Aerial Alternative

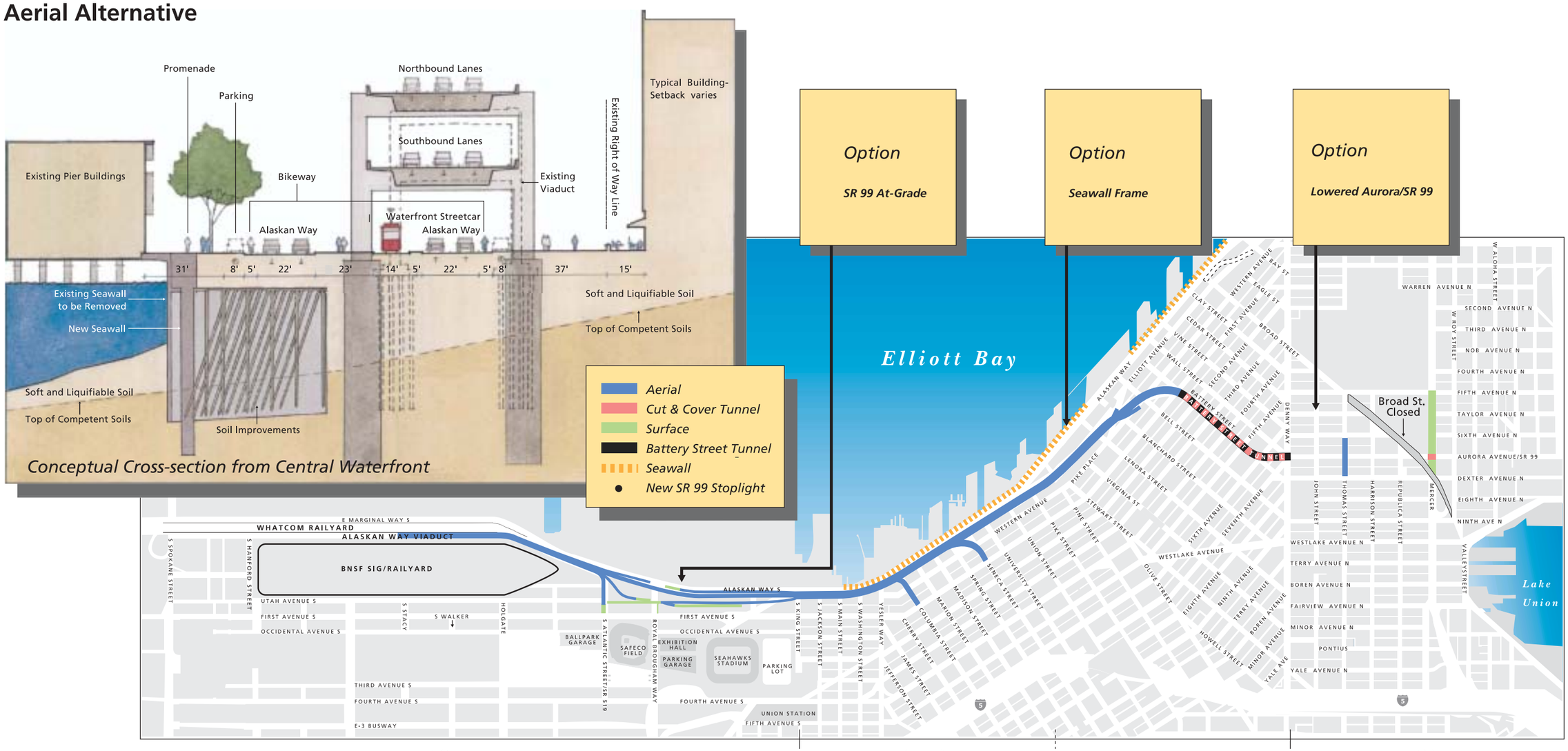


Exhibit 6-1

CHAPTER 6 - AERIAL ALTERNATIVE

1 What is the Aerial Alternative?

How does it replace SR 99 and the viaduct?

The Aerial Alternative includes replacing SR 99 with the following elements as shown in Exhibit 6-1:

- **South** - Replace the viaduct with a new double-level stacked aerial structure. It would be similar to the existing viaduct, but the SR 99 mainline would be approximately 20 feet wider. Replace ramps at First Avenue S. with an interchange connecting SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. The connections to SR 519 would be provided via ramps that would touch down at-grade.
- **Central** - Replace the existing viaduct with an aerial structure. The new structure would have three lanes in each direction from S. King Street up to Pike Street. It would be similar to the existing viaduct; except the SR 99 mainline would be approximately 20 feet wider. Build a new connection between Pike Street and the Battery Street Tunnel. The new connection would have two lanes in each direction and it would be wider than the existing facility. New ramps would be built at Columbia, Seneca, Western, and Elliott. The existing Battery Street ramps would be maintained for only emergency vehicle use.
- **North Waterfront** - Reconstruct the Alaskan Way surface street with four lanes (two lanes in each direction).
- **North** - Improve the Battery Street Tunnel for fire and life safety by adding emergency exits, upgrading electrical systems, adding ventilation, and upgrading the fire suppression system. Widen the Mercer underpass by expanding Mercer Street from four eastbound lanes to a seven-lane, two-way roadway with three lanes in each direction and a center turn lane. Build a new two-lane bridge over Aurora Avenue/SR 99 at Thomas Street, and close Broad Street from Fifth Avenue to Ninth Avenue.

The Aerial Alternative includes several possible options, including:

- **South** - Replace the existing viaduct (SR 99) with an at-grade roadway. Construct a new, elevated interchange to connect SR 99 with SR 519 at S. Atlantic Street and S. Royal Brougham Way (similar to what was described for the Rebuild Alternative).
- **North** - Lower Aurora/SR 99 by approximately 25 feet between Denny Way and Ward Street. Reconnect the street grid over the top of the lowered Aurora by constructing five new bridges at Thomas, Harrison, Republican, Mercer, and Roy Streets. Close Broad Street between Fifth and Ninth Avenues. Retain the existing ramps at Denny Way, but restrict them to transit use only. Construct new northbound and southbound ramps to and from Mercer and Roy Streets connecting to Aurora/SR 99.

How would it replace the seawall?

The proposed seawall replacement is the same for the Aerial Alternative as what is proposed for the Rebuild Alternative. For the Aerial Alternative, the seawall would be replaced with drilled shafts and improved soils from S. Washington Street up to Bay Street as shown in Exhibit 6-1.[1] The liquefiable soils behind the seawall and under the relieving platform would be improved by strengthening them with cement grout. Similarly, a small section of existing sheet pile wall from near S. King Street to S. Washington Street would be removed and replaced with improved soils and drilled shafts. In some areas along the seawall, drilled shafts may not be needed and the soils would only be improved.

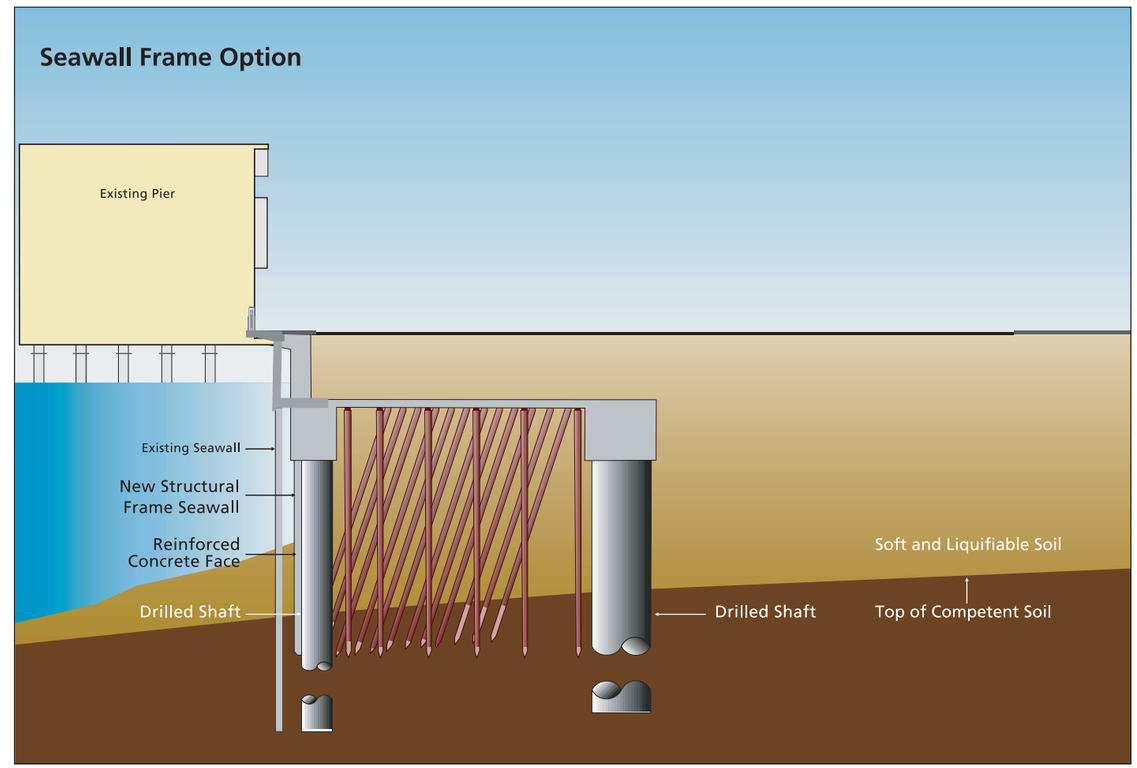


Exhibit 6-2

Another possibility is that the seawall could be replaced with the Seawall Frame option as shown in Exhibit 6-2. For the Seawall Frame option, a continuous wall of drilled shafts would be constructed behind the existing seawall, and a row of drilled shafts would be installed 30 to 60 feet east of the pile

Appendix B contains additional information describing the Aerial Alternative.

