Bypass Tunnel Alternative

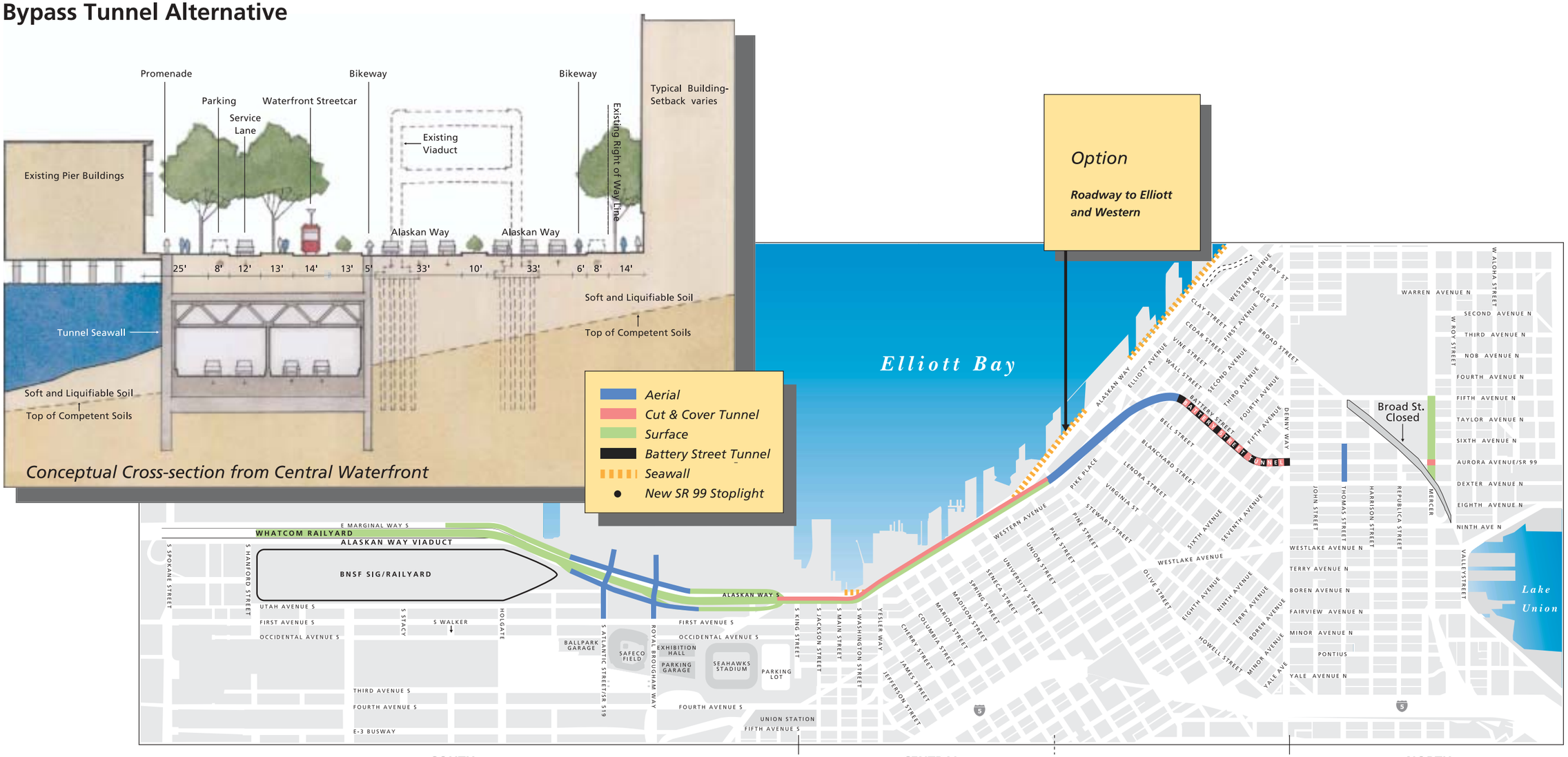


Exhibit 8-1

CHAPTER 8 - BYPASS TUNNEL ALTERNATIVE

1 What is the Bypass Tunnel Alternative?

How would it replace SR 99 and the viaduct?

The Bypass Tunnel Alternative includes replacing SR 99 with the following elements as shown in Exhibit 8-1:

- **South** - Replace the existing viaduct with an at-grade roadway. Replace the existing ramps at First Avenue S. with an elevated interchange connecting SR 99 to SR 519 at S. Atlantic Street and S. Royal Brougham Way. Also, provide a northbound off-ramp and southbound on-ramp at S. King Street.
- **Central** - Replace the viaduct with a four-lane tunnel (two lanes in each direction). The tunnel would have emergency exits, a fire suppression system, and a ventilation system. Build the Alaskan Way surface street with six lanes (three lanes in each direction). Construct a new aerial section connecting the new tunnel to the Battery Street Tunnel. The new connection would have two lanes in each direction. It would be wider than the existing facility and it would not have ramps to Elliott and Western Avenues. Ramps at Battery Street would remain open for only emergency vehicle use.
- **North Waterfront** - Reconstruct the Alaskan Way surface street with four lanes (two lanes in each direction). Alaskan Way would provide access to Ballard/Interbay.
- **North** - Improve the Battery Street Tunnel by adding emergency exits, upgrading electrical systems, and adding ventilation to improve fire and life safety. 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/SR 99 at Thomas Street, and close Broad Street from Fifth Avenue to Ninth Avenue.

In addition, there is one option for the Bypass Tunnel Alternative:

- **Central** - Build a separate roadway connecting the Alaskan Way surface street to Elliott and Western Avenues to provide Ballard/Interbay access.

How would it replace the seawall?

The Bypass Tunnel Alternative would replace the seawall with the outer wall of the tunnel from S. Washington Street up to Pike Street. In areas where there is no tunnel, the seawall would be rebuilt as described for the Rebuild Alternative. The seawall would be replaced with drilled shafts and improved soils from S. Washington Street up to Bay Street as shown in Exhibit 8-1. 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.

2 How would the Bypass Tunnel 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 in areas where the bypass tunnel would not be built. Construction of the bypass tunnel and the west half of the SR 519 overpass would begin. The Widened Mercer Underpass would be built, and detours on Broad Street would be established.

Next, the southbound section of the 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. In addition, the bypass tunnel and west half of the SR 519 connection would be completed.

The northbound half of the Battery Street Tunnel would then be improved with new exits, electrical systems, ventilation, and an improved fire suppression system.

Finally, utilities would be placed in their final locations, the viaduct would be torn down, the east half of the SR 519 overpass would be built, 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 Bypass Tunnel 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 Bypass Tunnel Alternative would replace the First Avenue S. ramps with an elevated interchange over SR 99. 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

Appendix B contains additional information describing the Bypass Tunnel Alternative.

Appendix W contains preliminary engineering drawings of this alternative.

How can soils 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.

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

would provide connections to the stadiums and SR 519, which connects to I-90. The SR 519 interchange would also separate vehicles and rail operations. Currently these operations are not separated, and there are times when trains block roadway connections at S. Atlantic Street.

In addition, new ramps would be provided to connect near S. King Street. The S. King Street ramps would provide drivers access into and out of downtown. Traffic movements provided by the new ramps would include:

- Northbound off from SR 99 near S. Holgate Street to S. Atlantic Street and S. Royal Brougham Way.
- Northbound off from SR 99 to the Alaskan Way surface street near S. King Street.
- Northbound on from S. Royal Brougham Way to SR 99.
- Southbound on from E. Marginal Way near S. Holgate Street to SR 99.
- Southbound on from S. King Street to SR 99.
- Southbound off from SR 99 to S. Atlantic Street and S. Royal Brougham Way.

How would it change railroad access?

Changes to railroad access in the south end would be similar to those 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 Burlington Northern Santa Fe (BNSF) Seattle International Gateway (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, 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.

