Chapter 5 Operational Effects and Mitigation

This chapter describes the potential effects of the Elliott Bay Seawall Project after construction has been completed and the new seawall and associated infrastructure are in operation. The same elements of the environment discussed in Chapters 3 and 4 are discussed in this chapter, following the same organization. Because there is a seawall, waterfront roadway, and sidewalks in place now and there would also be a seawall, waterfront roadway, and sidewalks in place upon project completion, few operational changes and, therefore, very few operational effects would result from project implementation.

The potential direct and indirect effects of project operation were analyzed for the No Action Alternative under the three scenarios described in Chapter 2 and for the three build alternatives. It should be noted that under the No Action Alternative, the project would not be constructed; therefore, the only operational effects would be those caused by required future maintenance and repairs if the seawall fails in part or in whole.

The discussion of each environmental discipline includes measures that could be implemented to avoid, minimize, or mitigate any adverse operational effects. The final mitigation commitments for the preferred alternative (Alternative C) are shown in Chapter 8. The potential operational effects of the build alternatives are summarized at the end of this chapter (Table 5-3).

5.1 Transportation

Analyses of traffic operation often evaluate the year that the project is completed (the "year of opening"), along with a design year. Traffic conditions for Alternatives A, B, and C were evaluated for two opening years: (1) 2017, when the Central Seawall is expected to be completed, and (2) 2023, when the North Seawall is expected to be completed. In addition, analyses were completed for two design years: 2030 and 2040. A quantitative analysis was completed for 2030, while 2040 was evaluated qualitatively to identify the potential for cumulative effects.

Design Year
Projects are planned and designed to meet the future, anticipated needs and characteristics of a certain year. This is referred to as the design year. Typically, the design year is 10 to 20 years after project completion.

The traffic analyses assumed that population and employment in downtown Seattle would continue to grow throughout the period of the transportation analysis and that the bored tunnel would be open for use in the 2030 and 2040 design years. The analyses also assumed that the bored tunnel would not be tolled; however, there is a possibility that tolls could be put in place at some point in the future. Regardless of whether tolls are implemented, the capacity of the tunnel, and its reduced connections to downtown compared to the existing Alaskan

Way Viaduct, would result in some diversion of traffic onto city streets. Additional discussion of tolling can be found in Chapter 6, Section 6.1.

A baseline forecast was also prepared for the No Action Alternative in the project's opening and design years. Because the baseline assumes that the downtown Seattle waterfront—particularly Alaskan Way—would remain as it is today, there are no anticipated changes to truck routes, bicycle/pedestrian facilities, transit, water-transit services, rail, or emergency access between now and 2017. The most substantive change to the transportation system anticipated by 2017 is the closure of the Alaskan Way Viaduct and the opening of the bored tunnel.

The conditions for the 2017 baseline also apply to the conditions in 2023, although there would be slightly higher traffic volumes due to regional growth. Therefore, the analysis considers how closure of the Alaskan Way Viaduct and the opening of the bored tunnel would influence traffic patterns in the study area in 2017 and 2023.

The 2030 traffic analysis showed that the projected growth in traffic volumes, combined with changes in travel patterns due to the bored tunnel, would result in increased levels of traffic congestion in the Alaskan Way corridor. Transportation conditions in the Alaskan Way corridor in 2040 would be similar to those for 2030, with an incremental increase in demand.

An analysis was undertaken for the 2040 baseline to show the effects of the Elliott Avenue/Western Avenue Connector, a potential separate and independent project, on traffic conditions along the downtown Seattle waterfront. The Elliott Avenue/Western Avenue Connector is a proposed new roadway linking Alaskan Way to Elliott and Western Avenues over the BNSF mainline railroad tracks. It is conceptual at this stage: the assumption is that it would have four traffic lanes with pedestrian and bicycle facilities and could not be built until the Alaskan Way Viaduct is removed. This connector roadway would act as an alternate route for much of the traffic that currently uses Alaskan Way north of Pike Street. In particular, many drivers traveling between downtown and Ballard, Interbay, and Magnolia would use the connector road since delays caused by the railroad crossings at Broad Street would be eliminated. The analysis can be found in Chapter 6, Section 6.1.

Because the Elliott Bay Seawall Project would not reduce existing traffic capacity on Alaskan Way—and, in the case of Alternatives A and C, would increase capacity somewhat—the increases in traffic volumes and congestion shown for future years are not impacts of the Elliott Bay Seawall Project, but rather effects of regional growth and changes in the local roadway network. Detailed analyses and quantitative modeling results for these transportation projections can be found in the Transportation Discipline Report (Appendix C).

Transportation Key Points

Traffic conditions were evaluated for two opening years (2017 and 2023) and two design years (2030 and 2040).

The No Action Alternative, Loss of Functionality scenario, and Collapse of the Seawall scenario would result in severe disruption to traffic and access throughout the project area.

Without the project, overall traffic volumes and congestion in the project area will increase in future years as a result of regional growth and changes in the roadway network. This will worsen intersection operations on Alaskan Way and increase travel times through the corridor.

Alternatives A and C would improve local traffic flow compared to the No Action Alternative by adding a northbound through lane on Alaskan Way between S. Washington and Madison Streets. Operations at three intersections would improve during the PM peak hour compared to the No Action Alternative, and northbound travel times would decrease by up to 7 minutes.

Seven parking spaces would be permanently eliminated in Alternatives A and C.

No Action Alternative

Traffic Operations

The No Action Alternative assumes that Alaskan Way would operate as it does today. However, the Alaskan Way Viaduct would be closed, and the bored tunnel would be open. In 2017 and 2023, all intersections in the Central Seawall and North Seawall areas would operate at LOS D or better during the AM peak hour. During the PM peak hour, six intersections on Alaskan Way in the Central Seawall area (Pine, Spring, Columbia, S. Main, S. Jackson, and S. King Streets) would be operating at LOS F. North Seawall intersections would operate at LOS D or better during the PM peak hour. Travel times would increase slightly during the AM peak hour, with a larger increase during the PM peak hour. This PM peak hour increase would be worse for southbound traffic, with travel times increasing by 5 to 6 minutes in 2017 and by up to 8 minutes in 2023 compared to existing conditions.

In the 2030 design year, conditions would be slightly worse than those for 2017 and 2023, with one intersection (Alaskan Way and Spring Street) operating at LOS F during the AM peak hour, and the same six intersections operating at LOS F during the PM peak hour. Increased traffic volumes would result in slower travel times, with delays of up to 3 minutes during the AM peak period and up to 8 minutes during the PM peak period compared to existing conditions. The worst delays would be experienced by southbound traffic on Alaskan Way during the PM peak hour.

Seawall Damage Scenarios

Under the Minimal Damage scenario, there may be occasional lane closures and parking losses while routine maintenance occurs or while sinkholes or other small failures of the seawall are repaired.

Under the Loss of Functionality scenario, traffic patterns on Alaskan Way could be severely disrupted for a period of months or years as repairs are made. Vehicle and pedestrian access to Colman Dock Ferry Terminal and Fire Station No. 5 would be provided as quickly as possible by means of temporary bridging or other emergency repairs. Parking in the immediate vicinity of seawall failure would likely be unavailable until the repairs are completed. The severity of the effects would be based on the extent of damage and the duration of repair work.

Under the Collapse of the Seawall scenario, traffic patterns on Alaskan Way would be severely disrupted for a period of years while the seawall and much of the waterfront is reconstructed. During the necessary period of closure of Alaskan Way, traffic would be dispersed along other downtown streets to the extent that they are not also damaged as a result of a seismic event.

Effects Common to All Build Alternatives

Overall, the build alternatives would operate similarly to No Action. The only change from No Action would result from the additional northbound lane in the vicinity of the ferry terminal under Alternatives A and C. This would increase northbound capacity over the baseline, eliminating bottlenecks on northbound Alaskan Way at Yesler Way and S. Washington Street. In 2017 and 2023, the number of intersections operating at LOS F in the PM peak hour would decrease from six to three (Pine, Spring, and Columbia Streets). Forecasts for 2030 show similar improvements for Alternatives A and C over the No Build Alternative. Alternative B would operate the same as the No Action Alternative. 2040 conditions are expected to be similar to those evaluated for 2030.

Reconstruction of Alaskan Way, including bicycle and pedestrian facilities, under all build alternatives would meet the current ADA standards and likely result in an improved roadway and trail surface. This would constitute a beneficial effect on the pedestrian and bicycle system.

The addition of the northbound land on Alaskan Way under Alternatives A and C would permanently eliminate seven on-street parking spaces.

In all other respects, transportation would be the same for all build alternatives as it would for the No Action Alternative.

Indirect Effects

The build alternatives would not result in any indirect effects on the transportation system.

Avoidance, Minimization, and Mitigation Measures

The City will partner with private and public facilities to implement e-Park (described in Chapter 4) and other measures to ensure adequate short-term parking supply as mitigation for the loss of parking along Alaskan Way.

5.2 Economics

No Action Alternative

Adverse economic effects of the No Action Alternative would range from minor to substantial, depending on how much of the seawall fails or collapses.

Under the Minimal Damage scenario, there would be minor effects on employment and taxes and localized effects on businesses resulting from temporary loss of access to businesses on a pier during needed repairs. If several businesses were affected, there could be a temporary adverse effect on business revenues, which could in turn lead to a minor reduction in business and sales taxes and parking revenue. Any adverse

Economics Key Points

If the Elliott Bay Seawall were to collapse or lose its functionality, an estimated 4,793 jobs would be lost.

Over time, any of the build alternatives could result in slightly higher tax and local revenues.

Lost parking revenue could reach $87,000 annually if seven parking spaces are eliminated as a result of Alternatives A or C.

There would be no net parking revenue lost from Alternative B.

There would be no permanent adverse economic effects as a result of any build alternatives, and no mitigation is required.

effects would be offset by the beneficial effects of some additional spending during repairs and/or maintenance.

Under the Loss of Functionality scenario, there would be greater adverse effects on employment. With this scenario, the seawall would not be considered safe for public access and people would not be able to visit many of the local businesses along the downtown Seattle waterfront. Businesses could close for extended periods of time, thereby reducing employment and tax revenues and adversely affecting the local and regional economy. The Collapse of the Seawall scenario would cause even greater adverse effects because a portion or all of the access to the downtown Seattle waterfront would be cut off completely. Temporary or permanent business closures would result in long-term reductions in employment, business income, and tax revenues.

IMPLAN modeling (described in Chapter 4) was used to assess the impacts of a seawall failure. The results are reported over a 3-year period, which is estimated to be the amount of time during which impacts would be felt in the regional economy before they were absorbed by means of transfers within the regional economy. Under either the Loss of Functionality scenario or the Collapse of the Seawall scenario, business closures during this period were predicted to result in a loss of 4,793 full-time equivalents, while state and local tax revenues would decline by an estimated $60,000 (with a net present value of $1,254,000) and City parking revenue by an estimated $727,000 (with a net present value of $15,288,000). Adverse effects on regional economic development and tourism could amount to losses of about $203 million in net present value, or about $10.5 million in annualized impact, over the 3-year period.