[1]No seawall work is required for any of the alternatives between Blanchard and Battery Streets adjacent to the Bell Harbor International Conference Center.

wall. A concrete beam would connect the drilled shafts, forming a frame.

2 How would the Aerial Alternative be built?

The construction steps described below are preliminary and they may change based on additional project design.

Construction of this alternative would begin by relocating utilities. Next, the seawall would be replaced and a temporary single-level viaduct would be built over the existing Alaskan Way surface street. Traffic would be routed from the old viaduct onto the new temporary structure. A small section of the new south end aerial structure would be built from S. Stacy Street to S. Royal Brougham Way. Improvements associated with the Widened Mercer Underpass in the north end would be constructed, and traffic detours on Broad Street would be established.

Next, the southbound section of the old viaduct between Pike Street and the Battery Street Tunnel would be torn down and a new aerial structure would be built. The southbound half of the Battery Street Tunnel would be improved with new exits, electrical systems, ventilation, and an improved fire suppression system.

After that, the viaduct would be torn down and the new aerial viaduct would be built from S. Royal Brougham Way up to the Battery Street Tunnel. The northbound half of the Battery Street Tunnel would be improved with new exits, electrical systems, ventilation, and an improved fire suppression system.

Finally, the temporary viaduct along the waterfront would be removed, utilities would be placed in their final locations, the Alaskan Way surface street would be rebuilt, and traffic would be routed to its permanent locations. Additional information about construction is provided in Chapter 10.

3 How would the Aerial Alternative change access?

How would it change vehicle access in the south?

Currently in the south end, SR 99 has a southbound off-ramp and a northbound on-ramp connecting at First Avenue S. near Railroad Way S. The Aerial Alternative would replace the First Avenue S. ramps with an interchange that would descend from the new aerial SR 99 structure to meet with existing streets. The interchange would connect SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. It would improve access in the south end by adding ramps that would provide connections to the stadiums and SR 519, which connects to I-90. Traffic movements provided by the new ramps would include:

- Northbound off from SR 99 to S. Atlantic Street and S. Royal Brougham Way.
- Northbound on from S. Royal Brougham Way to SR 99.
- Southbound on from S. Royal Brougham Way to SR 99.
- Southbound off from SR 99 to S. Royal Brougham Way.

The option to build SR 99 at-grade is similar to that described for the Rebuild Alternative. If this option were built, the First Avenue S. ramps would be removed and replaced with an elevated interchange connecting SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. The ramp connections proposed with this option include the following movements:

- Northbound off from SR 99 to S. Atlantic Street and S. Royal Brougham Way.
- Northbound on from S. Royal Brougham Way to SR 99.
- Southbound on from E. Marginal Way to SR 99.
- Southbound off from SR 99 to S. Atlantic Street and S. Royal Brougham Way.

How would it change railroad access?

The Aerial Alternative would not require any changes to the Burlington Northern Santa Fe (BNSF) Seattle International Gateway (SIG) Rail Yard or the tail track. There would also be no permanent changes to the Whatcom Rail Yard; however, it would be removed during construction and replaced once construction was completed.

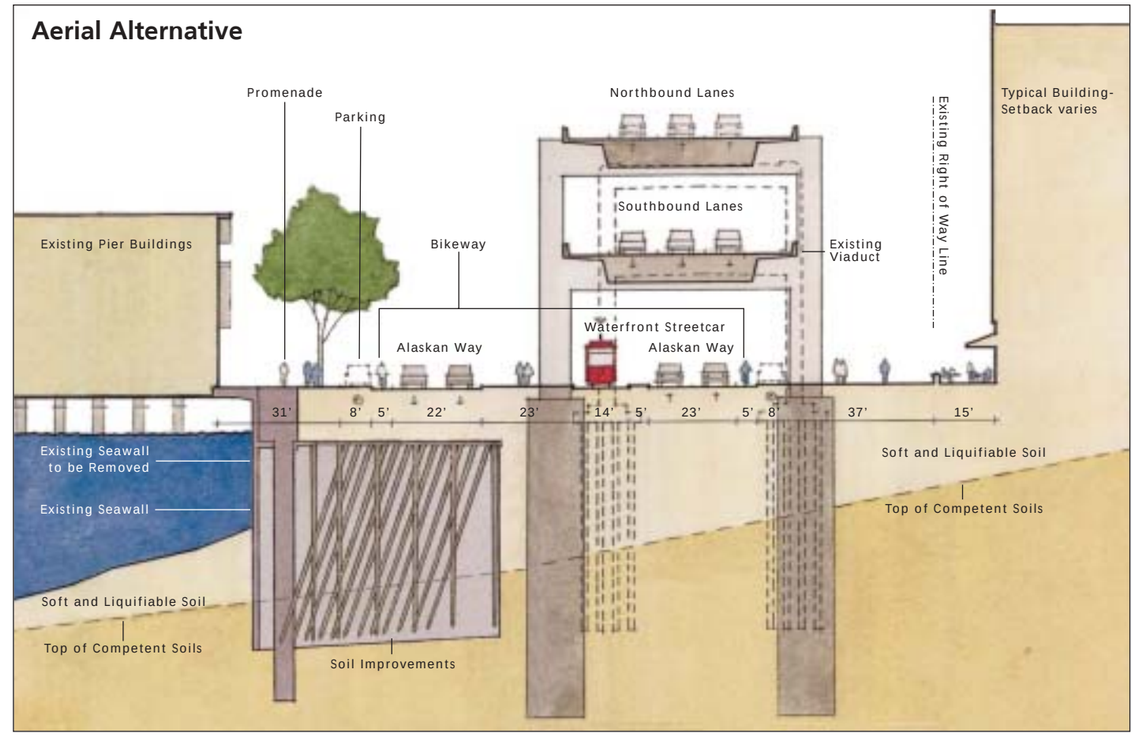


Exhibit 6-3

If the option to replace SR 99 with an at-grade roadway were selected, railroad access in the south end of the project area would change and be similar to what was discussed for the Rebuild Alternative. The new at-grade SR 99 would be built west of the existing viaduct where the Whatcom Rail Yard is currently located. As a result, the Whatcom Rail Yard would be removed and the BNSF SIG Rail Yard, located to the west of SR 99, would be expanded and reconfigured to include the relocated Whatcom Rail Yard tracks.

In addition, with the option, the tail track would need to be moved from the west side of SR 99 to the east side of SR 99. The tail track would extend from the reconfigured BNSF SIG Rail Yard to just south of Railroad Way S.

Preliminary engineering drawings of this alternative are contained in Appendix W.

How can soil be improved or strengthened?

Soil can be strengthened by mixing it with cement grout. Construction methods that may be used to strengthen soil for this project are described in more detail in Chapter 10.

Appendix C contains additional details about transportation.

How would it change vehicle access for ferries?

People driving to the ferry get there via Alaskan Way surface street, often by taking a left at Yesler Way. When Colman Dock is full, drivers wait for the ferry under the viaduct south of Railroad Way S. Drivers leaving Colman Dock use Marion Street or Alaskan Way. The Aerial Alternative would not change ferry access locations or ferry queuing areas from existing conditions.

However, a new over-water pier would be constructed between S. Washington Street and Yesler Way. The pier would be needed during construction to maintain ferry access and egress. During construction, a roadway would be built for ferry traffic. The pier could also accommodate construction staging activities. Once the project was built, the new pier could provide new shoreline access to pedestrians and bicyclists, and it would provide space to relocate the historic Washington Street Boat Landing.

If the option to build SR 99 at-grade were constructed with the Aerial Alternative, ferry access locations and ferry queuing areas would change. With this option, the viaduct would be removed and replaced with an at-grade roadway south of Yesler Way. Therefore, the existing ferry holding area under the viaduct would need to be relocated. Ferry holding could be provided east of SR 99 near S. Royal Brougham Way or west of SR 99 on part of Terminal 46, just south of S. King Street. With either of these ferry holding locations, traffic flow would be improved for both Alaskan Way surface street traffic and ferry traffic by building a separate roadway connecting the holding area to Colman Dock. Improved traffic flow at Colman Dock could also make ferry loading and unloading operations more efficient.

With this option, the separate ferry access roadway would be built on a new over-water pier between S. Washington Street and Yesler Way. Drivers would get to Colman Dock using S. King Street and the new ferry access roadway. Drivers leaving Colman Dock would be able to exit where they do now at Marion Street or Alaskan Way, or they could exit using the roadway to S. King Street.

As previously described, the new ferry access road and over-water pier are needed for some additional reasons. The new pier would provide space to relocate the historic Washington Street Boat Landing, and it could provide new shoreline access to pedestrians and bicyclists. During construction, the roadway and pier would be needed to maintain ferry access and egress. They could also accommodate construction staging activities.

How would it change vehicle access into or out of downtown?

There would be some minor changes for drivers traveling into and out of downtown. On the south end, a new interchange at S. Atlantic Street and S. Royal Brougham Way would offer drivers a new way into or out of the south downtown area. The ramps at Columbia, Seneca, Elliott, and Western would remain in their current locations, so drivers would not notice much of a change compared with what is there today. The Battery Street ramps would be closed to general traffic, but they would remain open for emergency vehicles.

How would it change the Alaskan Way surface street for vehicles?