How would it change vehicle access for ferries?

People driving to the ferry get there via the 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 Bypass Tunnel Alternative would change where drivers would wait for the ferry when Colman Dock is full. It would also change the way drivers get to Colman Dock, and it would add a new way for drivers to exit Colman Dock.

With this alternative, the viaduct would be removed and replaced with an at-grade roadway south of Railroad Way S. Therefore, the existing ferry holding area under the viaduct would need to be relocated west of SR 99 on part of Terminal 46, just south of S. King Street. With this ferry holding location, 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.

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.

The new ferry access roadway and over-water pier is 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?

The Bypass Tunnel Alternative would replace SR 99 with a tunnel with two lanes in each direction between S. King Street and Pike Street. The Alaskan Way surface street would be expanded from four lanes to six lanes.The new tunnel would be a bypass route for through traffic. Drivers traveling into or out of downtown or to and from the Ballard/Interbay area would rely on the Alaskan Way surface street or other downtown streets to reach SR 99 connections. Though the specific routes where drivers get into and out of downtown would change, several access locations would continue to be provided.

The existing ramps to Columbia and Seneca Streets would be replaced with new ramps at S. King Street that would connect to the Alaskan Way surface street. Drivers could also reach downtown by using the new SR 519 interchange at S. Atlantic Street and S. Royal Brougham Way. In addition, there are several ways drivers could get to and from downtown using connections from the Alaskan Way surface street.

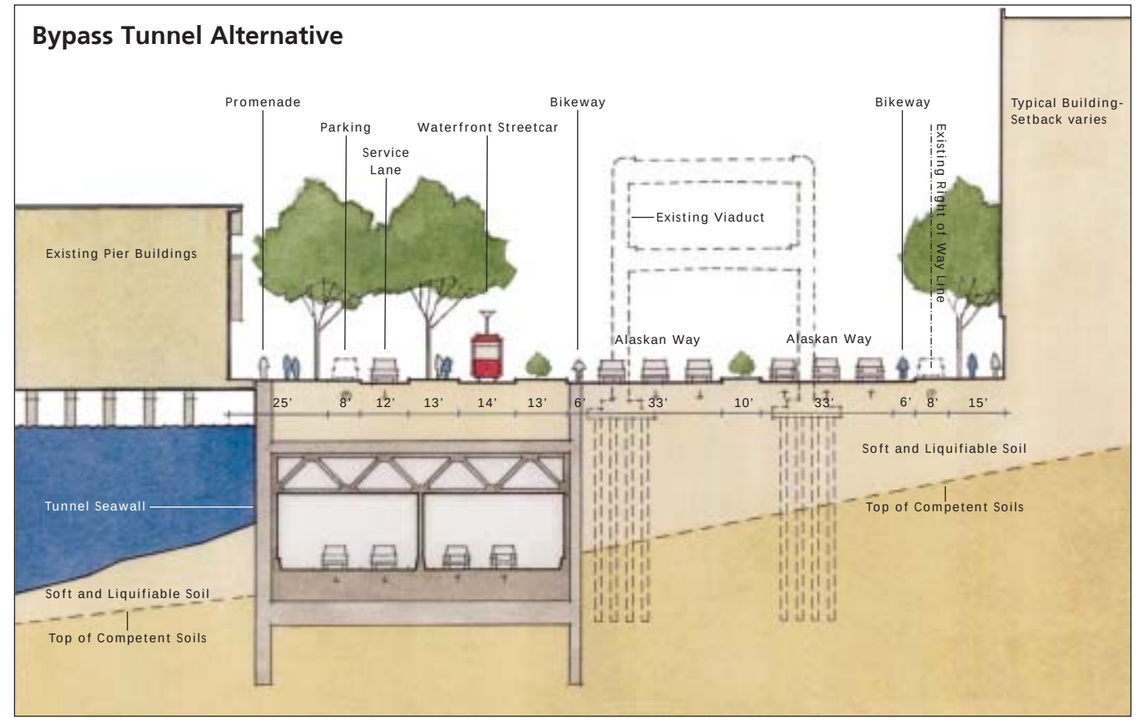


Exhibit 8-2

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.

Traffic traveling to and from the Ballard/Interbay and Belltown areas would use ramps on the south end and travel on the Alaskan Way surface street.

From Pike Street, the tunnel would transition to a side-by-side aerial structure connecting into the Battery Street Tunnel. The existing ramps to Battery Street would be closed to general traffic, but maintained for emergency access.

If the roadway option were constructed in this area, a new roadway would be built connecting the Alaskan Way surface street with Elliott and Western Avenues. This roadway would have two lanes (one lane in each direction) and would provide access for Ballard/Interbay and Belltown traffic.

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

With the Bypass Tunnel Alternative, the Alaskan Way surface street would be expanded to have six lanes instead of four lanes. The extra lanes are needed to provide roadway capacity for drivers traveling to and from downtown, Ballard/Interbay, and Belltown, since SR 99 would only be for through traffic. As a result, the number of vehicles on the Alaskan Way surface street would increase.

Since the viaduct would be removed, there are several possible surface street design configurations. One possible surface street design for the Bypass Tunnel Alternative is shown in Exhibit 8-2. Regardless of the design selected, the Alaskan Way surface street would be rebuilt with six lanes (three lanes in each direction), and turn pockets may be provided in some locations. The surface street would have expanded pedestrian promenades, new bicycle lanes, one or two trolley tracks, on-street parking, and service roadways for piers and adjacent buildings.

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 Bypass Tunnel 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. Once construction was completed, existing ramps to Mercer and Broad Streets would be removed. After 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 was completed, the Mercer 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 are constrained by Aurora/SR 99 because it cuts off the street grid. Once construction was completed, Broad Street could be closed between Fifth and Ninth Avenues, allowing for more streets to be reconnected.

How would it change bicycle access?

The Bypass Tunnel 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 Yesler Way, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. Additionally, it may be possible to develop a spur shared use trail that would lead diagonally from the north side of Seahawks Stadium (midway between S. Atlantic Street and S. Royal Brougham Way) to the southwest corner of the intersection of Alaskan Way and S. King Street. Between Yesler Way and Pine Street, the Waterfront Trail would be replaced with striped bicycle lanes along each side of the Alaskan Way surface street. 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 Bypass Tunnel Alternative would change pedestrian access by changing the location of the Waterfront Trail. 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 Yesler Way, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side.

Additionally, it may be possible to develop a shared use trail that would lead diagonally from the north side of Seahawks Stadium (midway between S. Atlantic Street and S. Royal Brougham Way) to the southwest corner of the intersection of Alaskan Way and S. King Street. North of Yesler Way pedestrians could walk on sidewalks on the east side of Alaskan Way or the waterfront promenade located on the west side of Alaskan Way. 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.

In the SR 519 area, pedestrian access would be maintained by continuing the sidewalks on Alaskan Way and associated local streets on the SR 519 interchange. Connections across SR 99 would be provided by sidewalks on S. Royal Brougham Way and

Other possible surface street design variations are shown in Appendix X, Design Variations for Surface Street Improvements.

S. Atlantic Street, which would cross over the SR 99 mainline.

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.

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

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

Travel patterns and traffic distribution would change over existing conditions if the Bypass Tunnel Alternative is built. In the central section of SR 99 where traffic volumes are the highest, daily traffic is expected to peak at 90,000 vehicles per day for the Bypass Tunnel Alternative compared with 126,000 vehicles per day for the existing facility in 2030. The number of vehicles traveling on SR 99 would decrease with this alternative because SR 99 would have fewer lanes than the existing facility. Instead, one lane would be added in each direction on the Alaskan Way surface street, and trips destined for downtown, Belltown, and Ballard/Interbay would be routed to Alaskan Way.

With the Bypass Tunnel Alternative, the number of hours that the SR 99 mainline would be congested is slightly higher than the year 2030 existing facility as shown in Exhibit 8-3.