Net Present Value

Net present value is a way of comparing the value of money today, with the value of money in the future. This discussion presents the net present value of tax revenues and losses in the future, expressed in today's dollars. For example, if you assume a discount rate of 5 percent, the net present value of $2 million 10 years from now is $1.2 million.

Effects Common to All Build Alternatives

There would be no effects on employment under any of the three build alternatives and minimal effects on local or regional businesses. After construction, the study area would look very similar to what it looks like today, and businesses are expected to operate as usual. There would be no appreciable change in traffic or parking for any of the build alternatives.

Any of the build alternatives could result in minimal beneficial effects on taxes (state, use, hotel, and B&O) and local revenues (i.e., parking) if the improvements increase the attractiveness of the downtown Seattle waterfront to residents and visitors. Therefore, parking revenues and sale tax revenues could slightly increase over the long term as a result of the project.

Unique Effects of the Build Alternatives

The build alternatives would differ slightly in their operational impacts. Alternatives A and C would remove seven on-street parking spaces along Alaskan Way, resulting in a small loss of parking revenue to the

City if these spaces are not replaced elsewhere. Alternative B would provide more public amenities than A and C, and thus could increase business and tax revenues to some degree if these amenities attract additional visitors. If the view decks are constructed under Alternative C, two business facilities would be displaced (The Frankfurter and the ticket kiosk for Let's Go Sailing). If these businesses cannot be relocated within the project area, a loss of employment could result.

Indirect Effects

Some beneficial indirect effects on economic resources are expected under all of the build alternatives. Property or tenant improvements in the planning stages could be considered more timely by individual property owners after the necessary seawall improvements and disruptions associated with construction are complete. Revitalization and reinvestment could increase property values, stimulate economic activity, enable opportunities for new or expanded business and employment, and generate more tax revenues. These potential public and private investments, along with the additional public amenities associated with any of the build alternatives, could also prompt increased public use and visitation to the area, thus resulting in a beneficial indirect effect on economic activity.

Avoidance, Minimization, and Mitigation Measures

The City will work with any displaced business to provide relocation assistance under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

5.3 Noise and Vibration

No Action Alternative

The adverse operational effects of the No Action Alternative in terms of noise and vibration would be temporary and negligible to moderate and would depend on how much of the seawall is damaged.

Under the Minimal Damage scenario, there would be no appreciable operational sources of noise or vibration. Additional maintenance activities such as repair of sinkholes, potholes, and other settlement effects are likely if the seawall is not replaced. The Alaskan Way Viaduct would continue to be the primary source of noise in the area until 2016. Noise associated with ongoing maintenance would be comparable to the existing conditions.

Under the Loss of Function or Collapse of the Seawall scenarios, the noise and vibration effects of seawall repair or reconstruction would be similar to those described for construction of the build alternatives along most of or the entire downtown Seattle waterfront.

Noise and Vibration Key Point

There would be no appreciable operational sources of noise or vibration for any of the build alternatives, and no mitigation would be required.

Effects Common to All Build Alternatives

None of the build alternatives would cause noise or vibration, and all would require fewer maintenance activities than either the No Action Alternative or existing conditions. The Alaskan Way Viaduct would continue to be the primary source of noise in the area until 2016, and noise associated with its maintenance would be comparable to the existing conditions. Although routine maintenance and repair of the new seawall could result in temporary noise and vibration, these effects are expected to be negligible.

Indirect Effects

No indirect effects are expected as a result of operational sources of noise or vibration.

Avoidance, Minimization, and Mitigation Measures

No mitigation will be required as the project will not generate noise and vibration after construction.

5.4 Cultural, Historic, and Archaeological Resources

No Action Alternative

Overall, the operational effects of the No Action Alternative on archaeological sites and historic resources would range from negligible to adverse and from minor to substantial, depending on how much of the seawall fails or collapses. For all No Action scenarios that would result in new seawall construction, impacts on cultural, historic, and archaeological resources would be similar to those described for any of the build alternatives in Chapter 4.

Effects under the No Action scenarios would depend on how much of the seawall fails or collapses. The Minimal Damage scenario could have adverse effects on archaeological resources. The APE encompasses two previously recorded archaeological sites and several other sites with the potential for significant archaeological resources. Ongoing maintenance and repairs of the seawall could affect the three existing underwater archaeological sites identified in Chapter 3 if repairs to the seawall occur in the water in the vicinity of those sites (see the Cultural, Historic, and Archaeological Resources Discipline Report [Appendix F]). The Minimal Damage scenario would have minimal to no operational effects on historic resources; the seawall would be maintained and repaired as needed, similar to current maintenance practices.

The Loss of Functionality and Collapse of the Seawall scenarios would involve greater damage to the seawall and potentially to archaeological and historic resources. Underwater archaeological sites located north of the foot of Madison Street (45KI1011), south of the foot of Columbia

Cultural, Historic, and Archaeological Resources Key Points

If the seawall fails or collapses, effects on cultural, historic, and archaeological resources could be adverse and substantial.

All build scenarios would have no adverse effect on pre-contact and historic archaeological sites.

All build scenarios could have a potentially adverse effect on the Elliott Bay Seawall as a historic resource.

Alternative B could result in a potential adverse impact on historic piers because of the larger distance between the new seawall and the piers.

Mitigation for adverse effects on historic resources would include Historic American Engineering Record documentation for the existing seawall, and securing certificates of approval from the appropriate preservation boards, as required.

Street (45KI1012), and south of the foot of Yesler Way (45KI1013) could be affected if the seawall were to fail in any of these areas. Damage to piers and their underpinnings could cause the piers to collapse, which could in turn adversely affect the underwater archaeological sites. Also affected could be any archaeological sites that are preserved in historic fill behind the seawall, in particular sites associated with Yesler's Wharf and Ballast Island in Zone 1. These scenarios also could result in substantial or total loss of the seawall and potentially the loss of or severe damage to 18 other historic buildings or structures within the APE, including historic piers 54 to 59, Washington Street Boat Landing, and portions of the Pike Place Market and Pioneer Square historic districts. All or most historic resources within the APE would potentially be so damaged that they would no longer be eligible for the NRHP. Repairs, if possible at all, may also alter significant features of these historic resources. The construction effects on historic resources of rebuilding most or all of a new seawall would be similar to those described for the build alternatives in Chapter 4.

Archaeological Resources Potentially Affected by Seawall Collapse

Underwater archaeological sites located north of the foot of Madison Street (45KI1011), south of the foot of Columbia Street (45KI1012), and south of the foot of Yesler Way (45KI1013) could be affected if the seawall were to fail in any of these areas. Repairs and maintenance activities associated with any of the no-build scenarios could also have adverse effects on these resources.

Effects Common to All Build Alternatives

The build alternatives would have no adverse operational effects on potentially significant archaeological sites.

The only historic building or structure that could be potentially adversely affected by the build alternatives is the Elliott Bay Seawall itself. The seawall would be partially demolished and encased in the new seawall structure, and its existing function would be replaced entirely. As the lead federal agency, USACE in coordination with DAHP will make the final effect determinations.

Alternatives B and C could have some effect on the historic piers because of the proposed seawall setback from the existing location; however, the current design maintains the existing connections between piers, sidewalks, and the roadway. No other operational effects on historic properties are expected because of the distance of the historic properties from the seawall itself.

Indirect Effects

No indirect effects on archaeological or historic resources are expected to result from the operation of the new seawall under any of the build alternatives.

Avoidance, Minimization, and Mitigation Measures

The operation of the new seawall is not expected to result in any adverse effects on known archaeological sites; therefore, no mitigation is required.

The City may implement the following mitigation measures for effects if it is determined they would have an adverse impact on historic resources:

- Prepare Historic American Engineering Record-level documentation for the Elliott Bay Seawall.
- Replace the existing historical plaques on the seawall (or equivalent interpretive materials) in appropriate locations.

5.5 Energy Resources

No Action Alternative

Energy

Overall, the adverse operational effects of the No Action Alternative on energy resources would be minor and temporary. Energy resources would be used to maintain the failing seawall under all of the No Action Alternative scenarios.

The Minimal Damage scenario would require periodic seawall inspection, maintenance activities, and repair work, all resulting in varying amounts of annual energy use by vehicles and equipment. Energy would also be consumed during utility relocations, vehicle and freight traffic rerouting, and environmental cleanup. Due to the age and condition of the existing seawall, ongoing operational maintenance activities under the Minimal Damage scenario would be expected to be more frequent than the activities required for the build alternatives.

Under the Loss of Functionality scenario, energy services for users in project area may be temporarily disrupted because primary utility lines and distribution lines could be damaged. Annual operations and maintenance, tidal repairs, seismic repairs, and shoreline stabilization associated with major seawall repair would require fuel consumption by construction equipment and/or vehicles. The quantities of fuel would depend on the linear extent of the damage.

Under the Collapse of the Seawall scenario, energy services for users in the project area would be temporarily disrupted because primary utility and distribution lines would be severely damaged. Rebuilding the seawall and shoreline stabilization would require fuel consumption by construction equipment and vehicles in similar quantities as those needed for any of the build alternatives. After a seawall collapse, energy would also be consumed during utility relocations, vehicle and freight traffic rerouting, and environmental cleanup.

Greenhouse Gas Emissions

Under all of the No Action Alternative scenarios, GHG emissions would be released during maintenance of the failing seawall. Due to the age and condition of the existing seawall, ongoing operation and maintenance activities under the No Action Alternative are expected to be more frequent than under any of the build alternatives. Therefore,

Energy Key Points

The No Action Alternative would have minor adverse effects on energy resources, depending on the extent of seawall failure or collapse.

The build alternatives would use the same or less operational energy resources than today, and no mitigation would be required.

Greenhouse Gas Key Points

The No Action Alternative would require more frequent seawall maintenance activities than Alternatives A, B or C, resulting in greater GHG emissions under the No Action Alternative than the build alternatives.

the No Action Alternative would result in greater GHG emissions than any of the build alternatives.

The Minimal Damage scenario would require periodic seawall inspection, maintenance activities, and repair work, resulting in variable amounts of GHG emissions from vehicles and equipment.
GHG emissions would also occur during utility relocations, vehicle and freight traffic rerouting, and environmental cleanup.

Under the Loss of Functionality scenario, repairs and shoreline stabilization would require construction equipment and/or vehicle use, which would result in GHG emissions. The quantity of the emissions would depend on the extent of seawall repair and/or replacement required.

The Collapse of the Seawall scenario would require the use of construction equipment and/or vehicles in similar quantities as those needed for the build alternatives, resulting in levels of GHG emissions similar to those described in Chapter 4.

Effects Common to All Build Alternatives

Energy

Street lighting and pedestrian signal systems would consume energy in the form of electricity in amount approximately the same as consumed today. The existing electricity grid is expected to have sufficient capacity for the operational electricity demand of any build alternative. An overall reduction in operational energy consumption associated with routine operation, maintenance, and repairs of the seawall is likely because the new seawall would require less repair and maintenance work than the existing structure. Thus, no adverse impacts are anticipated during seawall operation.