The Alaskan Way surface street would be rebuilt with four lanes (two lanes in each direction). The configuration would change in the central section of the project area and would likely be similar to what is shown in Exhibit 6-3. Instead of having four lanes directly adjacent to the waterfront, two southbound lanes would be provided along the waterfront and two northbound lanes would be located east of the waterfront under the new viaduct. This configuration would allow for expanded pedestrian walkways. Some parallel parking would be provided throughout the corridor, though parking under the viaduct would be removed.

How would the Battery Street Tunnel change?

Fire and life safety conditions in the Battery Street Tunnel would be improved by adding emergency exits, upgrading electrical systems, adding ventilation, and upgrading the fire suppression system.

How would it change vehicle access north of the Battery Street Tunnel?

Connections north of the Battery Street Tunnel are important for traffic detours during construction. For the Aerial Alternative, the Battery Street Tunnel would be upgraded and a new aerial connection between Pike Street and the Battery Street Tunnel would be built. During construction of these improvements, traffic along this section of SR 99 would need to be detoured. Improvements to Mercer Street and other streets north of the Battery Street Tunnel would allow these streets to handle the additional traffic. After construction, these north end improvements would provide long-term benefits that are described below.

In the north end, Mercer Street would be widened from four eastbound lanes to a two-way, seven-lane street. Mercer would have three lanes in each direction and a center turn lane between Fifth and Dexter Avenues. In addition, a two-lane bridge would be built over Aurora/SR 99 at Thomas Street. During construction, the Mercer Street and Thomas Street improvements would change traffic flow in the north end to allow southbound SR 99 traffic to be detoured onto Broad Street. Once construction is completed, existing ramps to Mercer and Broad Streets would be removed and Broad Street could be closed between Fifth and Ninth Avenues, allowing for more streets to be reconnected. After construction, the Mercer Street and Thomas Street upgrades would improve east-west circulation in the South Lake Union and Uptown neighborhoods. East-west connections for vehicles, bicyclists, and pedestrians in the north end are constrained by Aurora/SR 99 because it cuts off the street grid.

The Lowered Aurora/SR 99 option is another approach that could be built in the north end. This option would reconnect the street grid at Thomas, Harrison, and Republican Streets. This option would help facilitate the movement of east-west traffic, which is currently constrained.

What is the tail track?

The tail track is a single railroad track that connects the Burlington Northern Santa Fe (BNSF) Seattle International Gateway (SIG) Rail Yard on the east side of SR 99 to the Whatcom Rail Yard located west of SR 99..

The tail track is used to assemble and sort railcars for both the Whatcom and BNSF SIG Rail Yards.

This option proposes to lower the Aurora/SR 99 mainline and construct five new bridges across Aurora/SR 99 at Thomas, Harrison, Republican, Mercer, and Roy Streets. The existing ramps at Denny Way would be retained, but restricted to transit use only. New northbound and southbound ramps providing access to and from Mercer and Roy Streets would be built connecting to Aurora/SR 99. Broad Street would be closed from Fifth to Ninth Avenues, allowing the street grid to be reconnected. These improvements would improve east-west circulation in the South Lake Union and Uptown neighborhoods for vehicles, pedestrians, and bicyclists. Currently, Aurora/SR 99 cuts off the street grid and constrains east-west movements.

How would it change bicycle access?

The Aerial Alternative would change bicycle access by modifying the location of the Waterfront Trail. The existing Waterfront Trail begins at S. Royal Brougham Way and runs along the east of side of E. Marginal Way/Alaskan Way to Bell Street. It is separated from the Alaskan Way surface street and is shared by bicyclists and pedestrians. The separated, shared path would be extended south from S. Royal Brougham Way to just south of S. Atlantic Street. From S. Atlantic Street to S. King Street, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. Between S. King Street and Pine Street, the Waterfront Trail would be replaced with striped bicycle lanes along each side of the Alaskan Way surface street. The northbound bicycle lanes in this section of the corridor might be located under the new aerial viaduct as opposed to adjacent to it, while southbound lanes might be located beneath the aerial structure for about a two-block distance between S. Jackson and S. Washington Streets. North of Pine Street, cyclists would be routed back to the Waterfront Trail, which would be located in its present location on the east side of Alaskan Way.

How would it change pedestrian access?

As with bicycle access, the Aerial Alternative would change pedestrian access by modifying the location of the Waterfront Trail. Additionally, sidewalks and a promenade would be added in parts of the project corridor. The separated, shared path would be extended south from S. Royal Brougham Way to just south of S. Atlantic Street. From S. Atlantic Street to S. King Street, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. In the SR 519 area, pedestrian access would be maintained and connections under the elevated SR 99 structure would be provided.

Between S. King Street and Yesler Way, the Waterfront Trail could be replaced with sidewalks on either side of the Alaskan Way surface street. At Yesler Way, sidewalks on the west side of Alaskan Way would broaden and merge with the waterfront promenade, which would continue on to Pine Street. North of Pine Street, pedestrians could walk on either the waterfront promenade on the west side of Alaskan Way or the Waterfront Trail on the east side of Alaskan Way.

All of the alternatives would add a new over-water pier connecting Pier 48 near the end of S. Washington Street with the Colman Dock Ferry Terminal. The pier would accommodate pedestrians on its waterside edge. In addition, for all alternatives, a pedestrian bridge may be added over the Alaskan Way surface street connecting the Colman Dock Ferry Terminal near Madison Street. The existing pedestrian bridge for people traveling to and from the Ferry Terminal at Marion Street would be rebuilt near its existing location.

North of the Battery Street Tunnel, a bridge would be added at Thomas Street across SR 99. This bridge would have sidewalks on both sides, which would add a new east-west route for pedestrians in the South Lake Union area. In addition, the existing sidewalks on both sides of Mercer Street would be widened in some areas, which would improve conditions for pedestrians.

Aerial Alternative Travel Times

During the PM Peak

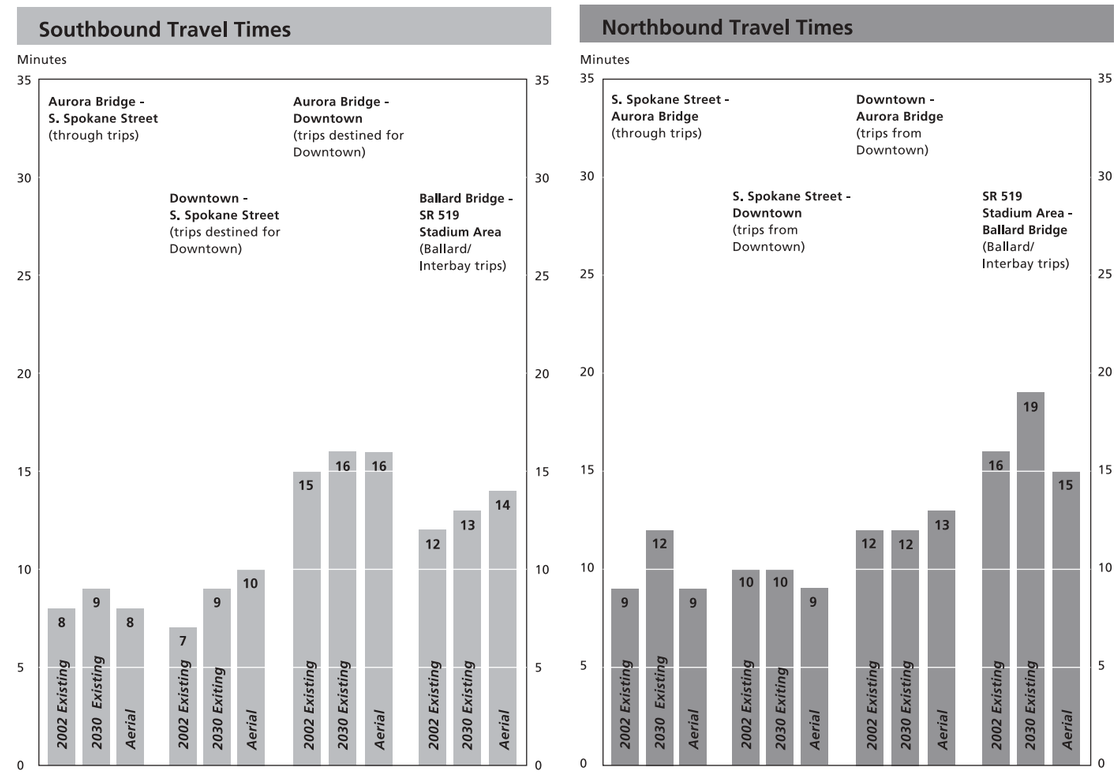


Exhibit 6-5

4 How would the Aerial Alternative affect travel times and traffic flow?

How would daily traffic patterns and volumes on SR 99 change with the Aerial Alternative?

In the central section of SR 99 where traffic volumes are the highest, daily traffic is expected to peak at 129,000 vehicles per day compared with 126,000 vehicles per day for the existing facility in 2030. For the most part, travel patterns and volumes would not change much over existing conditions if the Aerial Alternative were built.

What is the "year 2030 existing facility" and why is it evaluated?

The year 2030 existing facility shows how much traffic is projected to use the existing SR 99 facility in the year 2030. It takes into account future population growth and other funded transportation projects such as Monorail and Link light rail. It assumes that the viaduct would remain in the year 2030 in its existing condition. We know it is unlikely that the viaduct will last until 2030. However, the information provides a baseline that can be compared with traffic conditions for the proposed alternatives.