Exhibit 8-3

Daily Hours of Congested Operations on the SR 99 Mainline

	2002 Existing	*2030 Existing Facility*	*Bypass Tunnel*
Southbound	<1	3	5
Northbound	<1	4	5

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. This additional traffic is not expected to negatively affect operations on SR 99 headed southbound during the PM Peak; however, speeds for northbound traffic would be reduced compared with year 2030 existing conditions. Northbound traffic speeds would be reduced because of limited tunnel capacity and merging ramp conflicts near S. Royal Brougham Way.

With the Bypass Tunnel Alternative, ramps to downtown would be provided at S. King Street. Both the northbound on-ramp and southbound off-ramp at S. King Street are expected to have more traffic using them compared with the nearest downtown ramps at Columbia and Seneca Streets for the existing facility.

In the central section, traffic volumes on SR 99 would be reduced compared to the existing facility in 2030. These trips would instead be accommodated on the Alaskan Way surface street, which would be widened from four lanes to six lanes. SR 99 traffic volumes decrease because Ballard/Interbay traffic would travel on Alaskan Way instead of SR 99.

Traffic volumes in the Battery Street Tunnel are expected to increase, particularly in the southbound direction, because ramps to downtown and at Elliott Avenue, Western Avenue, and Battery Street would be removed. Traffic volumes entering SR 99 at Denny Way and access points north of Denny Way are expected to increase due to the loss of the Battery Street ramps.

Bypass Tunnel Alternative Travel Times

During the PM Peak

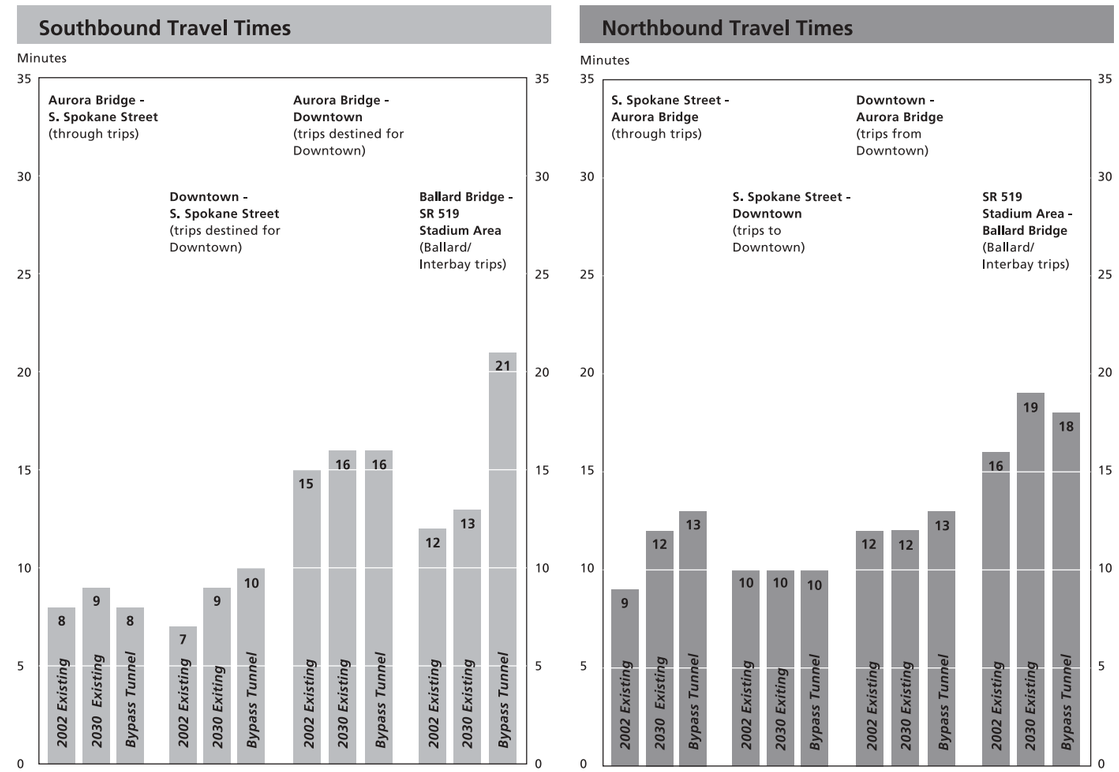


Exhibit 8-4

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

For the most part, travel times for the Bypass Tunnel Alternative would be similar to those expected for the existing facility in 2030 as shown in Exhibit 8-4. The main exception is for southbound trips from the Ballard Bridge to the SR 519/stadium area. In this case, traffic times for the Bypass Tunnel Alternative would increase from 13 minutes for the year 2030 existing facility to 21 minutes. Travel times would increase for this trip because Ballard/Interbay traffic would travel on the Alaskan Way surface street through downtown instead of SR 99. In the northbound direction, travel times between the Ballard

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.

Bridge and SR 519 are comparable because congested conditions are expected for the year 2030 existing facility near the Western Avenue off-ramp.

Average travel speeds for the Bypass Tunnel Alternative are mixed when they are compared with the existing facility in 2030 as shown in Exhibit 8-5. For northbound traffic headed through the stadium area, speeds would be reduced to 27 miles per hour, compared with 46 miles per hour for the existing facility in 2030. The reduced travel speed is mostly due to limited tunnel capacity and merging ramp conflicts near S. Royal Brougham Way. Also, north of the Battery Street Tunnel, speeds in the southbound direc-tion would be reduced from 33 miles per hour to 30 miles per hour. Speeds would be reduced in the north because more traffic would enter SR 99 in this area.

In contrast, the Bypass Tunnel Alternative would also increase travel speeds in some areas of SR 99. Speeds would improve in the area through downtown in both the northbound and southbound directions. For example, southbound travel speeds are expected to increase from 40 miles per hour for the 2030 existing facility to 49 miles per hour for the Bypass Tunnel Alternative. Speeds would increase in this area because removing ramps to Western, Elliott, and Battery Street would eliminate merging traffic.