Greenhouse Gas Emissions

Overall, the new seawall would require less repair and maintenance than the existing seawall, resulting in a slight reduction in GHG emissions compared to No Action. Alternatives A and C would provide an added reduction in GHG emissions because of the reduced congestion provided by the additional northbound through lane on Alaskan Way.

Indirect Effects

The public amenities associated with any of the build alternatives could prompt an increase in public use of and visitation to the project area, therefore resulting in minor increases in traffic and the associated GHG emissions. The effects of any increased visitation on energy resources are also expected to be minor.

Avoidance, Minimization, and Mitigation Measures

The City will use energy efficient lighting (i.e., LED bulbs) to minimize energy use over the lifetime of the project.

5.6 Land Use, Shorelines, and Parks and Recreation

No Action Alternative

Land Use and Shorelines

Under the Minimal Damage scenario, routine maintenance activities would continue to result in occasional sidewalk and/or lane closures, with resulting short-term effects such as construction noise, dust, and access restrictions.

Under the Loss of Functionality scenario, closures or detours required for repairs are likely to affect sidewalks, parking, and/or travel lanes. If there is a series of seawall failures, access along the downtown Seattle waterfront would be partially or severely restricted or even prohibited. Construction activities to provide temporary access to essential facilities such as Colman Dock Ferry Terminal and Fire Station No. 5 would likely result in short-term noise and dust. Access to and from the waterfront would be restricted in areas of seawall failure and in adjacent areas where further failure is possible.

Under the Collapse of the Seawall scenario, access to piers along the downtown Seattle waterfront could be severely restricted or prohibited until reconstruction of the seawall is completed. If the seawall is reconstructed, the construction effects on land use and shorelines would be similar to those of the build alternatives (described in Chapter 4). However, unlike the seawall construction associated with the build alternatives, reconstruction after a seawall collapse would likely occur on a year-round basis, and access to piers and possibly businesses and residences on the east side of Alaskan Way would be unavailable or severely restricted. Such access restrictions would result in business closures, and residential units could be inaccessible for an indeterminate amount of time.

Parks and Recreation

Under the Minimal Damage scenario, maintenance and repair activities could result in short-term effects, such as construction noise, dust, and access restrictions, which would have minimal effects on parks and recreational facilities.

Under the Loss of Functionality scenario, short-term closures or detours required as repairs are made are likely to affect sidewalks, parking and/or travel lanes. Depending on the location of the seawall damage, access to Waterfront Park, the Seattle Aquarium, Piers 62 and 63, and public access points along the downtown Seattle waterfront could be

Land Use Key Points

The No Action Alternative could result in a complete loss of or severely restricted access to businesses and residences in the project area, and seawall reconstruction (if needed) could occur on a year-round basis.

All build alternatives would be consistent with existing land use zoning and comprehensive plan designations.

Limited private property would be acquired as easements for any of the build alternatives. Most easements would be from government agencies (WSDOT, WDNR, and the Port of Seattle).

Alternative B would require about 196,000 square feet of permanent easement, the most of the build alternatives.

Parks and Recreation Key Points

The No Action Alternative could result in a complete loss of or severely restricted access to parks and recreation facilities in the project area, and seawall reconstruction (if needed) could occur on a year-round basis.

The largest impacts on Pier 59, Seattle Aquarium, Waterfront Promenade, and Washington Street Boat Landing would occur under Alternative B.

partially or severely restricted or even temporarily prohibited until repairs are completed. Access to the boat service to Blake Island State Park could also be restricted or prohibited. The waterfront multi-use trail may be unusable in whole or in part. Parking serving parks and recreational facilities may be unavailable for short or long periods of time, depending on the location of seawall failure and the size and location of the construction zones. Failure of the seawall in the vicinity of the Seattle Aquarium could have major adverse effects on the fish and marine mammals in the collection, especially if there is disruption in utility service or the water supply.

Under the Collapse of the Seawall scenario, all of the effects discussed under the Loss of Functionality scenario would likely occur along most or all of downtown Seattle waterfront. Reconstruction of the seawall would have effects similar to those of the build alternatives described in Chapter 4. However, unlike the construction associated with the build alternatives, reconstruction after seawall collapse would likely occur on a year-round basis.

Effects Common to All Build Alternatives

Land Use and Shorelines

Under all three build alternatives, the seawall and restored roadway would be located within the existing street right-of-way. The seawall and roadway are permitted uses in the Downtown Harborfront land use zone and Urban Harborfront shoreline zone. All three build alternatives would support public- and private-sector improvements along the downtown Seattle waterfront, consistent with the existing zoning and comprehensive plan designations.

Parks and Recreation

Under all three build alternatives, once the project is completed, access to parks and recreational facilities along the downtown Seattle waterfront would be similar to what it is today. Riparian plantings along the seawall edge would add some visual interest along the waterfront as pedestrians approach parks, recreational facilities, ferry terminals, and existing viewpoints on the piers. Bus loading zones would be configured more or less as they are today to provide convenient access to the Seattle Aquarium and various parks and recreational spaces. The extension of the multi-use trail from Vine Street to Broad Street would improve bicycle and pedestrian access to Olympic Sculpture Park and Myrtle Edwards Park and would facilitate a direct connection to the Lake to Bay Loop Trail.

Operational effects on parks and recreational facilities would be similar for all three build alternatives; therefore, the effects are discussed by the affected park or recreational facility in the following sections. Only those facilities that would be affected by project operation are discussed. Effects that differ among the alternatives are noted where appropriate.

Waterfront Promenade

Under Alternative B, the Waterfront Promenade would differ from today in Zone 3 (Central Piers), where the wall would be set landward 30 feet, and in Zone 4 (Seattle Aquarium/Park Zone), where the main sidewalk would be located east of its current location and along the eastern edge of the water plaza or land plaza. Walkways linking the main sidewalk to the Seattle Aquarium and alongside the Seattle Aquarium would provide overall pedestrian access similar to today. A continuous walkway on the west side of Alaskan Way would be provided to maintain the access provided by the existing sidewalk.

Washington Street Boat Landing

The Washington Street Boat Landing would be restored and would continue to provide seating and views of the water and mountains to the west, as well as views of the new intertidal habitat bench area under Alternatives B and C. Under Alternative B, new seating areas could be added, increasing the space provided for seating but limiting access to and viewing of the habitat bench.

The addition of a short-stay boat moorage under Alternative B would provide access for powered and non-powered watercraft to dock a short distance from Pioneer Square and the piers on the downtown Seattle waterfront.

Waterfront Park

The new seawall would remain independent of the structures on which Waterfront Park is located, allowing any reconstruction to occur or new park facility to be installed regardless of the seawall location. The build alternatives would support Seattle's Parks and Recreation 2011 Development Plan as related to Waterfront Park (see the Land Use, Shorelines, and Parks and Recreation Discipline Report [Appendix I]).

Pier 59 and Seattle Aquarium

Under Alternative B, the seawall setback in Zone 4 could provide increased public space around the Seattle Aquarium. The water plaza and the land plaza would provide different visual experiences for pedestrians. The water plaza would provide the opportunity for viewing tide pools and aquatic life below in conjunction with the Seattle Aquarium's educational endeavors; the existing open-water area adjacent to the aquarium could be covered for additional pedestrian plaza space. Alternative B would continue to provide flexibility for future expansion of the Seattle Aquarium, although the water plaza could be viewed as more limiting than the land plaza because the creation of new aquatic habitat could limit the area where future expansion can occur.

Pier 62/63

Access to the passive, view-oriented park at Pier 62/63 would remain as today. The location and proximity of the seawall, similar to what it is

today, should have no adverse effect on future plans for the pier, especially plans related to the potential Seattle Aquarium expansion. The build alternatives would support Seattle's Parks and Recreation 2011 Development Plan as related to Pier 62/63 (see the Land Use, Shorelines, and Parks and Recreation Discipline Report [Appendix I]).

Olympic Sculpture Park

No changes in access are proposed.

Lake to Bay Loop Trail

The extension of the Waterfront Trail to Broad Street would provide connections to and through Olympic Sculpture Park and Myrtle Edwards Park.

Unique Effects of the Build Alternatives

The build alternatives would differ somewhat in the extent of long-term easements required for the new seawall. Habitat features would require easements from WSDOT, WDNR, and the Port of Seattle. Table 5-1 compares the amount of long-term easements for the Central and North Seawall areas under each alternative.

Table 5-1. Long-Term Easements Required for Build Alternatives (Square Feet)

Alternative	Central Seawall	North Seawall	Total
Alternative A	44,000	70,000	114,000
Alternative B	126,000	70,000	196,000
Alternative C	126,000	70,000	196,000

As discussed in previous sections, the additional northbound through lane included for Alternatives A and C would cause the permanent loss of seven short-term parking spaces on Alaskan Way between S. Washington Street and Virginia Street. This loss is not expected to have an adverse effect on the existing land uses. The economic effects of parking loss are discussed in Section 5.2.

Under Alternative B, the water plaza option in Zone 4 would create outdoor educational opportunities in conjunction with the Seattle Aquarium that could be viewed as a benefit to the aquarium. Habitat improvements and the land plaza option in this zone could also have educational and view benefits. In addition, the proposed short-stay boat moorage at Washington Street Boat Landing and the creation of habitat area in Zone 1 may attract additional visitors to this portion of the waterfront and further encourage pedestrian flows between the waterfront and the historic Pioneer Square neighborhood.

The impacts of Alternative C would be similar to those of Alternative A, except that the increased habitat creation (especially in Zone 1) could have similar benefits to those discussed for Alternative B.

Once the project is completed, the change in location of the seawall changes the extent of the 200-foot shoreline zone, especially under Alternative B in the vicinity of Waterfront Park and the Seattle Aquarium, where the seawall could be set back up to 75 feet.

Indirect Effects

The new seawall would provide the owners of adjacent piers a seismically stable structure for support. This could result in the implementation of deferred maintenance and/or upgrades, although no changes to land use or shoreline zoning are expected as a result of any of the build alternatives.

Completion of the seawall project could prompt additional investment by owners of recreational facilities. Such public and private investments, along with the additional public amenities associated with any of the build alternatives, could also encourage increased public use and visitation to the area. Improvements that attract additional visitors to the general vicinity of the downtown Seattle waterfront may also have beneficial indirect effects on adjacent areas, especially Pioneer Square, Pike Place Market, Belltown, and Olympic Sculpture Park. Public amenities including the proposed short-stay boat moorage (Alternative B), the water plaza or land plaza (Alternative B), and enhanced viewpoints (Alternatives B and C) may also attract new investment or reinvestment in the area.

Avoidance, Minimization, and Mitigation Measures

No long-term adverse effects on land use and shorelines will result from operation of the new seawall; therefore, no mitigation will be necessary.