With the Aerial Alternative, the number of hours that the SR 99 mainline would be congested is comparable to the year 2030 existing facility as shown in Exhibit 6-4.

Exhibit 6-4

Daily Hours of Congested Operations on the SR 99 Mainline

	2002 Existing	*2030 Existing Facility*	*Aerial*
Southbound	<1	3	3
Northbound	<1	4	4

In the south end of the project area, mainline SR 99 traffic volumes and ramp volumes are expected to increase due to improved access between SR 99 and SR 519 (S. Atlantic Street and S. Royal Brougham Way). This traffic increase is not expected to affect operations on SR 99 in the south because there would be adequate roadway capacity to accommodate the trips.

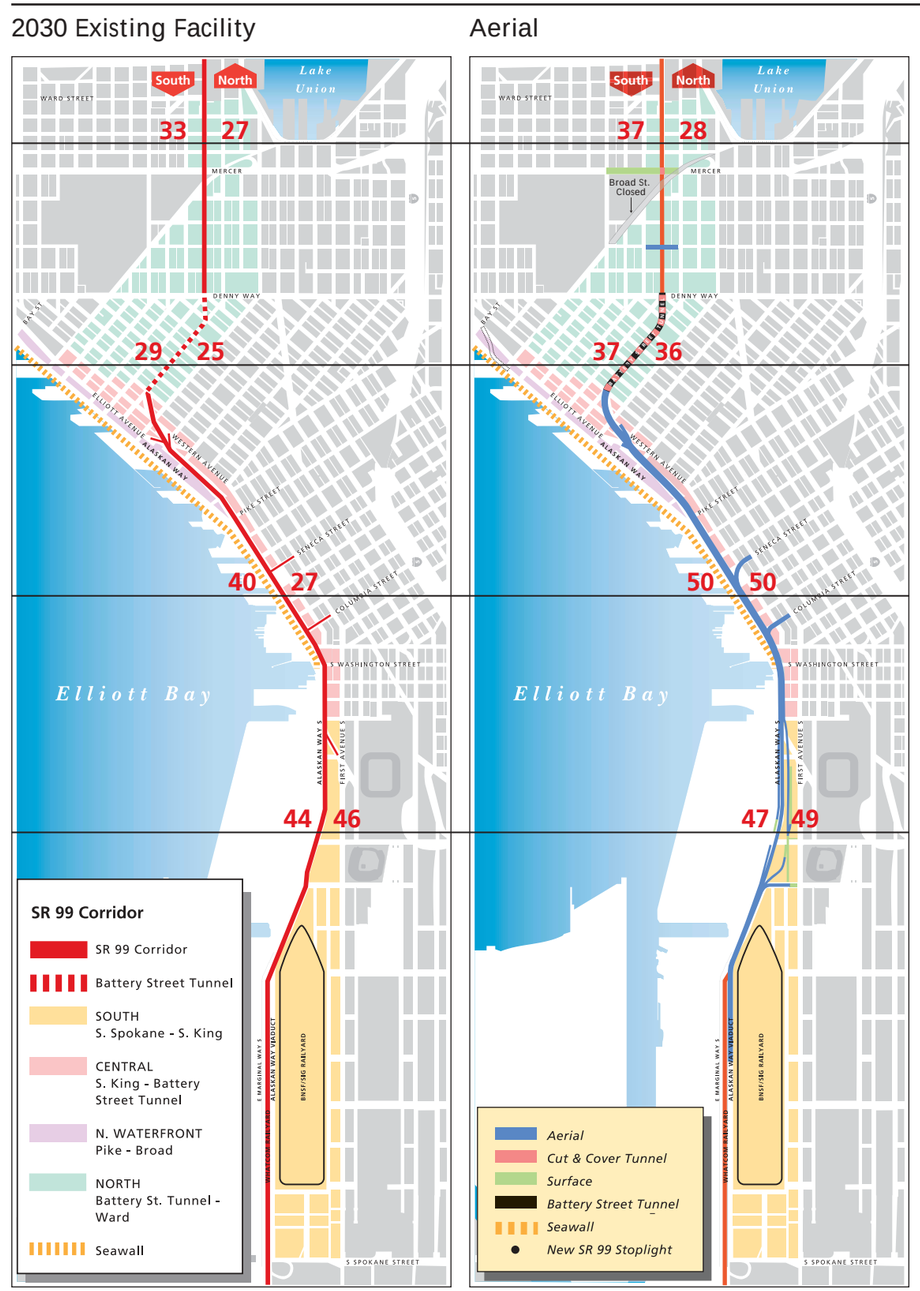
In the central section, similar traffic volumes are expected on the SR 99 mainline and at ramps at Columbia, Seneca, Elliott, and Western. The Battery Street northbound on-ramp and southbound off-ramp would be closed to general traffic. As a result, the number of drivers that would use the northbound Denny Way on-ramp is expected to increase during the late afternoon commute. Consequently, the volume of traffic headed northbound in the Battery Street Tunnel would slightly decrease.

How would travel times and travel speeds change on SR 99 with the Aerial Alternative?

If the Aerial Alternative were built, travel times would be comparable or slightly improved compared to what is expected for the existing facility in 2030. Exhibit 6-5 shows southbound and northbound travel times for four common trips on SR 99 during the late afternoon commute. The Aerial Alternative would slightly reduce northbound travel times for trips traveling through downtown between S. Spokane Street and the Aurora Bridge and SR 519 and the Ballard Bridge. These travel times would improve because the northbound on-ramp at Battery Street would be

Average Traffic Speeds

During the PM Peak



Southbound SR 99 Speeds

During the PM Peak Hour

Shown as miles per hour

SR 99 Section	*2002 Existing*	*2030 Existing*	*Aerial*
South Lake Union Area	39	33	37
Battery Street Tunnel	34	29	37
Downtown	41	40	50
Stadium Area	44	44	47

Northbound SR 99 Speeds

During the PM Peak Hour

Shown as miles per hour

SR 99 Section	*2002 Existing*	*2030 Existing*	*Aerial*
South Lake Union Area	33	27	28
Battery Street Tunnel	33	25	36
Downtown	39	27	50
Stadium Area	46	46	49

How are congested operations on SR 99 defined?

The number of hours SR 99 would be congested was estimated by determining how long the busiest sections of SR 99 would be expected to have regular traffic slow downs or stop and go traffic.

What is the PM Peak Hour and why is traffic data analyzed for the PM Peak?

The PM Peak Hour is the time period when traffic is heaviest during the late afternoon commute. For SR 99, the PM Peak Hour occurs from 4:00 to 5:00 p.m. For this project, PM Peak data was evaluated because overall traffic conditions in and around the project area are the most congested during that time of day.

Exhibit 6-6

closed, which would improve safety and traffic flow. Travel times in the southbound direction would be comparable to those for the 2030 existing facility.

Average traffic speeds for the Aerial Alternative would improve in all areas of the AWV Corridor compared with 2030 conditions for the existing facility as shown in Exhibit 6-6. Average traffic speeds would increase the most for northbound traffic traveling north from downtown through the Battery Street Tunnel. Through downtown, northbound traffic speeds are expected to increase from 27 miles per hour for the 2030 existing facility to 50 miles per hour for the Aerial Alternative. Average northbound speeds through the Battery Street Tunnel are expected to increase from 25 miles per hour to 36 miles per hour. Similarly, average traffic speeds would increase for southbound traffic traveling through the Battery Street Tunnel and downtown. Increased traffic speeds through downtown and the Battery Street Tunnel would occur because the Battery Street ramps would be closed, which would improve traffic operations. Speeds throughout the corridor would also improve because the roadway would be wider than the existing facility, making it easier for people to drive.

How would local streets and intersections operate?

Traffic on local streets and delay at intersections would not substantially change in the south, central, and north waterfront areas if the Aerial Alternative is built as shown in Exhibit 6-7. Delay at intersections is expected to increase in the north end of the project area.

In the south, intersections at First Avenue S. and S. Royal Brougham Way and First Avenue S. and S. Atlantic Street would slightly improve from highly congested conditions to congested conditions. Conditions at these intersections would improve because fewer drivers would need to turn to connect with SR 519. Also, the new interchange would distribute traffic between two streets, compared with the existing facility that distributes traffic at only one street (First Avenue S.).

In the downtown area, there would be a modest reduction in delay at intersections due to a slight reduction in traffic on downtown streets. Slightly less congestion is expected for the Aerial Alternative at the intersections of Second Avenue and Madison Street and the intersection of Western Avenue and Wall Street.

In the north end, the Aerial Alternative would have more congested intersections than the 2030 existing facility. The Aerial Alternative proposes to widen Mercer Street and convert it to a two-way street between Fifth Avenue and Dexter Avenue. At the intersections of Mercer Street/Fifth Avenue and Mercer Street/Dexter Avenue, Mercer would transition back to a one-way street. Congestion is expected to increase near the areas where Mercer converts from a two-way street to a one-way street (see Exhibit 6-7). Congestion projected in this area could get better if improvements beyond the limits of this project were made. The City of Seattle is currently studying several alternatives to improve the roadway network in the South Lake Union area as a separate project. Improvements to the roadway network in the South Lake Union area are not necessary for north end improvements proposed as part of the Alaskan Way Viaduct and Seawall Replacement Project.

At first glance, it may seem that the Mercer Street improvements provide little benefit to the area since congestion would increase at a few north end intersections. However, what is not captured by the intersection analysis is the fact that the north end improvements would increase east-west mobility across SR 99, which is currently constrained. Also, the north end improvements could help reduce congestion during construction.

How would traffic volumes change on the Alaskan Way surface street?