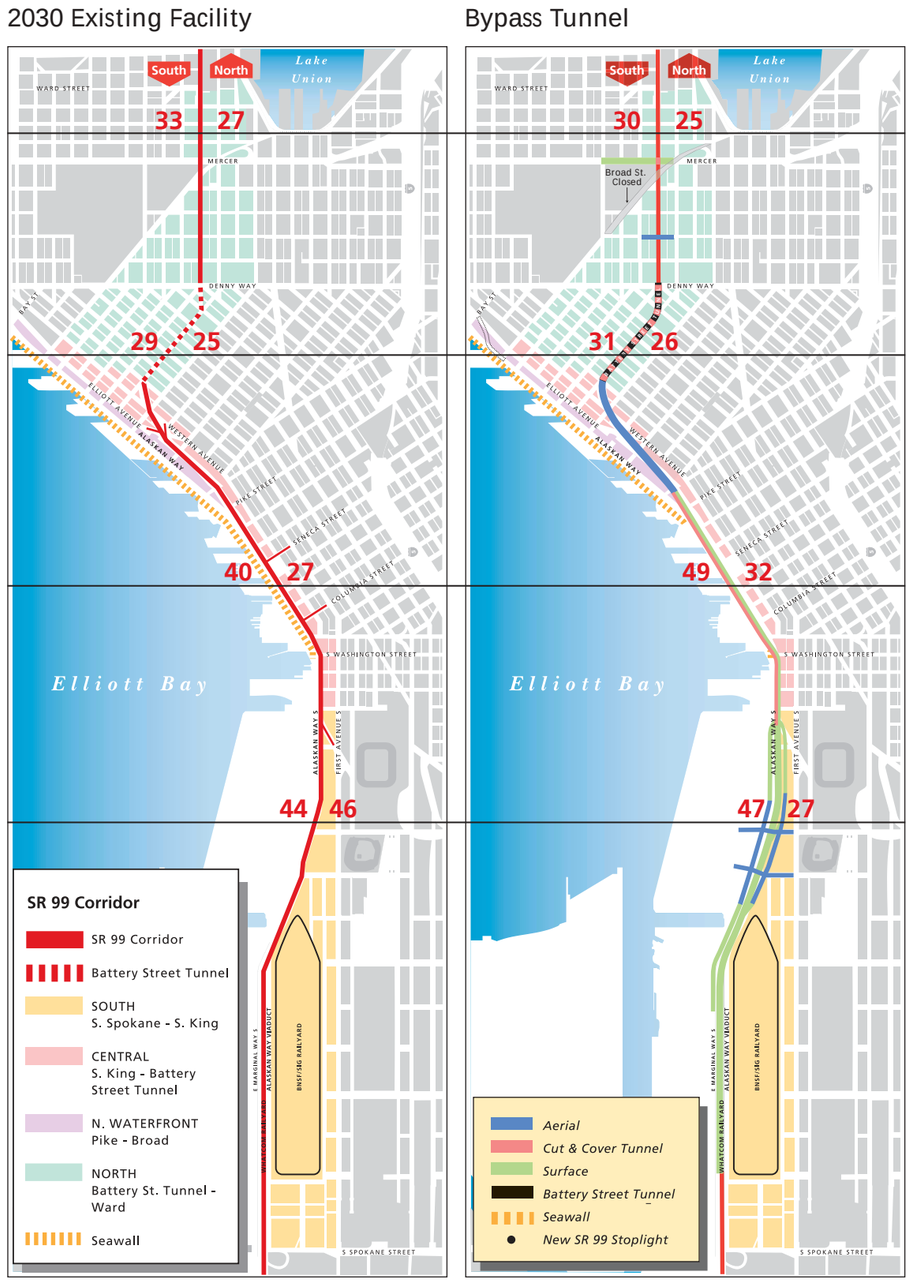
How would local streets and intersections operate?

Traffic on local streets and delay at intersections would not substantially change in the south area, as shown in Exhibit 8-6. Intersection delay would be reduced in the downtown area, and it would be increased in the north waterfront and north 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 at these intersections would improve because fewer drivers would need to turn to connect with SR 519. Also, the new interchange distributes traffic between two streets, compared with the existing facility that distributes traffic at only one street (First Avenue S.).

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*	*Bypass Tunnel*
South Lake Union Area	39	33	30
Battery Street Tunnel	34	29	31
Downtown	41	40	49
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*	*Bypass Tunnel*
South Lake Union Area	33	27	25
Battery Street Tunnel	33	25	26
Downtown	39	27	32
Stadium Area	46	46	27

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 8-5

In the downtown area, the number of congested intersections would decrease from eight intersections to five. Intersection delay would be reduced because ramps at Columbia and Seneca Streets would be removed, which would cause traffic to be more evenly distributed on downtown streets. Also, delay at the intersection of Alaskan Way and Yesler Way is expected to be reduced from an estimated 124 seconds of delay to 14 seconds of delay. Delay at Yesler Way would be reduced because ferry access to Colman Dock would be moved from Yesler Way to S. King Street. The tradeoff is that an intersection would be added at Alaskan Way and S. King Street. This intersection would have about 87 seconds of delay during the PM Peak.

In addition, traffic on Elliott and Western Avenues would be reduced, since ramps to these streets would be removed and Ballard/Interbay traffic would be routed onto the Alaskan Way surface street. Consequently, more traffic is expected on Alaskan Way. Alaskan Way is expected to operate well, with the exception of the area where Alaskan Way traffic would be routed to an underpass crossing below the BNSF railroad tracks north of Broad Street. This intersection would be congested.

In the north end, the Bypass Tunnel Alternative would have more congested intersections than the 2030 existing facility. The Bypass Tunnel 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 8-6). 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 would 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?

Traffic volumes on the Alaskan Way surface street would increase substantially from 11,000 daily trips projected for the existing facility in 2030 to 48,000 trips. Traffic volumes on Alaskan Way would increase because SR 99 would primarily be a bypass route through downtown. Alaskan Way would be widened from four lanes to six lanes to accommodate the additional trips. The only intersection where congestion would increase compared with the 2030 existing facility is the area where Alaskan Way traffic would be routed to an underpass crossing below the BNSF railroad tracks north of Broad Street.

Would traffic on other parallel city streets change?

In the south end of the project area, fewer drivers are expected to use parallel city streets, mostly due to improved connections to SR 519/S. Atlantic Street and S. Royal Brougham Way. The reduction in cars on city streets may slightly improve traffic flow on these routes.

In the central section of the project area, fewer drivers are expected to use parallel city streets. Intersection delay would be reduced because traffic would no longer be restricted to enter or exit SR 99 via ramps at Columbia and Seneca Streets. Instead, drivers would access SR 99 via multiple east-west city streets along the Alaskan Way surface street or they would access downtown from ramps provided at Denny Way and S. King Street. Also, fewer vehicles

Bypass Tunnel Alternative Congested Intersections

During the PM Peak

2030 Existing Facility | **BypassTunnel**

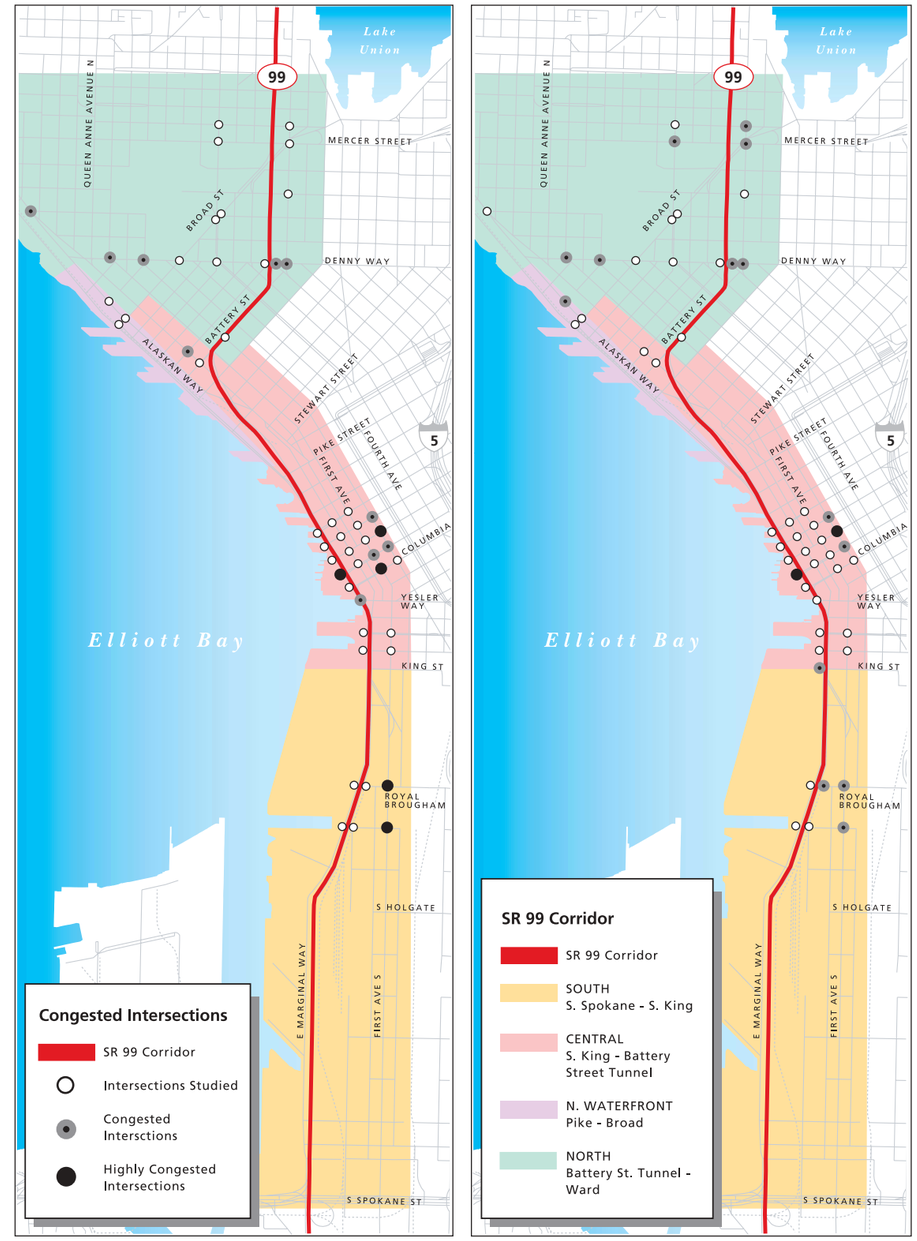


Exhibit 8-6

would be expected on Elliott and Western Avenues because SR 99 ramps to or from these streets would be removed.