5.7 Public Services and Utilities

No Action Alternative

Public Services

Under the Minimal Damage scenario, the existing seawall and surface street would remain in place unless all or a portion of the seawall collapses as a result of tidal or seismic activity. Routine maintenance activities may occasionally result in sidewalk and/or lane closures. These short-term lane closures may have some impact on emergency response times, but emergency providers would be informed in advance of any such closures due to maintenance. Overall impacts on the provision of public services are expected to be minor.

Public Services Key Points

The No Action Alternative could prevent emergency services from accessing waterfront businesses and residences in the event of a seawall failure or collapse.

Long-term impacts on public services would be negligible for all of the build alternatives.

Under the Loss of Functionality scenario, short-term closures or detours required as repairs are made are likely to affect sidewalks, parking, and/or travel lanes. If there is a series of failures or a major collapse of the seawall, access along the downtown Seattle waterfront would be partially or severely restricted or even prohibited. Access to Fire Station No. 5 could be affected, depending on the location of the wall failure. In the worst-case scenario, access to the fire station could be prohibited until a temporary access structure is constructed. This would require relocating the engine company. If the two fireboats assigned to Fire Station No. 5 are damaged or become inaccessible, another boat at Fishermen's Terminal would be positioned on the waterfront to provide alternative fireboat access.

Under the Collapse of the Seawall scenario, access to commercial and residential properties along the downtown Seattle waterfront could be severely affected. The restricted access for ground-based emergency services—particularly fire department services—could render buildings unsafe for occupation until the roadway and seawall repairs are completed. In addition, service disruptions of key utilities (such as water mains) could substantially disrupt firefighting ability in the area.

Utilities

Under the Minimal Damage scenario, the existing seawall and surface street would remain in place unless all or a portion of the seawall collapses as a result of tidal or seismic activity. Routine maintenance activities would continue and may occasionally result in sidewalk and/or lane closures.

The Minimal Damage scenario would have no immediate operational effects on utilities. Utilities would continue standard operation and maintenance practices, with system upgrades as required. The City and private utility owners would each respond as required to repair minimal damage resulting from seawall failures in order to maintain services to their customers.

The Loss of Functionality scenario would render the downtown Seattle waterfront unsafe but may or may not result in immediate effects on any individual utility system. Under this scenario, all utilities within the project area would be relocated, and the operational effects would depend on the sequencing and efficiency of the response of each utility owner. In the case of utilities that suffer immediate damage, the operational effects would be severe.

Under the Collapse of the Seawall scenario, major utility systems would suffer immediate disruption, and the effects would be both local and regional. All utilities would need to be relocated as quickly as possible in order to limit the duration of disruptions. Under this scenario, the environmental effects of the disruptions to the combined sewer system would be significant because drainage and sewage from major portions of downtown pass through the diversion structures in the study area.

Utilities Key Points

The No Action Alternative could result in severe effects on utility service.

Under the build alternatives, Seawall maintenance could cause temporary utility service disruptions, but effects are expected to be minor.

Utility providers would have the opportunity to upgrade utility systems during construction of the project, which could result in a beneficial indirect effect.

Effects Common to All Build Alternatives

Public Services

Under any of the build alternative, the long-term effects on public services would be negligible. The new seawall should require only routine maintenance over its expected design life (75 years).

Because of the similarity of operational effects for all three build alternatives, these effects are discussed by the affected public service in the following subsections. Notable differences between the build alternatives are discussed where applicable; public services that would not be affected during project operation are not discussed.

Fire and Emergency Services, Law Enforcement Services, and Emergency Medical Services

The restored roadway would convey similar traffic volumes as those under the No Action Alternative; therefore, emergency response times would be similar to No Action under Alternative B and would improve under Alternatives A and C due to the addition of a new permanent northbound through lane near the ferry terminal. Overall demand for emergency services should remain constant, adjusting for normal growth that would occur with or without the project. New water connections installed at adjacent buildings would improve the reliability of flow.

Under Alternative B, the eastward movement of the traffic lanes in the vicinity of the Seattle Aquarium would put greater distance (up to 75 additional feet) between the roadway and the Seattle Aquarium. This increased distance could affect fire suppression services and emergency management activities. The water plaza or land plaza would also create additional barriers between the street and the Seattle Aquarium, potentially providing less flexibility in access for emergency services.

For all build alternatives, improved amenities and a restored Washington Street Boat Landing (and short-stay boat moorage under Alternative B) could potentially result in a few more emergency calls (i.e., police and ambulance) as a result of the public use of these features, although these calls likely would be sporadic.

Disaster Preparedness

Impacts on disaster preparedness would include a greatly reduced likelihood of a seawall failure once the new seawall is constructed.

Utilities

All three build alternative would have similar operational effects on utilities in the study area. Ongoing seawall maintenance could cause temporary disruptions in utility service due to excavation, vibration, and ground settlement. Operation of each of the utilities could be temporarily affected if access for maintenance and repair is not provided at all times.

There is potential for each utility owner to consider upgrading its system in coordination with the project.

Although regular maintenance and repair of the new seawall could result in temporary adverse effects if services are disrupted, these effects are expected to be minor. The operational effects specific to each utility are described in the following subsections.

Electrical Power

Continuity of operation of the network distribution and transmission systems is critical to maintaining electrical service to the downtown core of Seattle. Protecting portions of the system in place with incremental relocation of segments of the system may not provide the operational continuity required of the system. Final operation of the system would be unchanged or improved once project construction is completed.

Sewer, Combined Sewer, and Storm Drains

The build alternatives would have similar effects on the gravity-pipeline systems in the seawall. While the current approach for the build alternatives is to protect and/or remove outfalls and storm drains (large gravity pipes would not be moved or removed) during construction, the City is also investigating opportunities to consolidate some existing outfalls. Some outfalls will have drop structures that lower the discharge elevation.

The City currently is investigating options for improving control of CSO events as part of a separate and independent project, which would likely include significant revisions to the size and operation of the existing CSO system in the study area. If utility space planning is coordinated with this future project, overall costs to the City could be reduced.

Natural Gas

Operation of the natural gas utility system is not expected to change as a result of the build alternatives. Once construction is completed, the function of the system would be unchanged.

Steam

The affected portions of the steam utility system would be replaced. Final operation of the steam utility system would remain unchanged.

Telecommunications

The communications system would be replaced in-kind. Final operation of the communications system would remain unchanged or improved once project construction is completed.

Indirect Effects

No indirect operational effects on public services and utilities have been identified.

Avoidance, Minimization, and Mitigation Measures

No long-term adverse operational effects on public services have been identified, and part of the purpose and need for the project is to protect public services and utilities from damage that could occur as a result of no action. Therefore, no mitigation measures for public services are necessary.

The project design will comply with current City and Washington State code requirements, including utility policies and strategies listed in the Utilities Element in the Seattle Comprehensive Plant. The City will coordinate with customers at service connections and provide overall coordination of design efforts to be provided by each utility owner.

5.8 Social Resources and Environmental Justice

No Action Alternative

Damage to the seawall under the No Action Alternative could affect adjacent social resources, including market-rate and low-income housing, community facilities, educational institutions, social services, and cultural and social institutions. The temporary or permanent loss of one or more of these resources due to seawall failure could affect a number of residents in the community, including minority and low-income populations and homeless persons.

Under the Minimal Damage scenario, planned repair and maintenance work would be consistent with current practices. These activities would cause only temporary disruptions in access to social service providers. Each repair or maintenance job would likely be completed in a number of weeks or several months at most. Construction zones are expected to be limited in size, perhaps only several city blocks at most. There would be no substantial adverse effects on any social resources, and all of the effects would be short term. The existing seawall and surface street would remain in place unless all or a portion of the seawall collapses as a result of tidal or seismic activity.

Under the Loss of Functionality scenario, short-term closures or detours required as repairs are made are likely to affect sidewalks, parking and/or travel lanes. Access along the downtown Seattle waterfront would be partially or severely restricted. Construction activities to provide temporary access to Colman Dock Ferry Terminal and Fire Station No. 5 would result in short-term noise and dust. Access along the waterfront and to and from the waterfront would be restricted in areas of seawall failure and in adjacent areas where further failure is possible.

Under the Collapse of the Seawall scenario, access along the downtown Seattle waterfront would be partially or severely restricted or even prohibited. Construction activities to provide temporary access to

Social Resources and Environmental Justice Key Points

The No Action alternative could result in minimal to substantial adverse effects on social resources in the project area, depending on the scenario.

The net operational effects of all three build alternatives on social resources in the study area would be minor to moderately beneficial, and there would be no adverse operational effects that would be predominantly borne by minority and/or low-income populations.

Colman Dock Ferry Terminal and Fire Station No. 5 would result in short-term noise and dust. Access to piers along the waterfront could be severely restricted or prohibited until reconstruction of the seawall is completed. As the seawall is reconstructed at some future date, the construction effects would be similar to those of the build alternatives described in Chapter 4. However, unlike the build alternatives, reconstruction after seawall collapse would likely occur on a year-round emergency basis (with in-water work restrictions) and access to piers and possibly businesses and residences on the east side of Alaskan Way would be unavailable or severely restricted. These access restrictions would result in business closures, and residential units could be inaccessible for an indeterminate amount of time.

Effects Common to All Build Alternatives

Any of the build alternatives would result in many of the same operational effects on social resources and environmental justice populations in the study area. After construction of the build alternatives, the downtown Seattle waterfront and the study area would be very similar to what they are today. The main difference would be the roadway restoration, which would result in a loss of approximately seven parking spaces under Alternatives A and C, and a gain of a northbound through lane in the vicinity of Colman Dock Ferry Terminal. The loss of parking would slightly reduce the supply of available parking that serves residents, businesses, and visitors in the study area.

The net operational effects of all three build alternatives on social resources in the study area would have minor beneficial effects under Alternatives A and C and be moderately beneficial under Alternative B, and there would be no adverse operational effects that would be predominantly borne by minority and/or low-income populations.

Because of the similarity of operational effects for all three build alternatives, the effects are discussed by category in the following subsections.

Population and Demographics

None of the build alternatives would likely have a long-term effect on population or housing in the study area because the downtown Seattle waterfront would look very similar to what it looks like today once construction is completed. Under Alternative B and Alternative C (to a lesser degree), the enhanced downtown Seattle waterfront with more proposed amenities may encourage people to move closer to the waterfront, possibly increasing the demand for housing in the long term.

Under the build alternatives, seawall operations would likely require workers to repair and maintain the seawall on a less frequent basis than the maintenance under existing conditions. The number of employees would be small and already employed by SDOT, Seattle Public Utilities, Seattle City Light, and other private utilities. Any new jobs that are

created would likely be filled by workers from the regional labor force because the types of new jobs would not likely require employees with highly specialized skills. The completed project would not require workers from outside the region and, therefore, would not result in increases in the regional population or the demand for housing. There would be beneficial effects on those who fish along the piers and/or waterfront as a result of habitat improvements and better access to the water under any of the build alternatives, although these effects would be greater under Alternatives B and C than under Alternative A.

