A would result in an estimated 340,000 cy of excavation and 86,000 cy fill material. The overall constructability risk based on geologic criteria for this option is low to moderate.
Option K	Option K would result in an estimated 1,300,000 cy of excavation and 320,000 cy of fill material. Deep pile walls would be required for the depressed SPUI and risks from leaks and contamination or settlement of adjacent soils would be greater than the other options. The overall constructability risk based on geologic criteria for this option is moderate to high.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Option L	Option L would result in an estimated 450,000 cy of excavation and 52,000 cy of fill material. The overall constructability risk based on geologic criteria for this option is moderate.
Sequential Excavation Method	The sequential excavation method would require ground freezing, which involves directional drilling ahead of excavation for individual freeze pipes. This method involves some risk of freeze pipe leakage or rupture into the surrounding soil.
Mitigation	The Preferred Alternative and SDEIS options would implement BMPs to prevent erosion including minimizing loss of vegetation, using erosion-control blankets and mulching, street sweeping, use of construction exits that minimize mud tracking, constructing temporary sedimentation ponds, and limiting the area exposed to runoff at any given time Construction techniques will be used to prevent adverse effects on slope and ground stability. For dewatering this may include reinjecting the pumped groundwater between the dewatering wells and the affected facility or using construction methods that do not require dewatering. Effects from ground vibrations could be mitigated by using drilled piles or shafts instead of pile-driving; switching to a different hammer or pre-boring holes before pile-driving; and using cofferdams (for sound attenuation and sedimentation control) or bubble curtains (for sound attenuation) within water bodies.
Hazardous Materials	
The Preferred Alternative and SDEIS options could encounter contaminated soil, sediment, and groundwater; create accidental spills and release hazardous materials; demolish structures that contain hazardous materials; and encounter underground storage tanks. The Preferred Alternative and SDEIS options would affect the following sites: NOAA Northwest Fisheries Center, Montlake 76 station, Seattle Fire Station 22, Miller Street Landfill, and sediments in Lake Washington, Union Bay, and Portage Bay	
Preferred Alternative	No additional effects identified.
Option A	Option A would also affect the Exxon Mobil and Circle K stations.
Option K	Option K may also affect the Montlake Landfill through construction activities occurring within 1,000 feet of this site.
Option L	Option L would also affect the Shell Oil Products station and Village Autocare.
Mitigation	WSDOT would conduct an assessment of sites where contamination may be present to identify the nature and extent of any contaminants. In addition, structures to be demolished would be surveyed to determine whether they contain hazardous building materials like asbestos, lead-based paint, and polychlorinated biphenyls (PCBs). The Preferred Alternative and SDEIS options would also include a comprehensive contingency and hazardous substance management plan and a worker health and safety plan to reduce potential risks to human health. An SPCC plan and a stormwater pollution prevention plan (SWPPP) would be prepared to prevent the release of pollution and hazardous substances to the environment.
Navigation	
The Preferred Alternative and SDEIS options would construct work bridges on both sides of the Portage Bay Bridge and would prohibit the use of recreational vessels such as canoes or kayaks in these areas during construction.	
Preferred Alternative	The Preferred Alternative would require complete closure of the Montlake Cut for two 24-hour periods and two full weekends (total of 6 days) for installation of the bascule bridge.
Option A	Option A would require complete closure of the Montlake Cut for two 24-hour periods and two full weekends (total of 6 days) for installation of the bascule bridge.
Option K	No additional effects.
Option L	Option L would require complete closure of the Montlake Cut for two 24-hour periods and two weekends (total of 6 days) for installation of the bascule bridge.

Table 6.17-1. Summary Comparison of Construction Effects of the Preferred Alternative and SDEIS Options

Mitigation	Construction of the new floating bridge would be staged so that the west and east navigation channels would not be closed on the same days. A “Local Notice to Mariners” would be distributed electronically by the Coast Guard to alert local commercial and recreational boating communities of all construction related closures in Lake Washington and the Montlake Cut. The notice would allow all potentially affected vessels time to relocate temporarily to prevent being blocked during the bridge construction period.

Table 6.17-2. Construction Effects – Quantitative Effects Summary

Element	Type of Effect	Construction Effects[a]			
		Preferred Alternative	Option A	Option K	Option L
6.1 Transportation		Please see qualitative effects summary in Table 6.17-1.			
6.2 Land Use and Economics	Number of jobs during peak year construction	7,683	7,683	12,620	9,526
6.3 Social Elements		Please see qualitative effects summary in Table 6.17-1.			
6.4 Recreation	Parks effects (acres)	7.4	5.9 (0.4)	9.0	6.9
6.5 Visual Quality		Please see qualitative effects summary in Table 6.17-1.			
6.6 Cultural Resources					
6.7 Noise					
6.8 Air Quality					
6.9 Energy and Greenhouse Gases	GHG Emissions (MT CO_2e, in millions)[a]	1,117,000	1,116,000	2,541,000	1,395,000
6.10 Water Resources		Please see qualitative effects summary in Table 6.17-1.			
6.11 Ecosystems	Wetland fill (acres)	0.2	0.6	1.1	0.5
	Wetland buffer fill (acres)	3.0	2.8	3.2	2.8
	Wetland shading (acres)	6.8	6.4	8.1	6.4
	Wetland buffer shading (acres)	1.1	0.2	0.6	0.2
	Lakebed substrate (sq ft)	17,625	14,525	18,350	14,315
	Overwater structures (acres)	10.9	11.0	11.9	10.4
	Vegetation removal (acres)	14.4	12.4	14.9	14.0
6.12 Geology and Soils	Excavation volume (cubic yards)	340,000	340,000	1,300,000	450,000
	Import fill volume (cubic yards)	86,000	86,000	320,000	52,000
6.13 Hazardous Materials	Number of known hazardous materials sites likely encountered during construction[b]	4	6	5	7
6.14 Navigation	Montlake Cut closure duration	Approximately 6 days	Approximately 6 days	No closure anticipated	Approximately 6 days

[a] MT CO_2e = metric tonnes carbon dioxide equivalent
[b] Site count does not include lake bed sediments encountered in Portage Bay, Union Bay, and Lake Washington.