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

Would the Bypass Tunnel Alternative affect traffic volumes on I-5?

The Bypass Tunnel 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?

If a roadway were built to Elliott and Western Avenues, traffic conditions would be similar to those described above for the Bypass Tunnel Alternative. The only difference is that the number of vehicles traveling on Alaskan Way surface street north of Pike Street would be reduced, and the number of vehicles using Elliott and Western Avenues would likely be similar to 2030 existing conditions.

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

How would the Bypass Tunnel Alternative change conditions for freight?

Freight access, travel times, and travel speeds would change with the Bypass Tunnel Alternative. 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 connections to and from the Ballard/Interbay industrial area would be changed with the Bypass Tunnel Alternative. Drivers heading to the Ballard/Interbay area would drive on the Alaskan Way surface street to reach Elliott Avenue. Travel times for this route vary as described below.

For example, travel time between SR 519 and the Ballard Bridge would be increased from 13 minutes to 21 minutes southbound during the PM Peak. However, in the northbound direction, this same trip would take 13 minutes compared with a 12-minute trip for the 2030 existing facility. Travel times for through trips from the Aurora Bridge to S. Spokane Street would be similar to the 2030 existing facility in both the northbound and southbound directions.

The Bypass Tunnel Alternative would also have varied effects on travel speeds. In the stadium area, travel speeds in the southbound direction are expected to increase from 44 miles per hour to 47 miles per hour with the Bypass Tunnel Alternative. However, in the northbound direction, travel speeds are expected to decrease compared to the 2030 existing facility from 46 miles per hour to 27 miles per hour.

If the Bypass Tunnel Alternative is constructed, it is likely that flammable and/or combustible cargo would be prohibited in the tunnel. Flammable and/or combustible cargo would continue to be prohibited in the Battery Street Tunnel. If flammable materials were prohibited, freight carrying these materials would need to use a different route, such as the Alaskan Way surface street.

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 Bypass Tunnel Alternative change transit conditions?

Conditions for transit would be maintained with the Bypass Tunnel Alternative. Bus routes that currently reach downtown from Columbia and Seneca Streets would be changed since the Columbia and Seneca ramps would be replaced. Buses could either use ramps to S. King Street to get to or from downtown or they could reach downtown via the SR 519 ramps.

If the S. King Street ramps were used, travel times would be similar to the 2030 existing facility. If the SR 519 ramps were used, travel times for transit to the downtown area would likely increase, but buses could 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.

On the north end, buses would continue to access downtown from the Denny Way ramps. Travel times for buses using the Denny Way ramps would be similar to those expected in 2030 with the existing facility.

Conditions for bus transit would be improved because speed and lane restrictions currently in effect for large vehicles (including buses) would be removed once the viaduct was replaced. Also, the SR 99 roadway and ramps would be wider than the existing facility, which would make it easier for bus operators to drive.

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 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.

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.

Appendix O contains additional information about flammable cargo.

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

6 How would the Bypass Tunnel Alternative improve roadway safety?

The Bypass Tunnel Alternative would improve roadway safety over existing conditions in many areas. The existing, deteriorating facility would be replaced, reducing seismic risks and other risks associated with the aging structure. Also, the new roadway would be wider than the existing facility, which would make it easier for people to drive. In the south end, the viaduct would be removed and replaced with a new at-grade roadway from S. Holgate Street up to near S. King Street. The new at-grade roadway would be built with wider lanes and shoulders than the existing SR 99, which would improve safety. In addition, the ramps at First Avenue S. would be removed and replaced with improved ramps with wider shoulders in the S. Atlantic Street/S. Royal Brougham Way area. However, the northbound on-ramp at S. Royal Brougham Way would be highly congested, which may increase the likelihood for accidents.

In the Bypass Tunnel Alternative, the roadway widths and shoulders would be wider than those on the existing viaduct. The inside shoulder of the Bypass Tunnel Alternative would be narrower than what is proposed for the Tunnel Alternative, but would still be an improvement over existing conditions. No ramps are proposed for the bypass tunnel, which would improve safety for drivers by eliminating weaving. The ramps at Battery Street would be open only to emergency vehicles, which would improve roadway safety. If the Roadway to Elliott/Western option were constructed, access to Elliott and Western Avenues from the Alaskan Way surface street would be built. This roadway would be a safety improvement compared with the existing ramps to Elliott and Western Avenues.

From about S. King Street north to Broad Street, traffic on the Alaskan Way surface street would increase substantially. This additional traffic would increase the overall number of vehicle and pedestrian accidents and the potential for injuries. 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.

7 How would the Bypass Tunnel Alternative affect parking?

There are 2,038 parking spaces located in the project area. As shown in Exhibit 8-7, a total of about 710 par-king spaces would be removed with the Bypass Tun-nel 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 8-7

Parking Changes for the Bypass Tunnel Alternative

	Short-Term[1]	Long Term[2]	Off-Street[3]	Total
Existing Parking Spaces	814	276	900	2,038
South End	+7	-241	+3	-231
Pioneer Square	-135	-15	+2	-148
Central Waterfront	-268	0	-69	-337
North Waterfront	+2	0	+4	+6
Net Change	-394	-256	-60	-710
Parking Spaces with the Bypass Tunnel Alternative	420	20	840	1,328

[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. Approximately seven short-term spaces and three off-street 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.

Bypass Tunnel Alternative Simulation
at Marion Street

Exhibit 8-8

In the Pioneer Square area, 135 short-term parking spaces would be removed. An additional 268 short-term spaces would be removed along the central waterfront area. 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.
- 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

Appendices D and E contains additional information about views.

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.

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

In the Bypass Tunnel Alternative, the existing viaduct would be replaced with a tunnel, starting near S. King Street and ending north of Pine Street, near the Seattle Aquarium. This alternative would change the corridor in several important ways.

With the viaduct gone, views to and from the waterfront, currently obstructed by the viaduct, would be opened up for the first time since the early 1950s. From the Pioneer Square Historic District and from the commercial core, views to the west that are currently dominated by the viaduct would instead focus on pier buildings along the waterfront, and then past those buildings to the Kitsap Peninsula, Bainbridge Island, and the Olympic Mountains. Looking back to downtown from the waterfront, views of the city's skyline would no longer be interrupted by the viaduct's two elevated lanes and numerous support columns. As a result, the waterfront would appear far more connected with the city than it now does.

The area currently beneath the viaduct is visually cluttered with parking and vertical support columns, always in shadow, and dominated by the elevated structure above. With the Bypass Tunnel Alternative, the AWV Corridor would be changed to improve the surface street and to improve the look and feel of this waterfront area for the public. Improvements could include landscaping, a broadened waterfront promenade, sidewalks on the east side of the Alaskan Way surface street, a landscaped trolley corridor, a parking and access lane along the waterfront, and bike lanes. Gone would be existing effects from the viaduct's height, scale, bulk, and its industrial concrete design, which contrast with the visual character of Pioneer Square Historic District, the central waterfront, and parts of the commercial core.