For the Aerial Alternative, traffic flow on the Alaskan Way surface street is not expected to change much over existing conditions. Daily traffic volumes are expected to be about 10,000 vehicles per day, which is about 1,000 vehicles less than what is predicted with the existing facility in 2030.

Aerial Alternative Congested Intersections

During the PM Peak

2030 Existing Facility **Aerial**

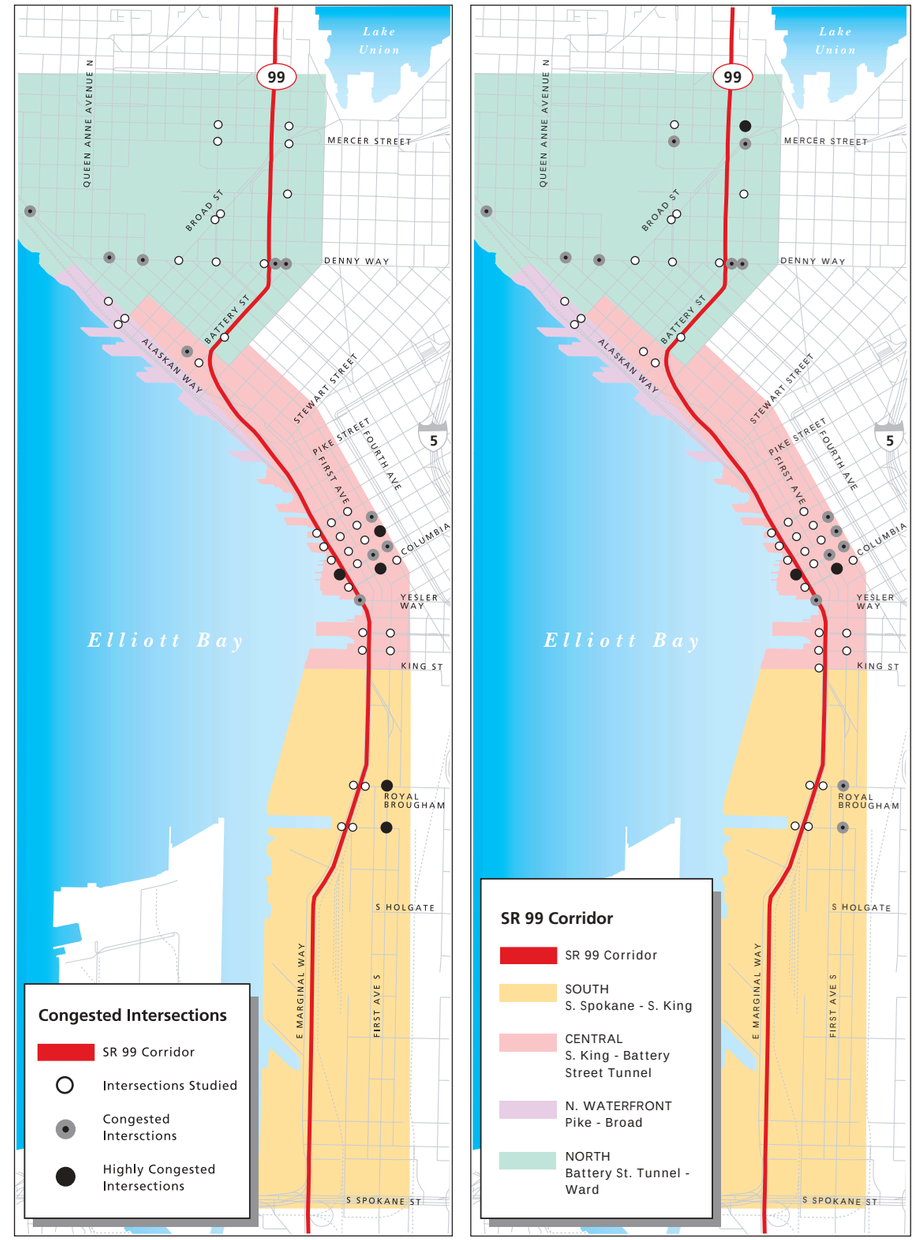


Exhibit 6-7

Would traffic on other parallel city streets change?

Traffic volumes on other city streets are not expected to change much if the Aerial Alternative is constructed. In the south end, fewer drivers are expected to use parallel city streets due to new connections to SR 519 at S. Atlantic Street and S. Royal Brougham Way.

In the north end of the project area, more drivers are expected to use city streets. This shift is mostly expected due to new city street connections at Thomas and Mercer Streets, which would improve access across SR 99.

Would the Aerial Alternative affect traffic volumes on I-5?

The Aerial Alternative is not expected to affect traffic volumes on I-5.

How would the options affect traffic conditions if they were built instead of the alternative?

The Aerial Alternative includes options in the south and north sections. These could become part of the preferred alternative in the Final EIS. In brief, here's how they would affect traffic:

- **In the south end** - The option to build SR 99 at-grade with aerial connections to SR 519 would operate similarly to what is described for the Rebuild Alternative in the south end.
- **In the north end** - If the Lowered Aurora/SR 99 option were constructed, SR 99 operations and safety would improve somewhat because side street connections would be eliminated. In addition, east-west mobility in this area would be improved by adding connections across Aurora/SR 99 at Thomas, Harrison, and Republican Streets.

5 **How would the Aerial Alternative change conditions for freight and transit?**

How would the Aerial Alternative change conditions for freight?

Freight access, travel times, and travel speeds would improve compared with the existing facility in 2030. A new interchange would be built at S. Atlantic Street and S. Royal Brougham Way, which would improve access between SR 99 and SR 519. This interchange would improve freight connections between the Duwamish industrial area, Harbor Island, SR 519, and I-90.

Freight access, travel times, and travel speeds would improve compared with the existing facility in 2030. A new interchange would be built at S. Atlantic Street and S. Royal Brougham Way, which would improve access between SR 99 and SR 519. This interchange would improve freight connections between the Duwamish industrial area, Harbor Island, SR 519, and I-90.

In addition, travel times would improve in the northbound direction compared to the existing facility in 2030. For example, travel time between SR 519 and the Ballard Bridge would be reduced from 19 minutes to 15 minutes for traffic heading northbound. Also, speeds would be improved for northbound and southbound traffic throughout the corridor. Improved travel times and speeds benefit all vehicles, including freight. Travel times and speeds are expected to improve because ramp connections would be changed and the roadway and ramps would be wider than the existing facility, making it easier for people to drive on them.

Finally, due to the viaduct's deteriorating condition, speeds for large vehicles over 10,000 pounds are currently restricted to 40 miles per hour (10 miles below the speed limit for other vehicles). Large vehicles also must use only the right lanes of the viaduct. These restrictions would be removed once the viaduct and seawall are replaced, which would benefit both freight and transit.

How would the Aerial Alternative change transit conditions?

Conditions for transit are expected to be similar to existing conditions. Buses could continue to reach downtown from Columbia and Seneca Streets and Denny Way as they do now. Using these established routes, average travel speeds would improve in all sections of the corridor compared to the 2030 existing facility. Travel times for various trips would improve or be comparable to the 2030 existing facility. For example, the southbound trip from downtown to S. Spokane Street would take 9 minutes for both the Aerial Alternative and the year 2030 existing facility. This trip represents the route that buses travel during the PM Peak between downtown and West Seattle.

Conditions for bus transit would improve because speed and lane restrictions currently in effect for large vehicles (including buses) would be removed once the viaduct was rebuilt. Also, the SR 99 roadway and ramps would be wider than the existing facility, which would make it easier for bus operators to drive. Finally, bus transit providers could decide to change their routes by entering downtown via the new S. Atlantic Street/S. Royal Brougham Way ramps. This would increase transit times to the downtown area, but would allow buses to access the entire Fourth Avenue corridor, thereby expanding services to growing employment centers in the International District and Pioneer Square area. Please note, if buses were routed to the SR 519 ramps, transit would be subject to traffic congestion in the stadium area during events unless alternate routes were developed.

The lead agencies are committed to improving other transportation options in the corridor as part of this project, particularly as part of construction. A Flexible Transportation Package has been developed that includes several different programs and tools to respond to varying needs in the corridor. Most of the tools are designed to decrease reliance on single-occupancy vehicles and increase other modes of transportation during construction of the project, though some investments would provide long-term benefits once the project was completed. The range of programs that could be implemented to provide long-term benefits includes implementing parking strategies to decrease long-term parking in the area and installing traffic management and transit priority systems. A more defined Flexible Transportation Package will be presented in the Final EIS as part of the preferred alternative.

Chapter 10 and Appendix B contain additional details about tools proposed for the Flexible Transportation Package.

What are congested and highly congested intersections?

Congested intersections are intersections that cause drivers considerable delay. A driver might wait between one and two minutes to get through a traffic signal at a congested intersection. At a highly congested intersection, a driver might wait two minutes or more to get through the traffic signal.

6 How would the Aerial Alternative improve roadway safety?

The Aerial Alternative would improve roadway safety over existing conditions. The existing, deteriorating structure would be entirely removed and replaced with a new aerial structure from S. Holgate Street up to the Battery Street Tunnel. This reduces seismic and other risks associated with the aging structure. The new structure would have substantially wider lanes and shoulders than the existing viaduct, making it easier for people to drive. The ramps at First Avenue S. would be replaced with new ramps at S. Atlantic Street and S. Royal Brougham Way with increased lengths and widths. In addition, the new structure of the viaduct from Yesler Way up to near Pike Street would have wider lanes and shoulders, further improving roadway safety. The new ramps to Columbia, Seneca, Elliott, and Western would have gentler grades, making them easier to drive. The Battery Street ramps would be closed to general traffic, which is expected to reduce accidents at these locations.