6.18 Effects of Concurrent Construction Projects

During construction of the SR 520, I-5 to Medina project, other planned development and transportation improvement projects would also be under construction. WSDOT examined the potential for construction effects of the SR 520, I-5 to Medina project to overlap in time and vicinity with the construction effects of other projects, producing concurrent construction effects. On the basis of currently available information, WSDOT concluded that three projects on the University of Washington (UW) campus would have the potential to produce concurrent construction effects with the SR 520, I-5 to Medina project. The concurrent construction effects would involve overlapping truck haul traffic on the portion of the SR 520 corridor between I-5 and the SR 520/Montlake Boulevard East interchange. The three projects that would be under construction concurrently with the SR 520, I-5 to Medina project are:

- Sound Transit's UW Station, part of the University Link light rail system, currently under construction adjacent to Husky Stadium, including a pedestrian-bicyclist bridge across Montlake Boulevard NE
- Renovation of the UW Husky Stadium
- Improvements by the UW to the Rainier Vista area of the campus, immediately northwest of the UW Station and Husky Stadium

Construction of the UW Station is currently in progress on a 7-day round-the-clock basis, with most haul traffic occurring at night. The haul route extends north-south along Montlake Boulevard NE/East between the construction site immediately west of Husky Stadium and the SR 520/Montlake Boulevard East interchange. The haul route also extends east-west along the SR 520 corridor between I-5 and the SR 520/Montlake Boulevard East interchange. This project includes construction of a pedestrian-bicyclist bridge from the UW Station across Montlake Boulevard NE to the lower part of Rainier Vista, with bridge construction scheduled to start in mid-2012 and to be completed by mid-2013. Haul traffic required for the pedestrian-bicyclist bridge will be incorporated into the haul traffic system for the UW Station.

Construction haul traffic for UW Station is scheduled for completion by the end of 2015, after which the station will be prepared for light rail operation and its public opening in 2016. The SR 520, I-5 to Medina project preliminary construction schedule does not include haul routes north of the SR 520/Montlake Boulevard East interchange until mid-way through the year 2016, when construction would begin on the new bascule bridge across the Montlake Cut. The schedules for the two projects show that there would not be concurrent haul traffic on Montlake Boulevard East/NE between the SR 520 interchange and the UW Station construction

site. However, there would be concurrent haul traffic along the SR 520 corridor between I-5 and the SR 520/Montlake Boulevard East interchange. This would occur from construction startup of the SR 520, I-5 to Medina project in 2012 until the end of construction haul traffic for the UW Station in 2015.

The UW will renovate Husky Stadium starting in November 2011, completing by August 2013. This project will employ daytime-only haul traffic. From construction startup of the SR 520, I-5 to Medina project in 2012 through August 2013, the Husky Stadium renovation would contribute during daytime hours to concurrent haul traffic along the SR 520 corridor from I-5 to the SR 520/Montlake Boulevard E interchange.

Starting in late 2014 and finishing in late 2015, the UW will construct structural, landscaping, and connectivity improvements to the Rainier Vista area of the campus. The Rainier Vista project is still in planning, and a project description and schedule have not been made final. The project as currently planned will use daytime-only truck hauling, which would be concurrent with SR 520, I-5 to Medina project daytime haul traffic from late 2014 through late 2015. The concurrent haul traffic would occur along the SR 520 corridor from I-5 to the SR 520/Montlake Boulevard East interchange.

All three of these projects, along with the SR 520, I-5 to Medina project, would contribute to concurrent haul traffic along the SR 520 corridor between I-5 and the SR 520/Montlake Boulevard East interchange. The effect would start in 2012 and extend through late 2015. Peaks in concurrent haul traffic volume could occur from mid-2012 through mid-2013 and from late 2014 through late 2015, when two projects in addition to the SR 520, I-5 to Medina project would be under construction at the same time. Haul traffic volumes would depend on the specific construction activities under way and the quantities of materials being hauled to and from the construction sites. Concurrent haul traffic would contribute to general traffic congestion on the SR 520 corridor west of the SR 520/ Montlake Boulevard East interchange. Slowed or idling vehicles would release more contaminants per unit time to the air in comparison with vehicles in freely flowing traffic, producing the potential for a local decrease in air quality along the approximately 0.9-mile affected portion of the SR 520 corridor.

The extent of potential haul-related effects on traffic congestion and air quality cannot be predicted on the basis of currently available information. However, all four of the concurrent construction projects will operate in accordance with construction management plans with requirements for managing and coordinating haul traffic. These include use of off-peak or nighttime hours to minimize traffic congestion and measures to control fugitive dust from truck haul loads. None of the three projects that would

be under construction concurrently with the SR 520, I-5 to Medina project would employ pile-driving.

WSDOT will coordinate with Sound Transit and the UW to minimize project conflicts during construction and to avoid or minimize concurrent construction effects on communities and University of Washington facilities and programs. This coordination effort is underway now and will continue throughout construction of the SR 520, I-5 to Medina project.