South of S. King Street, in an area where views are dominated by sports stadiums and industrial buildings, the overpass that would connect SR 99 with S. Atlantic Street and S. Royal Brougham Way would be about half the height of the existing viaduct and would not be expected to affect the existing visual character. Where SR 99 emerges from the tunnel near Pike Street and the Seattle Aquarium, the tunnel portal would be covered by a landscaped lid that would be stepped to cover the roadway as it begins to rise toward the Battery Street Tunnel.

Views of the central waterfront from Pike Place Market and Victor Steinbrueck Park would be enhanced by the removal of the viaduct. The elevated portion of SR 99 would be a few feet lower than it is now, but it would still be a large part of views west in this area. Both in Belltown, where the viaduct would be replaced with a new elevated structure, and on SR 99 north of Battery Street Tunnel, the overall character of the area would not be affected by this alternative.

In the Bypass Tunnel Alternative, Alaskan Way surface street would have six lanes total (two more than the Tunnel Alternative and the same as the Surface Alternative). The overall roadway width, coupled with the traffic that would be generated by six surface lanes, might contrast with the visual character of the central waterfront and reduce the potential for reestablishing a visual connection between the waterfront and the city.

Drivers traveling north and south along the waterfront would no longer have the scenic views currently available from the viaduct roadway. Many pleasant views would be available along the waterfront, including waterfront buildings and activities. Views stretching from Elliott Bay to the Olympics and newly revealed views of the Seattle skyline would be available for those not in vehicles.

9 How would noise or vibration levels change?

The Bypass Tunnel Alternative would reduce noise levels throughout the central waterfront, though the reduction would be to a lesser degree than with the Tunnel Alternative. This is because traffic volumes on the Alaskan Way surface street would increase. Noise levels would decrease up to 10 dBA in the central downtown waterfront area and increase up to 3 dBA in other locations compared to existing 2002 levels. To the human ear, the smallest noticeable change is about 3 dBA, while a 5-dBA change is readily noticeable. A 10-dBA decrease would sound like the noise level has been cut in half.

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 abatement impact criteria at 43 of the 48 sites modeled. Traffic noise levels with the Bypass Tunnel Alternative would approach or exceed the traffic noise abatement criteria at 30 sites. These sites include approximately 4,360 residential units, 1,290 hotel rooms, and 120 shelter beds. Three of the sites are park or public open spaces, two are educational or childcare sites, and five sites are commercial or other less noise-sensitive uses only. Modeled noise levels at specific locations may be found in Exhibits 5-1 and 5-2 of Appendix F. Six sites that are severely affected by noise for the year 2030 existing facility would continue to be severely affected by the Bypass Tunnel Alternative.

The new tunnel along the central waterfront would include a mechanical ventilation system with several ventilation buildings spaced along the tunnel with tall ventilation stacks. At the south portal near S. King Street, noise from vent buildings would not be as obvious, because land uses there are mostly industrial and commercial. Around the north portal, near Pike Street, people would be more likely to notice ventilation noise. Ventilation fans would be designed not to exceed 60 dBA at the nearest commercial property line or 57 dBA at the property line of the nearest residential use during normal daytime operations. A level of 57 dBA 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 will be designed not to exceed 47 dBA during those hours.

Appendix F contains additional noise and vibration information.

Proposed improvements to the Battery Street Tunnel include the extension of the tunnel portals and installation of jet fans to provide ventilation. Noise from the ventilation fans and jet fans in the tunnel would be especially loud near the fan and fan vents. Jet fans will be designed not to exceed 57 dBA at the residential buildings during normal daytime operations, or 47 dBA if used regularly during nighttime hours.

The following mitigation measures were evaluated for their potential to reduce noise impacts from the Bypass Tunnel 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. Because the Bypass Tunnel Alternative would already greatly reduce traffic noise levels in much of the corridor, additional mitigation would not be feasible and reasonable.

Throughout the corridor, 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.

The Bypass Tunnel Alternative would cause less vibration than the current viaduct, which focuses vibrations from its elevated structure into the areas around the bases of support piers.

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

Currently, the viaduct blocks views between the waterfront and neighborhoods to the east and restricts options for land use development-both under and adjacent to the elevated structure.

The Bypass Tunnel Alternative could affect land uses in the corridor in several important ways. The current layout of the central waterfront's streets, sidewalks, and open space would be reconfigured in this alternative, possibly adding part of the area that's currently under the viaduct to the surrounding public open space (compatible with the City of Seattle's central waterfront planning efforts). Additions might include features such as landscaping, bike lanes, planted traffic medians, and broadening the waterfront promenade. Closer to the water, extra room could be provided for shoreline access, outdoor seating for restaurants, and seating along the shoreline.

Replacing the central portion of the viaduct with the bypass tunnel could affect land uses away from the waterfront as well. Areas adjacent to the viaduct would experience lower levels of noise and vibration caused by fast-moving traffic. Without the viaduct, a scenic view would stretch from the edge of the commercial core to the Olympic Mountains. A clear visual connection could be established between the waterfront and the city, and the way to the waterfront and back could be enhanced with unobstructed sight lines, improved street crossings, and an extension of the City of Seattle's Green Streets efforts to the waterfront on east-west streets.

In the Bypass Tunnel Alternative, the Alaskan Way surface street would have three lanes in each direction-two more than the Tunnel Alternative, and the same number as the Surface Alternative. These lanes would reduce the potential amount of area available for open space and might limit the sense of connection between the waterfront and the city. Nevertheless, overall changes resulting from this alternative could make nearby buildings and land more desirable for land uses that benefit from views, proximity to public open space, and foot traffic-possibly leading to new kinds of development in the project corridor.

Some land along the project corridor would be converted to roadway, most of it in the industrial area on the south end of the corridor. About 710 parking spaces in the corridor would be removed. South of S. King Street, a new interchange would connect over SR 99 to S. Atlantic Street and S. Royal Brougham Way. The interchange would be partially located in the Port of Seattle's container cargo facilities at Terminal 46, reducing the area used for container delivery, storage, and pickup. However, the ramps would also make it easier for trucks to move between the Port's facilities and both SR 99 and I-5.

With the Bypass Tunnel Alternative, traffic traveling between the Ballard/Interbay industrial area and industrial areas south of downtown would follow the Alaskan Way surface street instead of SR 99. As a result, southbound travel times for this trip would increase during the PM Peak hour from 13 minutes for the 2030 existing facility to 21 minutes. Increased travel times for trips between these two industrial areas makes this alternative less supportive of their industrial land uses than other alternatives, which do not reduce travel times.

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

With the viaduct removed from the central waterfront, part of the area that is currently beneath it could be incorporated into an open space corridor in the central waterfront, with streetscaping, sidewalks, broadening of the existing promenade, and bike lanes. Views between the waterfront and the city would no longer be blocked by the elevated structure. Additionally, putting a section of SR 99 underground would result in far less noise and visual distraction from vehicles. However, the width of the six-lane surface street along with the traffic it would generate might reduce the potential for enhancing visual and physical connection between the waterfront and the city.

One of the benefits of this alternative to parks and recreational facilities is that the areas above some parts of the tunnel could be used as public open space. Between Union and Pine Streets (east of the Seattle Aquarium), part of the area above the tunnel would be occupied by a broad public open space that could be developed as plaza or park. At the north end of the plaza, where the lanes of SR 99 would rise toward the tunnel portal, the lid above would slope accordingly, providing an inclined area that could also be developed as a park or recreational facility.

A new over-water pier would be built near the end of S. Washington Street connecting to Colman Dock. 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

Historic Washington Street Boat Landing

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.