Regional and Community Growth

Alternative A would result in minor effects on the regional economy. Alternatives B and C, with the addition of new public spaces and viewpoints along the downtown Seattle waterfront, would have slightly greater beneficial effects on the regional economy.

These effects would occur over time with the revitalization and reinvestment in the project area once construction is completed and the downtown Seattle waterfront becomes more attractive to residents and visitors. Revitalization and reinvestment could increase property values, stimulate economic activity, provide opportunities for new or expanded business and employment, and generate more tax revenues. This revitalization and redevelopment could result in increased economic activity.

Community Facilities

The build alternatives would have no operational effects on community facilities (churches, schools, community centers, or libraries). However, added amenities and a safer downtown Seattle waterfront may result in increased foot traffic and visitors to the waterfront.

Neighborhood Cohesion

The build alternatives would not adversely affect travel routes and durations, transit service, pedestrian access, or the character of land uses in neighborhoods. Therefore, none of the build alternatives would have an operational effect on neighborhood cohesion in the study area.

Environmental Justice

Because the build alternatives would result in very limited and minor operational effects and all facilities would be restored as they are now, there would be no adverse operational effects that would be predominantly borne by minority and/or low-income populations.

Under Alternative B and Alternative C (to a lesser extent), the enhanced downtown Seattle waterfront with more proposed amenities may encourage people to move closer to the waterfront, possibly increasing the demand for housing in the long term. Beneficial effects on regional economic activity would occur over time once construction is completed and the downtown Seattle waterfront becomes more attractive to residents and visitors. Revitalization and reinvestment could increase property values, stimulate economic activity, provide opportunities for

new or expanded business and employment, and generate more tax revenues. In addition, there would be beneficial effects on those who fish along the piers and/or waterfront as a result of habitat improvements and better access to the water under any of the build alternatives, although these effects would be greater under Alternatives B and C than under Alternative A.

Indirect Effects

The improved fish habitat proposed under all three build alternatives could increase the number of salmon and other fish species over time and could indirectly benefit Native American fishing in the area. Furthermore, additional public amenities along the downtown Seattle waterfront associated with any of the build alternatives could make the area more appealing to residents and visitors and increase the number of cultural, recreational, and educational events along the waterfront. Improvements that may attract additional residents and/or visitors to the general vicinity of the waterfront may also indirectly benefit adjacent areas. These indirect effects are expected to be minor and beneficial.

Avoidance, Minimization, and Mitigation Measures

Community outreach and communication will continue during the initial months after construction to address restored traffic and access conditions.

5.9 Visual Resources

The illustrative series at the end of this section compares the existing conditions to visual simulations of four distinct waterfront viewpoints in the study area under each build alternative (see Figure 5-1 through Figure 5-19).

No Action Alternative

Recognizing that the intent of the seawall replacement is to protect the downtown Seattle waterfront from coastal storm and seismic damage, the No Action Alternative would expose the visual character and quality of all viewing sites to a risk of adverse effects due to future deterioration.

Under the Minimal Damage scenario, the visual environment would initially be unchanged. The existing conditions along the seawall at the four viewpoints are shown in the top image of each pair in illustrative series at the end of this section.

Under the Loss of Functionality scenario, the extent of impacts on the visual environment would depend on the magnitude of seawall damage. As sections of seawall reconstruction are completed, the resulting visual environment would be the same as that described for any of the seawall sections under the build alternatives (see Chapter 4).

Visual Resources Key Points

Under the No Action alternative, adverse visual effects would range from minor to substantial, depending on the scenario.

All build alternatives would change the seawall, water's edge, and upland public spaces immediately east of the seawall. The operational effects of any build alternative would be long term and beneficial for visual resources in the project area.

Where possible, trees would be added to the project to replace street trees that are removed. Additional mitigation for removal of street trees would be provided in other projects, including the Waterfront Seattle project.

Under the Collapse of the Seawall scenario, the construction effects on the visual environment of building a new seawall would be the same as those described for any of the build alternatives (see Chapter 4).

Effects Common to the Build Alternatives

All build alternatives would result in changes to the seawall, water's edge, and upland public spaces immediately east of the seawall. The improvements would include changes to the seawall face and its alignment, new railings, planters and plants, new viewpoints, aquatic habitat features, pavement, and site furnishings that would change the visual environment. The improvements would reinforce the existing visual character along the downtown Seattle waterfront. The visual experience from adjacent piers and watercraft would generally be improved by these elements. The addition of LPS in the sidewalk adjacent to the piers would alter the character of the sidewalk but would add visual interest. Operational effects on visual resources in the study area under all build alternatives are expected to be moderately beneficial.

The seawall setbacks under Alternative B would dramatically alter but improve the visual environment with the addition of new plaza space and visual elements that would enhance the Seattle Aquarium area.

Under Alternatives B and C, the new seawall would be set farther east than the seawall constructed under Alternative A. The greater setback would result in larger cantilevered sidewalks with more LPS, more extensive habitat improvement measures, and additional public amenities. Removal of existing street trees along the downtown Seattle waterfront would increase the visibility of Elliott Bay but may adversely affect the visual environment as viewed from the sidewalk. New riparian trees would frame the views and help to visually mitigate the loss of the existing street trees.

Indirect Effects

To the extent that project elements draw more visitors to the waterfront, this increased visitation could encourage redevelopment and investment by project-area land owners in their properties. Such future development, if carried out consistently with City codes and design standards, could result in enhanced visual conditions in the area.

Avoidance, Minimization, and Mitigation Measures

The City will install riparian vegetation and replace street trees in select areas to mitigate for effects to street trees during construction. Additional street plantings and landscaping will be installed within the project area.

Viewpoints Used in Visual Quality Assessment

The visual quality assessment provides a visual simulation of what the seawall and surrounding environment would look like under either the No Action Alternative or the build alternatives. Four viewpoints along the waterfront in the project area were chosen to represent a range of visual interests and potential impacts on visual quality:

- **Viewpoint 1:** Between Pier 48 and Colman Dock
- **Viewpoint 2:** Between Pier 54 and Pier 55
- **Viewpoint 3:** Between the Seattle Aquarium and Pier 62/63. Note that for Alternative B, Viewpoint 3 has shifted in order to show the Water Plaza and Land Plaza options.
- **Viewpoint 4:** Between Pier 66 and Pier 67.

Figure 5-1. Viewpoint 1, existing conditions

Figure 5-2. Viewpoint 1, Alternative A visual simulation

Figure 5-3. Viewpoint 1, Alternative B (boardwalk option) visual simulation

Figure 5-4. Viewpoint 1, Alternative B (boulder option) visual simulation

Figure 5-5. Viewpoint 1, Alternative C visual simulation

Figure 5-6. Viewpoint 2, existing conditions

Figure 5-7. Viewpoint 2, Alternative A visual simulation

Figure 5-8. Viewpoint 2, Alternative B visual simulation

Figure 5-9. Viewpoint 2, Alternative C visual simulation (with optional view deck). Note: without view deck, visual simulation would be similar to Alternative A.

Figure 5-10. Viewpoint 3, existing conditions

Figure 5-11. Viewpoint 3, Alternative A visual simulation

Figure 5-12. Viewpoint 3, existing conditions

Figure 5-13. Viewpoint 3, Alternative B (water plaza option) visual simulation

Figure 5-14. Viewpoint 3, Alternative B (land plaza option) visual simulation

Figure 5-15. Viewpoint 3, existing conditions

Figure 5-16. Viewpoint 3, Alternative C visual simulation

Figure 5-17. Viewpoint 4, existing conditions

Figure 5-18. Viewpoint 4, Alternatives A and C visual simulation

Figure 5-19. Viewpoint 4, Alternative B visual simulation

5.10 Fish, Wildlife, and Vegetation

No Action Alternative

The No Action Alternative would provide no environmental benefits for biological resources in the study area because the habitat enhancements proposed under the build alternatives would not be constructed. The nearshore and upland habitats would remain highly urbanized and degraded.

The Minimal Damage scenario could involve the repair of occasional sinkholes or panel failures that would require in-water work, resulting in only minimal, short-term effects on habitat.

Under the Loss of Functionality scenario, work could include major shoreline stabilization with rock or sheet piling after seawall failure. The urgency to stabilize and repair the seawall after a damaging event would largely preclude the incorporation of environmental enhancements and may require in-water work outside of typical agency-mandated work windows.

Under the Collapse of the Seawall scenario, a large quantity of soils and debris would likely sluice into the bay and bury existing habitats, incidentally creating shallow shoreline and intertidal habitat. These soils are likely to be contaminated, and the resulting shoreline would need to be stabilized with rock or other materials. During a partial or complete failure of the seawall, all existing utilities along the shoreline could be ruptured, and stormwater, sewage, natural gas, oil, and other pollutants would spill or be washed into the nearshore area. Although the effects would be temporary, millions of gallons of sewage and large amounts of natural gas and petroleum products could spill into Elliott Bay and adversely affect fish, wildlife, and aquatic vegetation.

Effects Common to All Build Alternatives

After construction of any build alternative, the operational activities that could affect fish, wildlife, and vegetation would include periodic maintenance activities like rock or substrate placement for the habitat features and cleaning of LPS, as well as continued stormwater discharges and disturbances due to human use along the waterfront. Even with the additional northbound lane between S. Washington Street and Spring Street under Alternatives A and C, runoff from the restored roadway would be expected to have a minimal effect on biological resources and localized stormwater runoff would be treated to meet the requirements of the Seattle Stormwater Code (SMC 22.88–22.808). The new seawall would be unlikely to have a significant adverse effect on biological resources and would serve to isolate and protect any existing contaminated soils in the upland area to prevent their contact with biological resources.

Permanent sidewalk and street lighting, which would be installed to meet City requirements, may have an effect on the aquatic environment. Nighttime street lighting and other artificial light sources

Fish, Wildlife, and Vegetation Key Points

A partial or complete seawall collapse could result in millions of gallons of sewage, as well as quantities of gas and petroleum, being released into Elliott Bay, which would cause adverse effects on fish, wildlife, and vegetation.

The primary effects of the build alternatives on fish, wildlife, and vegetation would be to increase habitats for project area species and to increase populations or densities in the study area.

New habitat features would increase the amount of shallow aquatic habitat in the area by up to 2 acres as well as substantially improve its overall quality.

Incorporating light-penetrating surfaces into the sidewalks would provide a continuous naturally lighted corridor for salmonid migration over 4,000 linear feet of the shoreline that is currently shaded.

installed for any of the build alternatives would emit high levels of light that could adversely affect fish movements (for example, a high shadow line would likely inhibit the migration of salmon under the piers). Other existing light sources such as business signage and security lights would likely continue to provide high levels of ambient light at night.