North of the Battery Street Tunnel, the Widened Mercer Underpass and new Thomas Street bridge would provide new pathways for pedestrians to safely cross this section of SR 99. The Lowered Aurora/SR 99 option would further increase the number of new pathways.

7 How would the Aerial Alternative affect parking?

There are 2,038 parking spaces located in the project area. As shown in Exhibit 6-8, a total of about 360 parking spaces would be removed with the Aerial Alternative between the south end and the north waterfront area. An additional 40 spaces would be removed in the north end due to the improvements associated with the Widened Mercer Underpass.

Exhibit 6-8

Parking Changes for the Aerial Alternative

	Short-Term[1]	Long Term[2]	Off-Street[3]	Total
Existing Parking Spaces	814	276	900	2,038
South End	+147	-211	-57	-121
Pioneer Square	-75	-15	+2	-88
Central Waterfront	-158	0	+1	-157
North Waterfront	+2	0	+4	+6
Net Change	**-84**	**-226**	**-50**	**-360**
Parking Spaces with the Aerial Alternative	**750**	**50**	**850**	**1,678**

[1] Short-term metered parking spaces
[2] Free, long-term parking spaces
[3] Pay parking and tenant only parking

The majority of parking spaces that would be removed are free, long-term spaces located in the south section of the project area. However, 147 short-term spaces would be gained. This project does not currently propose to replace these long-term parking spaces because there is enough long-term parking available in the project area. People currently parking for free would need to pay to park, or they would need to use transit. According to the Puget Sound Regional Council's 2002 parking inventory study, 46.6 percent of parking spaces in the south end are utilized. There are more than five parking facilities in this area providing more than 6,000 parking spaces. Using the estimated parking utilization rate in this area, approximately 2,800 spaces are available in this area on a normal business day.

In the Pioneer Square area, 75 short-term parking spaces would be removed and an additional 158 short-term spaces would be removed along the central waterfront. These spaces would be removed because the Alaskan Way surface street would relocated partially to the area under the new viaduct, which would require displace parking. Many businesses in these areas, particularly retail shops, restaurants, and tourist destinations, rely on short-term parking for customer and user access. Some parking mitigation options have been identified:

- Increase utilization of other existing parking facilities in the area.
- Lease an existing parking facility and convert it to short-term parking.

Aerial Alternative Simulation
at Yesler Way

Exhibit 6-9

- Purchase property and build new short-term parking.

A formal parking mitigation strategy for short-term parking losses in the Pioneer Square area and along the central waterfront will be developed and presented in the Final EIS. In the north end, parking lots in the area have available capacity to help offset the loss of 40 parking spaces, so mitigation is not proposed.

If the options on either the south or north end were constructed as part of the Aerial Alternative, the number of parking spaces removed would change in the south end and the north end of the project area. In the south end, the number of spaces removed would increase compared with the numbers presented in Exhibit 6-8. Some additional long-term parking spaces would likely be required for construction of the

option. Also, there could still be a slight gain in the number of short-term parking spaces available; however, the potential number of spaces gained would be less than the 147 gained if SR 99 is an aerial structure. Finally, no spaces would be removed in the north end of the project area if Aurora/SR 99 were lowered.

8 If the Aerial Alternative were built, what would it look like?

The aerial structure itself would be different from the existing viaduct in several ways. It would be one and a half times as wide as the existing viaduct, it would be about 7 feet taller, it would have solid traffic barrier instead of open railings, and it would have fewer vertical columns because they would be spaced almost twice as far apart as those on the existing viaduct. The corridor would look about the same as it does now, with a few exceptions that would affect primarily the central waterfront.

The wider structure would increase areas that would be in shadow. Because the edge of the structure would be closer to the waterfront than that of the existing viaduct, it would block downtown skyline views more and would be more of a general visual presence. Between S. King Street and Yesler Way, the elevated structure would be moved to the west, likely changing the character of the waterfront alongside it. Because it would be wider and taller than the existing viaduct, the Aerial Alternative would be a more prominent part of views from buildings and public spaces at the same level as the elevated structure or above, like the Harbor Steps, Victor Steinbrueck Park, and steep west-facing streets and sidewalks in the commercial core. Westward views in parts of Pioneer Square Historic District, the commercial core, and Belltown that are adjacent to the viaduct's east side would continue to be dominated by the viaduct. A benefit of this alternative is that wider spacing of vertical support columns and fewer columns overall would reduce view blockage and visual clutter beneath the elevated structure.

In the north-most part of the corridor, on SR 99 north of Battery Street Tunnel, the overall character of the area would not be affected by this alternative. Views from the elevated structure would not be noticeably different than the ones appreciated by motorists today.

9 How would noise or vibration levels change?

Compared to existing traffic noise levels, noise from the Aerial Alternative would change only plus or minus 2 dBA, which is barely noticeable to the human ear. These small changes would be caused by slightly modified traffic patterns resulting from new on- and off-ramp locations.

The noise abatement criterion is 67 dBA for noise-sensitive outdoor uses at locations such as parks, hotels, and residences. Existing traffic noise approaches or exceeds the FHWA traffic noise abatement criteria at 43 of 48 sites modeled. In general, traffic noise is currently loud, as is typical of a downtown urban environment, and would not change substantially under the Aerial Alternative.

Traffic noise levels with the Aerial Alternative would approach or exceed the traffic noise abatement criteria at the same 43 sites as existing conditions. These sites include approximately 4,490 residential units, 1,290 hotel rooms, and 120 shelter beds. Nine of the sites are park or public open spaces, two are educational or childcare sites, and ten sites represent commercial or other less noise-sensitive uses only. Four sites that are severely affected by noise under existing conditions and two additional sites would be severely affected by the Aerial Alternative. All six sites also experience severe impacts under the 2030 No Build Alternative. Modeled noise levels at specific locations may be found in Exhibits 5-1 and 5-2 of Appendix F.

Noise from other sources, such as aircraft, restaurants and other businesses, the bustle of sidewalks, construction, mechanical systems in buildings, alarms, and sirens, also contributes to the total noise environment.

Improvements to the Battery Street Tunnel would include the extension of the tunnel portals and installation of jet fans to improve ventilation, both for everyday use and emergencies. Noise from the ventilation fans and jet fans in the tunnel would be especially loud near the fan and fan vents. Near the south portal of the tunnel where several residential buildings are located, jet fans would be designed not to exceed 57 dBA at the residential buildings during normal daytime operations; this is about as loud as a conversation between two people standing 10 feet apart. If the fans are to be operated regularly during nighttime hours, they would be designed not to exceed 47 dBA during those hours.

The following mitigation measures were evaluated for their potential to reduce noise impacts from the Aerial Alternative: traffic management measures, acquiring land as buffer zones or for construction of noise barriers or berms, realigning the roadway, and installing noise insulation for public use or nonprofit institutional structures. The only measure that was found potentially feasible and reasonable was the use of sound-absorbing materials to reduce reflected noise from the viaduct structure.

Long-term vibration impacts from the Aerial Alternative would be similar to existing levels because the elevated structure would be in a similar location and configuration. Vibration would continue to be transferred from the structure to the ground via the columns.

10 How would the Aerial Alternative change character and land use in the project area?

The Aerial Alternative would replace the Alaskan Way Viaduct with an updated elevated structure that would have almost the same route as the existing viaduct, but would be almost half again as wide. The new elevated structure would affect existing land uses in much the same way as the existing viaduct, with traffic noise, exhaust, and visual concerns like view blockage and shadow. The Aerial Alternative would also continue to act as a barrier between retail, tourist, and recreational land uses on the waterfront and the downtown retail and commercial core. Some land along the corridor would be converted to roadway, most of it in the industrial area on the south end. About 310 parking spaces in the corridor would be removed. Because northbound lanes of the Alaskan Way surface street

Appendices D and E contains additional information about views.

Appendix F contains additional noise and vibration information.

The Land Use and Shorelines Technical Memorandum found in Appendix G discusses this topic more extensively and looks at the alternatives with an eye toward their consistency with current local land use plans and policies.

would be located beneath the elevated structure in this alternative, there would be a little more room for open space than what currently exists. Outside of that, the Aerial Alternative would not create opportunities for new types of development in the corridor, and land use would not change substantially.

11 How would the Aerial Alternative affect parks, recreation, and open space?

The Aerial Alternative would take about the same route as the present viaduct does, but it would be approximately half again as wide. In some places, this might increase the amount of noise, shade, and visual distraction experienced in parks and recreational facilities, but mostly the effects of the aerial structure would be about the same as those from the present viaduct.

A new over-water pier would be built near the end of S. Washington Street connecting to Colman Dock. The pier is needed for construction of the project. The pier would remove Alaska Square, a small public access and shoreline viewing area. Alaska Square is currently closed because the bulkhead supporting it is failing. The shoreline access at Alaska Square could be replaced with space on the pier for public access. The new over-water pier would also require relocating the Washington Street Boat Landing about 125 feet west of its current location.

The Aerial Alternative would modify the Waterfront Trail, which is separated from the Alaskan Way surface street and shared by bicyclists and pedestrians. The separated, shared path would be extended south from S. Royal Brougham Way to just south of S. Atlantic Street. From S. Atlantic Street to S. King Street, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. From S. King Street north, the Waterfront Trail would be replaced by sidewalks on either side of the Alaskan Way surface street, and bicyclists would ride wide bike lanes along either side of the street. Cyclists heading northbound on the Alaskan Way surface street would ride under the new aerial structures. Although these new facilities would be safe and enjoyable, there would be fewer opportunities for scenic views.