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

failing. Alaska Square could be replaced with sidewalks and shoreline viewing near its current location. The new over-water pier would also require relocating the Washington Street Boat Landing about 125 feet west of its current location.

The Bypass Tunnel 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 Yesler Way, the Waterfront Trail would be moved from the east side of E. Marginal Way/Alaskan Way to the west side. Between Yesler Way and Pine Street, the trail would change from being a separated, shared bicycle and pedestrian pathway. Bicyclists would ride in striped lanes along the Alaskan Way surface street, and pedestrians could walk on sidewalks on the east side of Alaskan Way or the waterfront promenade located on the west side of Alaskan Way. From Pine Street north, the Waterfront Trail would not be affected.

The Bypass Tunnel Alternative would result in the loss 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 Bypass Tunnel Alternative affect neighborhoods and the people who live there?

In the Duwamish area, the Bypass Tunnel Alternative construction of a new interchange would improve access to and from S. Atlantic Street and S. Royal Brougham Way, which could benefit local businesses. This alternative would dramatically change the character of the commercial core along the central waterfront. Removing the existing viaduct would reduce noise and remove a visual barrier that now separates the downtown portion of the neighborhood from the waterfront. What now feels like two different areas separated by a noisy, shadowy zone would become a more attractive waterfront landscaped arterial bordered by Elliott Bay, the piers, and downtown buildings. The more open feel of the area could encourage more people to live and work in the area. However, there would be more lanes of traffic and substantially more vehicles traveling on Alaskan Way surface street, which would diminish some of the sense of connection.

Along the north waterfront, more traffic along Alaskan Way surface street could increase the feeling of separation between the waterfront and upland areas. The option to build a roadway to Elliott and Western Avenues would move this traffic off of the waterfront into the Belltown area.

In the north end of the project area, Aurora/SR 99 is currently a barrier for people and traffic moving between the Uptown and South Lake Union neighborhoods on either side of the roadway. The Widened Mercer improvements would benefit neighborhoods in this area by improving east-west connections across SR 99 at Mercer and Thomas Streets.

13 Would the Bypass Tunnel Alternative affect community and social services?

The Bypass Tunnel Alternative would have little effect on most community and social services 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. In the south, a new southbound on-ramp from E. Marginal Way in front of the St. Martin de Porres homeless shelter would increase traffic. 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. This alternative would also reduce noise and improve views for residents of the Lutheran Compass Center (a shelter and transitional housing facility), which is located next to the viaduct. 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 20 parcels would be permanently acquired for the Bypass Tunnel Alternative. If these parcels are fully acquired, the total area obtained would be approximately 1,115,000 square feet (26 acres). Additionally, about 169,000 square feet along the eastern edge of Terminal 46 may be acquired for right-of-way needs or ferry holding. Up to 10 buildings would be modified or displaced during construction, including seven 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 up to 356 employees in the 10 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 20 parcels that would potentially be acquired, 7 are located in the southern section of the project, 12 are located in the central section, and 1 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 Bypass Tunnel Alternative affect historic resources?

The Bypass Tunnel Alternative would replace the viaduct with a tunnel, starting at S. King Street and ending at Pike Street. The benefits of this alternative to the historic buildings in the central waterfront would include reduced noise levels and substantially increased views of and from the historic buildings. Gone with the viaduct would be much of the noise and blocked views to and from historic buildings and neighborhoods. The existing viaduct detracts from

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.

Appendix K contains additional information about properties that would potentially be acquired.

Appendices L and N contain additional information about historic resources.

Pioneer Square Historic District and the distinctive working waterfront architecture of Piers 54 to 59 (eligible for consideration as a historic district in the National Register of Historic Places). With the viaduct gone, it would be easier to enjoy the historic character of these neighborhoods and their buildings.

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 ramps would affect nearby historic buildings with traffic noise and blocked views. Old ramps connecting SR 99 with First Avenue would be removed, benefiting the surrounding area. 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 on the National Register of Historic Places would be demolished. The building is the Washington-Oregon Shippers Cooperative Association (WOSCA) Freight House. The tunnel portal would be located just south of S. King Street and could affect nearby parts of Pioneer Square Historic District with noise and exhaust from cars.

Continuing into downtown, ramps at Columbia Street and Seneca Street would be removed, eliminating the existing effects to the historic buildings around them. Along the waterfront, the Washington Street Boat Landing pergola would be relocated approximately 125 feet west of its current location to make way for the Colman Dock ferry access road. In the Pioneer Square Historic District, the One Yesler Way building would be in the way of the bypass tunnel, but it could be picked up and moved to an open site across the street. The tunnel would be vented through structures with stacks tall enough to clear the buildings next to them. These structures could be designed to blend in with their surroundings. Finally, 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. The tunnel already intrudes on the basement of the Catholic Seamen's Club, which is eligible for listing in the National Register of Historic Places and may be altered for the tunnel improvements.

The existing viaduct is eligible to be listed in the National Register for Historic Places. The 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 Bypass Tunnel Alternative, measures would be taken to lessen the effects it would have 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 Bypass Tunnel Alternative affect public services (such as police and fire)?

Public services would mostly be affected by changes in traffic patterns within the corridor. The Bypass Tunnel Alternative would maintain traffic flow in the corridor, and travel times through downtown may be improved. Through trips to the Ballard/Interbay area would increase somewhat, since these trips would not have a direct off-ramp at Elliott and Western and must travel along the Alaskan Way surface street. The Bypass Tunnel Alternative may change routes for public service providers since ramp connections would change, but this should not have a negative effect on the ability to provide comparable services.

Project elements that would improve overall operations for public service providers include adding roadway connections in the south end at SR 519, shifting access to the ferry terminal from Yesler Way to S. King Street, 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.

Ramp connections from SR 99 into downtown at Columbia, Seneca, Elliott, and Western would not be provided with this alternative. This may change routes for public service providers. However, comparable access would be provided elsewhere in the corridor, so public service providers would not be negatively affected by these changes. The travel time for Ballard/Interbay trips is expected to increase, which may increase travel times for non-emergency services such as garbage and mail pickup.

North of the Battery Street Tunnel, effects to public service providers 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 would provide additional east-west traffic movements in this section of the corridor. However, additional congestion and delay is expected at a couple of additional intersections due to the roadway changes.

17 How would the Bypass Tunnel Alternative affect the local and regional economy?

The Bypass Tunnel Alternative would create a safer roadway. However, the travel times for transporting goods and services in the corridor would increase for certain routes. Increased travel times from the Ballard and Interbay areas to the Duwamish area would affect existing businesses located in these areas and could discourage growth of commercial uses supported by this corridor.

The Bypass Tunnel Alternative would permanently displace up to 10 buildings with approximately 356 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

Appendix O contains additional information about public services.

Appendix P contains additional information about Economics.

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 Bypass Tunnel Alternative, approximately 710 parking spaces would be removed. About 241 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. Most of the other spaces that would be removed, about 403, 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 Bypass Tunnel Alternative would provide improved connections to the Duwamish area, Harbor Island, and SR 519 with overcrossing ramps at S. Royal Brougham Way and S. Atlantic Street. The new interchange at SR 519 would provide grade-separated access over the tail track, allowing for vehicular access from the waterfront to SR 519 when freight trains are present. Vehicles would need to exit the SR 99 facility at S. King Street or north of the Battery Street Tunnel and use the Alaskan Way surface street to reach downtown destinations. Also, traffic traveling from the stadium area to the Ballard/Interbay area would use the Alaskan Way surface street instead of SR 99 to reach these destinations. This is a common trip for many trucks, and travel time would increase for this trip in the southbound direction during the PM Peak hour.