The habitat enhancements associated with the build alternatives would generally result in the conversion of what is now deep-water habitat and riprap into nearshore habitat that is accessible to migrating salmonids and other wildlife and plants. The primary habitat enhancement goal is to improve intertidal migration of juvenile salmonid along the seawall. This would be accomplished by modifying depths to achieve an intertidal habitat-bench elevation, improving underwater substrates, increasing daylight illumination of the habitat bench by incorporating LPS in the sidewalk above, increasing the texture of the seawall face to host aquatic organisms, and adding riparian plants along the seawall and sidewalk. Cobble reefs (except under Alternative C) and substrate enhancements would improve selected subtidal areas. Although constructed in an urban environment, these measures would replicate natural shoreline features to enhance primary and secondary productivity. The operational effects of the habitat enhancement features associated with the three build alternatives are summarized in the following subsections.

Habitat Benches and Reefs in the Nearshore Area

Existing subtidal sand and riprap habitat and communities would be converted into a mix of intertidal and subtidal rock and cobble/gravel habitat, increasing the amount of shallow aquatic habitat in the area by up to 2 acres, and substantially improving its overall quality. Although the habitat benches and cobble reefs are intended to enhance habitat for salmonids, they would also improve habitat for all other native species in the nearshore community. Note that cobble reefs are not included in Alternative C.

Riparian Plantings in Upland Areas

The upland habitat features would primarily include riparian plantings that would be installed to provide overhanging vegetation for ecosystem productivity and support. Plantings would provide riparian habitat for the terrestrial invertebrates that salmonids rely on for food while in the nearshore area. These plantings would also add upland habitat, which would aid in supporting native birds and other wildlife.

Textured Walls on the Seawall Face

The new textured face panels on the seawall would substantially increase substrate for intertidal alga and invertebrate attachment, increasing the quantity and quality of habitat found in and around the constructed seawall. Once the panels are colonized by invertebrates and algae, the overall habitat in the nearshore area would be enhanced for additional species such as salmonids and other larger fish and wildlife.

Light-Penetrating Surfaces

The sidewalks would be replaced and generally cantilevered over the nearshore area, would generally be wider than the existing sidewalks (due to the seawall setback), and would include some LPS. Strategically locating LPS would enhance the amount of ambient light that penetrates into the nearshore environment. This would improve the quality of the nearshore habitat relative to existing conditions for photosynthetic organisms such as marine algae and some invertebrates. The use of LPS is primarily intended to reestablish a corridor of nearshore habitat with mostly unbroken increased lighting, which would improve the area for salmonid migration.

The installation and construction of the enhancements would initially bury existing macroalgae and invertebrates and cause a temporary decrease in abundance and diversity. However, once constructed, the new habitat features should provide substantial long-term benefits to individual species and the ecosystem. Salmonids should benefit from an improved migration corridor with higher quality refuge and rearing habitat. Juvenile rockfish should benefit from the expanded habitat features, such as subtidal reefs, that would promote the establishment of bull kelp beds and macroalgae. The substrates and bathymetry in the nearshore area would be diversified, providing improved habitat for various marine plants, invertebrates, and vertebrates. The beneficial effects in the upland areas would include improved vegetation densities and vegetation distribution. If the anticipated improvements do occur as the result of implementing any of the build alternatives, it is expected that various native species would increase in density and potentially in diversity along the approximately 7,000-foot-long nearshore area in the project area and improve the overall natural environment in Elliott Bay. A post-construction monitoring and adaptive management plan to quantify ecological changes and the effectiveness of the habitat measures is currently being developed.

Unique Effects of the Build Alternatives

Under Alternative A, the seawall setback along much of the waterfront would provide a net increase in aquatic habitat of approximately 0.5 acre. The habitat measures installed as part of Alternative A (described in previous subsection) would provide ongoing beneficial environmental effects on the nearshore ecosystem and associated fish, wildlife, and vegetation.

Under Alternative B, the greater seawall setback along much of the waterfront would provide a net increase in aquatic habitat of approximately 4 acres. In Zone 1, the amount of shallow aquatic habitat would increase by nearly 2 acres, or twice as much as Alternative A. A large intertidal habitat bench with backshore would be surrounded by a subtidal cobble reef and bordered by upland riparian plants, rocks, and drift logs. Although these features are intended to enhance habitat for salmonids, they would also substantially improve habitat for all other native species that are part of the nearshore and adjacent upland

communities. The habitat measures installed as part of Alternative B would provide ongoing beneficial environmental effects on the nearshore ecosystem and associated fish, wildlife, and vegetation. Although the short-stay boat moorage in Zone 1 would result in a net increase in shading of about 0.1 acre, this shading effect could be reduced by the use of grating and other light-penetrating surfaces. Boat operation in this area could increase disturbance in the nearshore area and affect water quality, but enforcement of regulations would tend to mitigate these effects.

The water plaza option of Alternative B in Zone 4 would provide a greater net increase in aquatic habitat but less room for riparian and upland plantings and wildlife enhancement. The land plaza option would result in a lower net increase in aquatic habitat but more room for riparian and upland plantings and wildlife enhancement. Operationally, these and the other habitat enhancement measures noted above under either the land plaza or water plaza option of Alternative B would provide substantial long-term benefits to individual species and the ecosystem in larger proportion than those offered by Alternative A.

Under Alternative C, the seawall setbacks throughout much of the waterfront would provide a net increase in aquatic habitat of approximately 1.8 acres, compared to 0.5 acre under Alternative A and 4 acres under Alternative B. Alternative C also would include additional riparian plantings and landscaping. The habitat measures installed as part of Alternative C would provide ongoing beneficial environmental effects on the nearshore ecosystem and associated fish, wildlife, and vegetation. They would provide a much improved salmon migratory corridor and associated ecosystem productivity, along with a moderate area of enhanced habitat (more than that provided by Alternative A, but less than that provided by Alternative B) due to a moderate distance of seawall setback.

In Zone 1, Alternative C would increase the amount of shallow aquatic habitat in the area by approximately 2 acres, similar to Alternative B. It would provide the same large intertidal habitat bench with backshore and bordered by upland riparian plants, rocks, and drift logs. Although these collective features are intended to enhance habitat for salmonids, they would also substantially improve habitat for all other native species that are part of the nearshore and adjacent upland communities.

Indirect Effects

Although the proposed habitat enhancements associated with the build alternatives would benefit fish and other aquatic organisms, these enhancements would be constructed in an overall urbanized and degraded aquatic environment in which factors that have contributed to the degradation would largely continue. The locations of stormwater and CSO discharges would remain essentially the same, though the number of pipes would be reduced under Alternative C. Water quality

treatment facilities installed as part of the project would improve stormwater quality to meet the code requirements, which would remove the bulk of suspended solids and associated pollutants, as well as some oils and greases (Seattle Stormwater Code [SMC 22.800–22.808]). As a result, the enhanced habitat features included in the build alternatives could attract increased densities of species, including federally listed salmonids, in areas where they could be exposed to stormwater discharge and associated pollutants.

The City and King County are separately required to reduce their CSO outflows to no more than one discharge per year (by 2025 for the City and 2030 for King County). Once this requirement is met, overall pollutant loading would decrease over time, reducing the risks to fish and wildlife from these pollutants. However, habitat features could still become contaminated by the resuspension of the surrounding sediments or by discharges from outfalls. The design of the habitat enhancements serves to minimize the potential for these effects by separating outfall discharges from the habitat enhancements, and by elevating the habitat bench relative to the surrounding existing sediments. The improvements in habitat quality and quantity resulting from the build alternatives are expected to minimize the adverse effects of contaminated sediments and outfall discharges on fish and wildlife, and allow beneficial effects to persist effectively over the long term.

Habitat enhancements could attract higher densities of marine and upland species into the project area and could increase interactions between these organisms and people. Conflicts between people and fish or wildlife could include the harassment to and/or boat collisions with marine species, window and car strikes of birds and upland mammals, predation by pets, and people feeding wildlife. Despite the potential for conflicts, the habitat enhancements would provide a long-term beneficial effect on marine and upland wildlife communities, and people can be encouraged to appreciate living closer to wildlife. Overall, these interactions with marine and upland species are expected to be long term but minor.

The potential increases in populations of fish, wildlife, and vegetation resulting from the habitat improvements associated with the build alternatives could in turn result in an indirect effect of enhanced fishing and wildlife observation opportunities along the waterfront.

Avoidance, Minimization, and Mitigation Measures

Many of the operational effects of the project will be beneficial to fish, wildlife, and vegetation.

- Install LPS to reduce shade produced by the overwater walkways.

- Implement a Post-Construction Monitoring and Adaptive Management Plan to evaluate the success of the habitat features in achieving the objectives. If necessary, implement adaptive management actions to improve function.
- Orient street lighting away from Elliott Bay.

The City will implement the following BMPs to reduce potential adverse effects on biological resources in the study area during maintenance activities:

- Use containment wall and/or turbidity curtains.
- Use noise/vibration attenuating techniques.
- Manage materials to prevent spills.
- Limit in-water maintenance to approved in-water work windows.

5.11 Water Resources

No Action Alternative

Under the Minimal Damage scenario, stormwater runoff from Alaskan Way would continue to discharge to Elliott Bay untreated. This runoff would contain similar levels of pollutants as existing runoff, and would continue to affect nearshore water quality in Elliott Bay.

Ongoing seawall maintenance and street/sidewalk maintenance would require both in-water and upland work, depending on the type of maintenance work. If and when portions of the street corridor are excavated to make a repair, stormwater runoff in and near the area of disturbed soil could transport sediments into the nearby drainage system. With no permanent stormwater treatment facilities in place, sediment-laden water would be discharged to Elliott Bay, causing short-term turbidity plumes that could exceed the state water quality standards.

As under existing conditions, there is risk of spills of contaminated materials on the Alaskan Way roadway reaching Elliott Bay via separated stormwater conveyance outfalls. If accidental spills occur on the Alaskan Way roadway surface, some of that the spilled material could readily drain into the bay if cleanup actions are not implemented immediately. If a spill occurs during a storm event, it is inevitable that some of the spilled material would enter the storm drain system and discharge to the bay before cleanup is completed.

Under the Loss of Functionality scenario, failure of the seawall may result in variable amounts of sediment (including contaminated sediments) being released to Elliott Bay as portions of the existing seawall collapse or otherwise fail to retain the earth behind them. This sediment and the resulting turbidity plume would either settle out in the intertidal zone or remain suspended in the water column and

Water Resources Key Points

Under the No Action Alternative, adverse effects could range from minor to substantial, depending on the scenario.

Stormwater treatment facilities are included in the project design. Overall, the effects from the build alternatives would be beneficial to water quality in the surrounding environment.

Minor detrimental effects on groundwater hydrology and nearshore water quality may occur from potential groundwater mounding behind the new seawall.

The design of the new wall and habitat features would serve to encase and isolate contaminated soils and to prevent their interaction with Elliott Bay.

circulate with the tides and currents before settling farther away in Puget Sound. In either case, it could have adverse effects on aquatic habitat (see Section 5.10 of this Final EIS). If damage to the seawall and Alaskan Way reduces traffic, however, traffic-generated pollutants in stormwater runoff would be reduced until after normal operations were restored.