In the central section, the waterfront promenade would be widened. The additional width of the aerial structure might overlap areas for which both neighborhood planning groups and Seattle's Parks and Recreation Department have planned public open spaces. In addition, the Aerial Alternative would result in the removal of parking spaces that are currently beneath the viaduct, possibly making parking somewhat more difficult for some people visiting the waterfront.

12 How would the Aerial Alternative affect neighborhoods and the people who live there?

Although it is wider than the existing viaduct, the Aerial Alternative would be very similar and, like the Rebuild Alternative, would not result in many day-to-day changes to neighborhoods along the corridor. Access in the Duwamish neighborhood would be improved by better connections to S. Atlantic Street and S. Royal Brougham Way, which could benefit local businesses. In the north end of the project area, SR 99 is currently a barrier for people and traffic moving between neighborhoods to the east and west. The Widened Mercer improvements would benefit these neighborhoods by improving east-west connections across SR 99 at Mercer and Thomas Streets. The Lowered Aurora/SR 99 option has an even greater potential for improving connections, since up to five streets currently cut off by SR 99 would be reconnected via bridges. Population and employment along the rest of the corridor would change very little, if at all as a result of the project.

13 Would the Aerial Alternative affect community and social services?

The Aerial Alternative would have little, if any, effect on most community and social service providers in the corridor. The CASA Latina Day Workers' Center (which dispatches jobs for casual day laborers) is located near the south portal of the Battery Street Tunnel and would be displaced. Also, the optional at-grade SR 519 interchange has a new southbound on-ramp from E. Marginal Way that would increase traffic in front of the St. Martin de Porres homeless shelter. This could make driving to and from the shelter more difficult during peak travel times when transporting overnight clients to and from other downtown social service agencies. Other social services would not be affected.

14 What residences, businesses, or other properties would need to be acquired?

No residences would be affected. Up to 18 parcels would be permanently acquired for the Aerial Alternative. If these parcels are fully acquired, the total area obtained would be approximately 962,000 square feet (22 acres). Additionally, about 19,000 square feet along the eastern edge of Terminal 46 may be acquired for right-of-way needs or ferry holding. Up to eight buildings would be modified or acquired during construction, including five commercial buildings, two industrial buildings, and Fire Station No. 5. At this time, the number of businesses or employees that would need to be relocated is unknown; however, it is estimated that approximately 273 employees in the eight buildings may be affected. Specific information about the number of businesses and employees requiring relocation will be developed as part of the Final EIS.

Of the 18 parcels that would potentially be acquired, nine are located in the southern section of the project, eight are located in the central section, and one is located in the north section. Additional parcels or buildings would receive minor modifications, such as changes to driveways, parking, or fences, which would not alter their existing use. The lead agencies will work closely with the affected businesses and properties to minimize the level of disruption.

15 How would the Aerial Alternative affect historic resources?

The Aerial Alternative would affect historic buildings and neighborhoods in the corridor in much the same way that the viaduct does now. Because the width of the elevated structure would be half again as wide as the viaduct, the overall effect would be somewhat

Historic Washington Street Boat Landing

Appendices H and N contain additional information about parks and recreation.

Appendices I and J contain additional information about neighborhoods.

Will the agencies help relocate properties that need to be purchased for the project?

The lead agencies will provide relocation assistance and compensation to the affected property owners and tenants as mitigation. Compensation will comply with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Relocation assistance includes determining special needs and providing referrals to comparable properties.

Further details for properties that would potentially be acquired are included in Appendix K, Relocations Technical Memorandum.

Appendices L and N contain additional information about historic resources.

greater. The elevated structure would continue to block views to and from historic buildings, and in the cases of both Pioneer Square Historic District and Pike Place Market Historic District, views to, from, and within an entire historic neighborhood would still be affected. The height, bulk, and industrial design of the elevated structure would continue to detract from the historical character of buildings and neighborhoods in the corridor, especially those located a block or so from the viaduct. Noise from SR 99 traffic also would still affect these historic districts and neighborhoods. In some cases, access to historic buildings may be changed.

As with all alternatives, new ramps would connect SR 99 to S. Royal Brougham Way and S. Atlantic Street (on the south edge of the Pioneer Square neighborhood). These would have some of the same kinds of effects as the elevated structure as a whole on historic buildings in their vicinity. Old ramps connecting First Avenue S. with SR 99 would be removed, eliminating their effects near the south end of Pioneer Square. However, new ramps connecting SR 99 to S. Royal Brougham Way and S. Atlantic Street (on the south edge of the Pioneer Square neighborhood) would have some of the same effects as the existing viaduct, and could affect access to a nearby historic building. In the south end of the corridor, one building eligible for listing in the National Register of Historic Places may be demolished. The building was originally the Washington-Oregon Shippers Cooperative Association (WOSCA) Freight House.

New ramps would be built at Columbia and Seneca Streets that would be 10 to 15 feet wider, thus somewhat increasing existing effects to nearby historic buildings. The Battery Street Tunnel, another structure eligible for historic listing, would be remodeled to make it safer. These updates might change the character of the tunnel portals.

Along the waterfront, the Washington Street Boat Landing pergola would be removed, renovated, and reconstructed approximately 125 feet west of its current location to make way for the Colman Dock ferry access road. Piers 54 to 59, with their distinctive working waterfront architecture, are eligible for consideration as a historic district in the National Register of Historic Places. This area would continue to experience noise, pollution, vibration, and blocked views because of their location along the new elevated structure.

The existing viaduct is eligible to be listed in the National Register of Historic Places. The Alaskan Way Seawall is also eligible. The potential historic status of these structures will be considered as part of the planning process but is not expected to prevent their replacement. Replacement of the seawall is not expected to affect any other historic resource in the corridor. As part of the planning and design of the Aerial Alternative, measures would be taken to lessen its effects on historic buildings and neighborhoods. These measures might include designing new structures to blend in with their historic surroundings, moving historic buildings instead of tearing them down, and documenting buildings and structures that need to be removed (with photos, surveys, measurements, and notes) to help preserve the memory of Seattle's history for the future.

16 How would the Aerial Alternative affect public services (such as police and fire)?

Public services would mostly be affected by changes in traffic patterns within the corridor. Because overall traffic operations would improve under the Aerial Alternative, public service providers would benefit as well. This alternative is most likely to improve the response time of emergency vehicles. Project elements that would improve overall operations for traffic, including public service providers, include adding roadway connections in the south end at SR 519 and closing the Battery Street ramps to general traffic. The Battery Street ramps would remain open to emergency vehicles, which would provide direct access to the Battery Street Tunnel for emergency service providers. Improvements to the Battery Street Tunnel would enhance the ability to fight fires in the tunnel, and additional exits from the tunnel would improve overall safety.

North of the Battery Street Tunnel, effects on fire and police response would be mixed. Mercer Street would be widened and would become a two-way street, and a bridge would connect Thomas Street over the top of SR 99. The bridge at Thomas Street and expanded Mercer Street would provide additional east-west traffic movements in this section of the corridor. However, additional congestion and delay is expected at a couple of intersections due to the roadway changes.

17 How would the Aerial Alternative affect the local and regional economy?

Overall, the Aerial Alternative would benefit the local and regional economy because it would be safer, improve freight mobility, and provide a more reliable transportation corridor for goods and services.

The Aerial Alternative would permanently displace up to eight buildings with approximately 273 employees. If the businesses are not relocated within the city, local sales, business and occupation (B&O), and property tax revenue might be lost. If displaced businesses leave Seattle but stay in the region, the new location would continue to collect B&O taxes and support the regional economy.

Under the Aerial Alternative, approximately 360 parking spaces would be removed. About 226 of these spaces are free long-term spaces underneath the viaduct south of S. King Street. Therefore, people currently parking for free would need to pay for long-term parking, use public transit, or find other places to park. However, about 147 short-term spaces would be gained in the south area. Most of the other spaces that would be removed, about 233, are short-term spaces in Pioneer Square and the central waterfront project area. This short-term parking is used by customers and tourists in the AWV Corridor. Without mitigation, the property displacements and loss of parking spaces could affect the economic viability of businesses in these areas.

The Aerial Alternative would provide improved connections to the Duwamish area, Harbor Island, SR 519, I-5, and I-90. The tail track would be relocated to the west side of SR 99, and access across Alaskan

Appendix O contains additional information about public services.

Appendix P contains additional information about Economics.

Way/E. Marginal Way as well as between the viaduct and S. Atlantic Street would be blocked at times by switching activity. Connections to downtown Seattle would be about the same as they are presently, and a connection for the Ballard/Interbay industrial area would be provided. The northbound on-ramp at Battery Street would be closed, improving safety and traffic flow.

Freight access, particularly in the south, would improve with the access improvements between SR 519 and SR 99. Travel times for northbound traffic would be better than expected future conditions, and southbound travel times would be comparable to expected future conditions. In general, travel speeds would improve in both directions, because the slightly wider and safer roadway would improve driving conditions and overall mobility. Overall, freight conditions would improve over present day conditions, since lane and speed restrictions for freight traffic would be reduced. These improved connections, increased travel speeds, and decreased travel times would reduce freight operation and shipping costs.

18 Would the Aerial Alternative change air quality?

Under the Aerial Alternative, concentrations of carbon monoxide and particulate matter (PM_{10}) were estimated under peak traffic conditions for study area intersections (Exhibits 6-1, 6 2, and 6-3 in Appendix Q). The future pollutant concentrations were estimated to be below (within) the National Ambient Air Quality Standards (NAAQS).