The Bypass Tunnel Alternative's increased roadway widths and improved safety conditions and mobility would benefit traveling freight trucks. In most cases, travel times and travel speeds would be comparable or slightly degraded from the year 2030 existing facility conditions. One exception is southbound travel from the Ballard/Interbay area to the stadium area, where travel time would increase because trucks would have to use the Alaskan Way surface street instead of SR 99. Overall future freight mobility would vary compared to present day conditions and the year 2030 existing facility conditions, since lane and speed restrictions for freight traffic would be eliminated but travel times would increase in some areas. Associated freight operating and shipping costs would remain unchanged or be slightly increased.

18 Would the Bypass Tunnel Alternative change air quality?

Under the Bypass Tunnel 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).

The Bypass Tunnel Alternative includes four ventilation buildings that would be located adjacent to the tunnel near S. King Street, Yesler Way, Spring Street, and Pike Street. The ventilation buildings would be approximately 30 feet tall with 15-foot stacks. During the peak of an average rush hour, carbon monoxide emissions would not exceed the NAAQS in the surrounding neighborhoods.

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

The Bypass Tunnel Alternative would replace the seawall with a tunnel wall from S. Washington Street up to Pike Street and a rebuilt seawall from Pike Street to Virginia Street. Additionally, the sheet pile wall around Pier 48 would be replaced by the new seawall. The new seawall would be constructed slightly landward of the existing seawall through the majority of the corridor. However, a section of the tunnel would be constructed up to 58 feet farther into the water along about 430 feet of the shoreline between Pier 48 and Colman Dock. This would extend the Washington Street outfall further into Elliott Bay. Like the old seawall, the basic structure in the aquatic habitat along the new seawall would consist of a vertical concrete wall with rock riprap placed at its base where needed to prevent erosion from waves. Up on the 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 total area that would be altered at this location is approximately 33,000 square feet. The new tunnel structure would fill about 15,000 square feet in this location. The new pier would extend out from the new tunnel structure and cover approximately 18,000 square feet of the intertidal shoreline (areas that are exposed during low tides), including riprap, and shallow subtidal habitat (areas normally covered by water). As a result of the fill, the Bypass Tunnel Alternative would

Changes to Elliott Bay at S. Washington Street

Bypass Tunnel

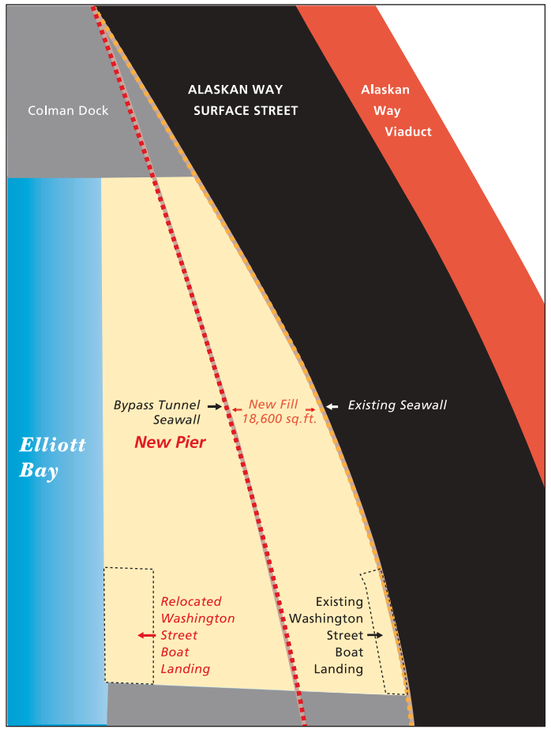


Exhibit 8-9

Appendix Q contains additional information about air quality.

Appendix R contains additional information about fish and wildlife.

decrease the shoreline habitat by about 5,000 cubic yards.

Under 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 keep macro algae and other aquatic vegetation from growing under the new pier.

Out of all the alternatives, the Bypass Tunnel Alternative could have the most effects on aquatic life. Project planners and designers would work with resource agencies (like the Corps of Engineers) to find ways 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 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 Bypass Tunnel Alternative change water quality?

The amount of impervious surface area would not increase under the Bypass Tunnel Alternative. Incorporation of Best Management Practices (BMPs) into the Bypass Tunnel 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 reduce water quality and can be harmful to aquatic plants and wildlife.

The Bypass Tunnel Alternative would provide an overall reduction in total suspended solids, zinc, and copper. The amount of pollutants would decrease in the Duwamish River, Elliott Bay, and Lake Union and increase in Puget Sound due to the greater volumes and associated pollutants discharged at the West Point Treatment Plant as compared to existing conditions.

Exhibit 8-10

Summary of Water Quality Benefits for the Bypass Tunnel Alternative Convey and Treat Approach

Annual Pollutant Load (lbs/yr)[1]	*Existing Conditions*	*Bypass Tunnel Alternative*	*Change (% Reduction)*[2]
Total Suspended Solids	87,300	50,500	42%
Zinc	132	86	34%
Copper	26	17	35%

[1] Annual pollutant load from project area pollutant-generating impervious surface (PGIS) after treatment with a convey and treat approach

[2] Pollutant reduction is an estimate based on a mass balance model developed for this project

The new tunnel along the waterfront and 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 Convey and Treat Approach would decrease the volume of stormwater that goes to Elliott Bay and increase the volume discharged to Puget Sound at the West Point Treatment Plant. The project would extend both the stormdrain and combined sewer outfall at Washington Street further into Elliott Bay. The Bypass Tunnel Alternative could result in a net benefit to the environment compared to existing conditions.

21 How would the Bypass Tunnel 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). In the central area of the Bypass Tunnel Alternative, much of these loose materials would be removed during tunnel excavation; however, in the south end and in locations where the alternative has elevated structures, soil improvements are required. The Bypass Tunnel Alternative's structures must be anchored in soils that are stronger than these loose materials to withstand an earthquake. Where piles or drilled shafts are needed, they would be installed 60 to 150 feet deep to reach the dense glacial soils that would support the facility.

Soils would be strengthened primarily in the south section around the new foundations needed for the structure, under some proposed retaining walls, and behind the seawall sections that are not part of the tunnel wall. Soils can be strengthened by using jet grouting or deep soil mixing techniques. These techniques inject, mix, or replace the existing soil with cement grout to strengthen the soils.

The soils between the new tunnel's north portal and the Battery Street Tunnel have sufficient strength and do not need to be improved. In the north section of the Bypass Tunnel 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.

In the central section, soils would not need to be strengthened because excavation for the cut-and-cover tunnel would permanently remove a large amount of the liquefiable soils that are a seismic hazard. Various types of contamination may potentially be found in some of the excavated soils, such as creosote piles or petroleum from underground fuel storage tanks. Removing these contaminated soils would improve the soil conditions in the area.

The new tunnel wall would also function as the new seawall between approximately S. Washington Street and Pike Street. The seawall improvements that are separate from the tunnel wall would take place in the south section between S. King Street and S. Washington Street and in the north section from approximately Pike Street to Myrtle Edwards Park. The area of soil behind the seawall that would be improved 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. The

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.

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

Appendix U contains additional information about contaminated materials.

majority of the seawall between Pike Street and Myrtle Edwards Park is Type A Seawall, with a small section of Type B Seawall at Clay Street. 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. Behind the Type B Seawall, the soil improvements would be around 60 feet in width and 65 feet in depth.

22 Would the Bypass Tunnel Alternative change groundwater flows?

Any groundwater flow in the tunnel vicinity would flow around, under, or over the tunnel structure. Consequently, the tunnel would not cause long-term operational impacts on water quality from affected groundwater. 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 Bypass Tunnel Alternative create or remove any contaminated materials or sites?

The Bypass Tunnel Alternative would not create any new contaminated materials or sites. This alternative would result in removal of an estimated 1,459,000 cubic yards of soil or material generated as spoils during construction. Of this amount, approximately 554,000 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. Additionally, most of the utilities would be placed in clean backfill above the tunnel, reducing the potential of exposure to contaminated soil and its associated air-borne contaminants for the workers servicing these utilities.