Under the Collapse of the Seawall scenario, a seawall collapse could cause short-term catastrophic water quality impacts in nearshore areas of Elliott Bay. A massive turbidity plume spreading out into Elliott Bay would be expected immediately after the wall's collapse. As documented in the Contaminated Materials Discipline Report (Appendix O), contaminated soil is present beneath the existing relieving platform below street level. Large amounts of soil beneath the relieving platform could wash into Elliott Bay, releasing the contaminants into the water column. Ruptured sewer lines could release large amounts of untreated wastewater into the bay, far exceeding the pollutant loading that occurs over longer periods of time with CSOs under the existing conditions, until the City is able to stop the flow to the ruptured lines. Concentrations of contaminants in the bay would likely be high, resulting in toxic effects on fish and aquatic organisms that are exposed to the contaminant plumes radiating from the failing shoreline area.

With complete loss of the seawall, the shoreline would be subjected to ongoing and widespread erosion that could prolong the duration of turbidity plumes and increase contaminant releases into the bay. Shoreline erosion would slow over time, and sediment loading to Elliott Bay would stabilize. As with the Loss of Functionality scenario, without vehicle traffic along Alaskan Way, traffic-generated pollutants in stormwater runoff may be lower than under existing conditions and the build alternatives, but these pollutant inputs would increase once traffic operations were restored. Work in and near Elliott Bay to repair or provide access to damaged facilities may cause short-term increases in turbidity and a disturbance of sediments.

Effects Common to All Build Alternatives

Aspects of the three build alternatives that could affect water resources include periodic maintenance activities and continued stormwater runoff and CSO discharges. Within the project area, stormwater runoff would be treated to meet the requirements of the Seattle Stormwater Code (SMC 22.800–22.808), which would reduce overall pollutant loads in stormwater flowing into Elliott Bay. The new seawall would be buried in the upland area, and habitat features would be built in the nearshore area, serving to isolate and protect existing contaminated soils in the upland and nearshore areas to prevent their interaction with Elliott Bay. Because of the weak tidal currents along the seawall, the proposed modifications to the Elliott Bay Seawall are not expected to affect wave or tidal action.

The land area draining to the combined system within the project area is small and would not be modified (see the Water Resources Discipline

Report [Appendix M]); therefore, CSO discharge volumes and frequencies would not change as a result of any of the build alternatives. The effects on water quality and sediment quality in Elliott Bay associated with CSOs would be the same as those under existing conditions. The City and King County are collaborating on plans to reduce CSO volume and frequency as part of the separate and independent Central Waterfront CSO Reduction Project; none of the build alternatives would preclude implementation of any aspects of the separate CSO project.

Because of the similarity of the operational effects of all three build alternatives, the effects are discussed by the affected water resource element in the following subsections. Notable differences between the build alternatives are discussed as applicable.

Stormwater Runoff to Elliott Bay

Currently, stormwater runoff generated within the project area is not treated before it enters Elliott Bay or the combined sewer system. Under the build alternatives, stormwater runoff from the Alaskan Way roadway surface and adjacent sidewalks and driveways that drain onto the roadway surface would be treated before being discharged. While the City is evaluating opportunities to consolidate existing outfalls in the project area, the volume of stormwater runoff would be very similar to the volume under existing conditions (and the No Action Alternative). The exception is a slight increase in runoff from the Pine Street and University Street outfall basins due to elimination of runoff infiltration from a small area of ballast material for the streetcar tracks. Treated stormwater would be discharged at comparable volumes and rates of flow to existing conditions. Any drainage design improvements would be consistent with requirements of the City's Stormwater Code, and discharges will meet required water quality thresholds.

Under all build alternatives, treatment of runoff would reduce the pollutant loads discharging to Elliott Bay compared to those under existing conditions. The greatest beneficial effects from reductions in pollutant loads would be in nearshore areas along the length of the seawall. Table 5-2 compares estimated pollutant loadings for Alternatives A, B, and C.

Pollutant loadings would be no more concentrated at any one outfall than they are under existing conditions. Therefore, compared to the existing conditions (and the No Action Alternative), there would be no potential for adverse effects on sediment quality near any outfall as a result of the build alternatives.

Table 5-2. Percent Change in Pollutant Load for Build Alternatives Compared to Existing Conditions

Pollutant	Alternative A	Alternative B	Alternative C
Total Suspended Solids	-72%	-73%	-72%
Total Copper	-28%	-31%	-28%
Dissolved Copper	+5%	0	+5%
Total Zinc	-33%	-36%	-33%
Dissolved Zinc	+5%	0	+5%
Benzo(a)Pyrene	-32%	-35%	-32%

Habitat Improvements

The habitat benches would be at a higher elevation than the surrounding sediments on the sea floor. As described in the Contaminated Materials Discipline Report (Appendix O), some of the nearshore sediments are contaminated. The higher elevation of the habitat benches would minimize the possibility of contaminated sediments migrating into the habitat benches. In areas where habitat bench material is placed on top of existing contaminated sediments, the habitat bench material would likely reduce the extent of resuspension of contaminants into the water column due to wave action and currents. Therefore, the placement of habitat bench material may result in beneficial effects on water quality near the habitat features.

Light-penetrating surfaces would increase benthic activity. More light penetration could increase water temperatures during low tides and in the shallowest areas of the shoreline, although the temperature effects are expected to be insignificant due to the large volume of water in Elliott Bay. Shoreline alterations for the habitat improvements in the nearshore area are not expected to affect overall water circulation in the nearshore areas of Elliott Bay.

Spills of Contaminated Materials on Alaskan Way

Traffic volumes along Alaskan Way would be similar to the volumes under existing conditions; therefore, the potential frequency of spills of contaminated materials on the roadway within the project area would not change. The proposed stormwater treatment facilities for runoff from the Alaskan Way roadway would provide a means of reducing the amount of spilled material that reaches Elliott Bay via the drainage outfalls within the project area. Although the stormwater treatment systems would not be designed to effectively handle spills on the roadway surface, they would allow some of the spilled material to be trapped and removed. Therefore, under the build alternatives, the long-term effects of contaminated material spills in the project area on water

quality in Elliott Bay would be slightly less than those resulting from the No Action Alternative.

Seawall Maintenance

The constructed project elements would require periodic maintenance, which could produce some temporary adverse effects that would be minimized by the use of BMPs during maintenance activities. Such impacts would likely be less than under existing conditions because of the new seawall's reduced maintenance requirements, resulting in a decreased risk of pollution.

Stormwater Runoff to Groundwater

Very little infiltration of runoff would occur within the project area because all drainage from the roadway would be directed to runoff treatment facilities. Compared to the volumes of runoff that would drain to Elliott Bay, the volume of ground surface infiltration from landscaped areas would be minimal. Water infiltrating the ground surface in landscaped areas would likely contain minimal pollutants, similar to the existing conditions. Therefore, the potential for groundwater contamination is negligible.

Indirect Effects

There are no anticipated indirect effects on water resources associated with operation of the new seawall under any of the build alternatives.

Avoidance, Minimization, and Mitigation Measures

The City will implement the following measures, as needed, to reduce future potential adverse effects on water resources:

- Use the most appropriate water quality treatment system(s) for the site conditions, taking into account the potential future impacts of sea-level rise. If the sea level in Puget Sound were to rise enough to result in backwater effects in storm drain pipes that compromise the performance of the proposed treatment systems, the City will adaptively manage the roadway drainage system or provide compensatory treatment as needed.
- Use appropriate BMPs during in-water work for maintenance of the seawall or habitat features to prevent the release of pollutants into open water.

5.12 Contaminated Materials

No Action Alternative

Under the Minimal Damage scenario, routine maintenance activities would continue and may occasionally result in contact with contaminated materials in the right-of-way. Not constructing the new seawall would have the following implications:

- No contaminated materials would be removed or stabilized
- The condition of aquatic substrates offshore of the existing seawall would not be improved, and existing contaminated sediments would continue to pose a risk for aquatic species
- No project-related improvements in stormwater quality would be implemented

Under the Loss of Functionality and Collapse of the Seawall scenarios, there could be direct releases of contaminated soils, pollutants from utilities, and hazardous building materials into the aquatic environment, which would result in a significant environmental impact on the aquatic ecosystems in Elliott Bay. As noted in the previous section, such releases could be extensive and long-lasting.

Effects Common to All Build Alternatives

Under any of the build alternatives, after project construction is completed, contaminated materials would remain in adjacent soil, groundwater, and sediment areas. This section describes the general types of effects related to contaminated materials that would result from any of the build alternatives.

Remaining Upland Contamination

With the new seawall in place, existing contaminated soil areas would remain separated from the nearshore environment. Excavation in the seawall setback areas and solidification or removal of soils for seawall construction would create significantly cleaner conditions at the shoreline edge than exists today. Alternative B would remove more of the existing contaminated soils than Alternatives A and C, and thus would have a somewhat greater benefit in this regard.

Contaminated groundwater or material from adjacent upland contaminated areas could migrate into the project area, and potentially into the aquatic environment, through weeps or pervious areas in the new seawall. However, the seawall would be much less pervious than it is currently, so such migration would be reduced, and it is less likely that contamination from adjacent areas could migrate into and recontaminate the clean areas constructed as part of the project.

Remaining In-Water Contamination and Aquatic Habitat Conditions

The build alternatives would not involve dredging or remediating existing contaminated sediments. However, clean fill and clean aquatic habitat substrates placed offshore of the existing seawall and above the existing seafloor sediments would provide new uncontaminated surfaces, thereby reducing the overall risk for nearshore aquatic species due to contamination. Alternatives B and C would create more new habitat than Alternative A, particularly in Zone 1 adjacent to the existing cleanup site near Colman Dock Ferry Terminal.

Contaminated Materials Key Points

Under the No Action Alternative, the adverse effects could range from minor to substantial, depending on the scenario.

There would be very few potential adverse operational environmental impacts associated with contaminated materials for any of the build alternatives.

Excavation and soil stabilization for the new seawall would result in significantly cleaner sediment conditions at the shoreline edge than currently exist.

New habitat would provide uncontaminated surfaces and contain underlying contaminated sediments.

Outfall Discharges

Stormwater treatment, as described in Section 5.11 of this Final EIS, would result in modest reductions in pollutant discharges from stormwater outfalls These reductions would result in corresponding improvements to the quality of offshore sediments.

Indirect Effects

Under all three build alternatives, work affecting existing contaminated areas would be coordinated with regulatory agencies, as appropriate, so that collected information can be used to assist future regulatory initiatives for adjacent cleanups in both the upland and sediment areas. Therefore, a potential indirect operational effect would be improved conditions in other contaminated areas in the project vicinity.

Avoidance, Minimization, and Mitigation Measures

Placement of jet grout will help prevent remaining upland contamination from migrating into the project site.