Daily pollutant emissions from traffic in the study area in 2030 were also estimated. Comparison between existing study area emissions and the various alternatives in 2030 demonstrates the trend towards cleaner operating vehicles for carbon monoxide, oxides of nitrogen, and hydrocarbons in 2030 (Exhibit 6-4 in Appendix Q).

19 How would the Aerial Alternative affect fish and wildlife species and their habitat?

One way the Aerial Alternative would affect wildlife habitat is by replacing the old seawall with a new one. The new concrete seawall would be constructed slightly landward of the existing seawall along the majority of the corridor. In some areas, the existing seawall would be removed, increasing water volume in the immediate area by an estimated 8,000 cubic yards. Like the old seawall, the basic structure in the aquatic habitat along the new seawall would consist of a vertical con-crete wall with rock riprap placed at its base where needed to prevent erosion. Up above at street level, urban habitat-mostly street trees and shrubs-would remain much the same as it currently is. The existing stormwater facilities that collect and convey water from the viaduct are old and would be replaced with new facilities using current design standards and technology, improving the quality of water discharged.

The vertical concrete seawall is poor intertidal habitat for many species, including ESA listed species such as Chinook salmon and bull trout. The Seattle waterfront is a migration corridor and rearing area for juvenile Chinook and other juvenile anadromous salmonids. Juvenile salmon are commonly present at various protected locations near the water's surface in the vicinity of the seawall during spring migration. Other fish species commonly observed in the shoreline area along the seawall include seaperch, bay pipefish, shiner perch, sculpins, greenling, various flatfishes, and a few lingcod. These fish would experience the same basic habitat as they do today when the new seawall is constructed. The habitat along the seawall is also occupied by a range of marine invertebrates, such as red crab, hairy crab, coon-striped shrimp, octopus, starfish, and anemones.

Between Pier 48 and Colman Dock, a new over-water pier would be built to provide vehicle access to the Colman Dock Ferry Terminal. The new pier would cover approximately 33,000 square feet of intertidal shoreline (areas that are exposed during low tides), including riprap, and shallow subtidal habitat (areas normally covered by water). Under other piers along the waterfront, marine biologists observed that macro algae (a kind of seaweed, important for food and habitat for aquatic animals) have a hard time growing in shade cast by the piers. The shade would probably

Changes to Elliott Bay at S. Washington Street

Rebuild, Aerial and Surface

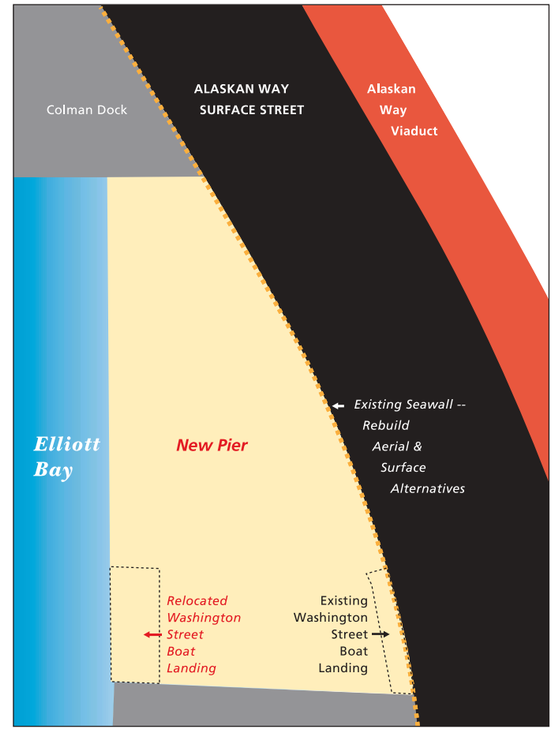


Exhibit 6-10

keep macro algae and other aquatic vegetation from growing under the new pier. Additionally, the Aerial Alternative has a Frame option for the seawall, which would cause the same amount of increased shading.

Project planners and designers would work with resource agencies (like the Corps of Engineers) to address habitat that could be affected by shading from the construction of the pier. These efforts could include protecting an existing intertidal beach with an offshore berm or breakwater and creating new beaches in open areas along the waterfront that would provide much-needed aquatic habitat along Seattle's urban shoreline. This would give young salmon the protective shallow water habitat they need to grow and provide a corridor along the waterfront in which

Appendix Q contains additional information about air quality.

Appendix R contains additional information about fish and wildlife.

What is a BMP?

A Best Management Practice (BMP) is an action or structure that reduces or prevents pollutants from entering the stormwater and degrading water quality.

The approaches for stormwater management are described in Chapter 2.

Appendix S contains additional information about water quality.

adult salmon could migrate on their way to and from the Pacific Ocean. Other possibilities for restoring more natural habitat characteristics where possible are also being studied.

20 Would the Aerial Alternative change water quality?

The amount of impervious surface area would not increase under the Aerial Alternative. Incorporation of Best Management Practices (BMPs) into the Aerial Alternative would improve the water quality of runoff discharged from the project area compared with existing conditions. Rain running off the streets and highways collects pollutants like zinc and copper that degrade water quality and can be harmful to aquatic plants and wildlife. By using BMPs, the Aerial Alternative would reduce the amount of these potentially harmful materials.

Exhibit 6-11
Summary of Water Quality Benefits for the Aerial Alternative BMP Approach

Annual Pollutant Load (lbs/yr)[1]	*Existing Conditions*	*Aerial Alternative*	*Change (% Reduction)*[2]
Total Suspended Solids	87,300	59,000	32%
Zinc	132	98	26%
Copper	26	20	23%

[1] Annual pollutant load from project area pollutant-generating impervious surface (PGIS) after treatment with the BMP Approach
[2] Pollutant reduction is an estimate based on a mass balance model developed for this project

The Battery Street Tunnel improvements include a fire suppression system. In an emergency, it is possible that runoff from this system could discharge directly into Elliott Bay, temporarily reducing dissolved oxygen needed by aquatic plants and wildlife. These short-term impacts are allowed under State of Washington laws.

The volume of stormwater water being treated and discharged to the Duwamish River, Elliott Bay, and Puget Sound would not change. According to the current design plans, the locations of the outfalls would remain the same. The Aerial Alternative could result in a net benefit to the environment compared to existing conditions. The reduction in pollutants discharged to Puget Sound is minimal because the West Point Treatment Plant efficiency would not change.

21 How would the Aerial Alternative change the soil conditions once the project is completed?

To meet earthquake standards, the soil would have to be strengthened to ensure that it would not liquefy in an earthquake. A large part of the Alaskan Way Viaduct project area is located on loose fill, soft sediment, sand, and gravel (described in Chapter 3 Question 2). The Aerial Alternative's structures must be anchored in soils that are stronger than these loose materials to withstand an earthquake. In the project area, piles or drilled shafts would need to be installed 60 to 150 feet deep to reach the dense glacial soils that would support the facility.

The soils would be strengthened to reduce the seismic hazards and meet the earthquake standards. Soils can be strengthened by using jet grouting or deep soil mixing. The jet grouting and deep soil mixing techniques inject, mix, or replace the existing soil with cement grout to strengthen the soils.

Soils would be strengthened around the new foundations of the viaduct, under some proposed retaining walls, and behind the seawall. The soils would primarily be strengthened in the south section and along the waterfront. The soils between Pine Street and the Battery Street Tunnel have sufficient strength and do not need to be improved. In the north section of the Aerial Alternative, the Battery Street Tunnel improvements may require some shallow foundations, which would displace a small amount of soil. The changes to the street grid would require soil excavation to widen Mercer Street and fill to be placed along Broad Street.

The extent of soil improvement behind the Aerial Alternative's seawall depends upon the type of seawall and depth to glacial soils. From S. King Street to S. Washington Street, soil improvements behind the existing sheet pile wall would be made to a depth of about 40 feet and a width of about 35 feet. Along the Pile-Supported Gravity Wall from S. Washington Street to Madison Street, soil improvements would be made to a depth of about 40 feet and width of about 65 feet. The Type A and Type B Seawalls are located between Madison Street and Myrtle Edwards Park.

Behind the Type B Seawall, the soil improvements would be around 60 feet in width and 65 feet in depth. The soil improvements behind the Type A Seawall would improve approximately the first 40 feet east of the seawall to a depth of about 55 feet.

If the Aerial Alternative option with the SR 519 at-grade configuration is built, it would be the same as the Rebuild Alternative in the south section. Soil improvements would only be made underneath the aerial structures near S. Atlantic Street and S. Royal Brougham Way.

If the Seawall Frame option were chosen, no soil improvements would be made north of S. Washington Street.

22 Would the Aerial Alternative change groundwater flows?

Once the soil has been injected, mixed, or replaced with cement grout, groundwater would not be able to flow as readily in these areas. However, since the improvements are limited, overall groundwater flow in the watershed would not be substantially affected by the project. Groundwater levels may change slightly, although the changes would probably be less than the natural fluctuations in groundwater levels that already occur.

23 Would the Aerial Alternative create or remove any contaminated materials or sites?

The Aerial Alternative would not create any new contaminated materials or sites. This alternative would result in removal of an estimated 809,000 cubic yards of soil or material generated as spoils during construction. Of this amount, approximately 353,000 cubic yards of potentially contaminated soils would be removed and disposed of appropriately, which would benefit the project area. Removal of the contaminated soil could reduce future groundwater contamination and could reduce the potential exposure to workers that may have future excavation projects in the area.

Appendix T contains more information about geology, soils, and groundwater.

Appendix U, contains additional information about contaminated materials.