5.13 Geology and Soils

No Action Alternative

Under the Minimal Damage scenario, ongoing routine maintenance and minor repair activities would continue. If the seawall is not replaced, it would remain vulnerable to earthquakes, coastal storm damage, and structural failure due to ongoing deterioration. Historically, sinkholes and other evidence of settlement have been observed behind the seawall. The settlement is likely occurring as material is washed out from below the seawall structure over time as a result of waves (wave-induced erosion). This continued soil erosion could result in settlement of surface roadways, sidewalks, utilities, and other structures adjacent to the seawall. The City and adjacent property owners would continue to maintain and repair sinkholes, potholes, and other settlement effects if the seawall is not replaced.

Under the Loss of Functionality scenario, lateral spreading of the ground in an earthquake would occur westward toward Elliott Bay and could cause damage to structures and utilities east of the seawall. The magnitude of the potential damage would depend on the foundation soils, the condition of existing structures and utilities, and the magnitude and duration of the ground shaking.

Under the Collapse of the Seawall scenario, the primary effect would be substantial alteration of the soil and groundwater conditions along the waterfront. Without the presence of the seawall, groundwater levels would be more sensitive to tidal fluctuations, which could result in flooding of areaways (below grade basements and walkways) along Western Avenue and First Avenue. The action of water from Elliott Bay on the exposed shoreline could result in erosion and loosening of the

Geology and Soils Key Points

Under the No Action Alternative, if the seawall collapsed, tidal fluctuations could flood basements and areaways.

Overall, the operational effects from any of the build alternatives are expected to be beneficial. The potential for liquefaction-induced settlement would be substantially less than expected under the No Action Alternative.

existing soils. These effects could lead to ground loss, which would reduce foundation support for adjacent railways, utilities, roadways, and structures. Without a seawall, the exposed shoreline would slump until the soil is at its natural angle of repose (likely about 20 to 30 degrees from horizontal). These changes to the shoreline would affect access from Alaskan Way to the adjacent piers.

Effects Common to All Build Alternatives

Overall, the operational effects of the build alternatives related to geology and soils are expected to be moderate and beneficial. Under any of the build alternatives, the waterfront in the project area and the seawall itself would be less vulnerable to earthquakes, coastal storm damage, and structural failure. The new seawall would be less susceptible to damage caused by ground shaking and liquefaction during an earthquake, and it would provide greater protection to nearby utilities and structures. The new seawall would likely restrict groundwater flow to a greater extent than the existing partially deteriorated seawall and could, therefore, reduce the influence of tidal fluctuations on groundwater levels.

Under the build alternatives, the placement of fill under water is proposed on the existing submarine slopes west of the seawall to create new habitat for marine life. Settlement of the granular subsurface soils would occur as the fills are placed. Over the long term, the soft, fine-grained soils may continue to settle. Where the fills are located adjacent to existing structures, settlement of the structures could also occur.

As discussed in Section 5.11 of this Final EIS, the presence of the new seawall could cause a higher groundwater level to mound up against the east side of the seawall and ground improvement zone. Based on subsurface conditions and surface topography, preliminary analyses indicate that a maximum groundwater buildup of approximately 3 to 4 feet could occur along the waterfront in the vicinity of Madison Street and Marion Street. Potential groundwater buildup (up to 4 feet) would be within the existing range of groundwater fluctuations resulting from tides in Elliott Bay that have been observed in shallow monitoring wells along the waterfront. The project design would accommodate draining of the groundwater through weep holes and under drains.

Numerous utilities lie within the footprint of the proposed seawall alignments for the build alternatives. Under all three build alternatives, utilities would need to be relocated temporarily or permanently, or protected in place before and during project construction. Abandoned utilities that are not backfilled could become conduits for water, gases, or contamination, which could affect existing or future facilities. If the abandoned utilities are not backfilled, breaks in the pipes or joints could cause erosion of soil around the pipes, which could result in ground settlement.

Alternatives A and C would involve soil improvement landward of the existing seawall. This is proposed to prevent liquefaction around the

existing relieving platform and to provide a reinforced soil mass that can be anchored to create a retaining structure. Outside the ground improvement zone, the fill soils below the groundwater table would still liquefy during an earthquake, which could result in differential settlement between the ground improvement zone and the surrounding area. Differential settlement could result in damage to and/or loss of function for utilities, transportation features (e.g., roads), and structures. In addition, voids caused by the presence of timber piles could create discontinuity in the ground improvement in some areas, reducing the stability of the structure compared to a continuous mass of jet grout.

For Alternative B, drilled shafts would also be used to rebuild the new seawall using a braced soldier pile system. Because the soil behind the new seawall would not be improved, the fill soils below the groundwater table would liquefy during an earthquake. The upland surface area that could liquefy would be greater with Alternative B than with the other build alternatives. Because the proposed braced soldier pile wall system would be founded in dense glacial deposits, differential settlement between the new seawall and the adjacent soils could result in damage to utilities and structures.

Indirect Effects

No indirect effects related to geology and soils are expected as a result of the operation of the new seawall under the build alternatives.

Avoidance, Minimization, and Mitigation Measures

The project has been designed to function according to all applicable laws and regulations and criteria approved by the City. However, the following measures will be applied to minimize the potential for any future impacts following construction:

- Backfill abandoned utilities with cement grout or other suitable backfill materials so that they cannot become conduits for water or gases.
- Monitor for ground settlement where utilities and structures are vulnerable.
- If ongoing analysis of preconstruction groundwater monitoring data indicates that groundwater mounding behind the new wall could be greater than the range of groundwater depths observed under existing conditions, install a drainage system with backflow prevention in the new seawall to allow groundwater to flow through the seawall to Elliott Bay.

5.14 Air Quality

No Action Alternative

Due to the age and condition of the existing seawall, ongoing maintenance activities under the Minimal Damage scenario are expected to be more frequent than under the build alternatives. The effects of such maintenance activities on air quality in the study area are not expected to be significant.

Under the Loss of Functionality and Collapse of the Seawall scenarios, the effects of reconstructing portions of the seawall would be similar to the construction effects of the build alternatives discussed in Chapter 4, because shoreline stabilization and reconstruction would be necessary along much of the seawall alignment on a scale similar to that proposed for the build alternatives.

Effects Common to All Build Alternatives

Under any of the build alternatives, operational emissions would be limited to vehicle and equipment emissions associated with periodic seawall inspection and maintenance activities along with any project-induced increases in transportation emissions. These emissions would be minimal and would not have a substantial impact on air quality in the Seattle area. With a new seawall, repairs should be less frequent than those required under existing conditions; therefore any of the build alternatives would result in lower operational emissions than the No Action Alternative.

Although operation of the seawall itself would not result in any pollutant emissions, the new Alaskan Way under Alternatives A and C would include an additional northbound through lane between S. Washington Street and Spring Street. This lane would increase northbound capacity, thereby reducing congestion and improving vehicle travel times through the corridor compared to the No Action Alternative. The changes would result in more efficient driving conditions and reduce the amount of fuel consumed by vehicles. Therefore, Alternatives A and C may slightly reduce transportation-related emissions in the area.

Indirect Effects

No indirect operational effects on air quality are expected to result from any of the build alternatives or the No Action Alternative.

Avoidance, Minimization, and Mitigation Measures

No mitigation will be required as the seawall will not be a source of emissions once constructed.

Air Quality Key Points

Under the No Action Alternative, adverse effects could range from negligible to minor, depending on the scenario.

All build alternatives would result in average daily criteria pollutant emissions similar to existing conditions.

The additional northbound lane on Alaskan Way under Alternatives A and C could reduce emissions from transportation in the area.

The net operational effects from all three build alternatives would be minor and beneficial for air quality in the study area.

Table 5-3. Operational Effects of the Build Alternatives and the No Action Alternative by Discipline

Discipline	No Action Alternative			Alternative A			Alternative B			Alternative C		
	Effect	**Duration**	**Degree of Effect**	**Effect**	**Duration**	**Degree of Effect**	**Effect**	**Duration**	**Degree of Effect**	**Effect**	**Duration**	**Degree of Effect**
TRANSPORTATION	Adverse	Temporary and long term	Minor to substantial	Beneficial	Long term	Moderate	Beneficial	Long term	Minor	Beneficial	Long term	Moderate
ECONOMICS	Adverse	Long term	Minor to substantial	Beneficial	Long term	Minor	Beneficial	Long term	Moderate	Beneficial	Long term	Minor
NOISE AND VIBRATION	Adverse	Temporary	Negligible to moderate	None	None	None	None	None	None	None	None	None
CULTURAL, HISTORIC, AND ARCHAEOLOGICAL RESOURCES												
Historic Resources	Adverse	Long term	Minor to substantial	Adverse	Long term	Minor	Adverse	Long term	Minor	Adverse	Long term	Minor
Archaeological and Cultural	Adverse	Long term	Minor to substantial	Beneficial	Long term	Minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor
ENERGY RESOURCES AND GREEENHOUSE GAS EMISSIONS												
Energy Resources	Adverse	Temporary	Minor to Moderate	Beneficial	Long term	Minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor
Greenhouse Gas Emissions	Adverse	Temporary	Minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor
LAND USE, SHORELINES, AND PARKS AND RECREATION												
Land Use and Shorelines	Adverse	Temporary	Minor to substantial	Beneficial	Long term	Negligible	Beneficial	Long term	Minor	Beneficial	Long term	Minor
Parks and Recreation	Adverse	Temporary	Minor to substantial	Beneficial	Long term	Negligible	Beneficial	Long term	Minor	Beneficial	Long term	Minor
PUBLIC SERVICES AND UTILITIES												
Public Services	Adverse	Temporary and long term	Minor to substantial	Beneficial	Long term	Negligible	Beneficial	Long term	Negligible	Beneficial	Long term	Negligible
Utilities	Adverse	Temporary and long term	Minor to substantial	Adverse	Temporary	Minor	Adverse	Temporary	Minor	Adverse	Temporary	Minor
SOCIAL RESOURCES AND ENVIRONMENTAL JUSTICE	Adverse	Temporary and long term	Minor to substantial	Beneficial	Long term	Minor	Beneficial	Long term	Moderate	Beneficial	Long term	Minor
VISUAL RESOURCES	Adverse	Long term	Minor to substantial	Beneficial	Long term	Moderate	Beneficial	Long term	Moderate	Beneficial	Long term	Moderate
FISH, WILDLIFE, AND VEGETATION	Adverse	Temporary and long term	Minor to substantial	Beneficial	Long term	Substantial	Beneficial	Long term	Substantial	Beneficial	Long term	Substantial
WATER RESOURCES	Adverse or beneficial	Temporary and long term	Minor to substantial	Beneficial	Long term	Minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor
CONTAMINATED MATERIALS	Adverse	Temporary and long term	Minor to substantial	Beneficial	Long term	Minor	Beneficial	Long term	Moderate	Beneficial	Long term	Minor to moderate
GEOLOGY AND SOILS	Adverse	Temporary and long term	Minor to substantial	Beneficial	Long term	Moderate	Beneficial	Long term	Moderate	Beneficial	Long term	Moderate
AIR QUALITY	Adverse	Temporary	Negligible to minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor	Beneficial	Long term	Minor

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