Elliott Bay Seawall Project

Public Services and Utilities Discipline Report

FINAL

October 2012

Submitted to:

City of Seattle
Department of Transportation
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CLIENTS PEOPLE PERFORMANCE

Elliott Bay Seawall Project

PUBLIC SERVICES AND UTILITIES DISCIPLINE REPORT

Agreement No. T09-24

FINAL

OCTOBER 2012

This Discipline Report provides detailed background and analysis to support the City of Seattle's SEPA (Washington State Environmental Policy Act) Environmental Impact Statement for the Elliott Bay Seawall Project. This report also serves the same role to support the USACE's NEPA (National Environmental Policy Act) environmental analysis for the Elliott Bay Seawall Project. Thus, both SEPA and NEPA references and considerations are included.

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City of Seattle

Public Services and Utilities Discipline Report

TABLE OF CONTENTS

Title **Page No.**

Executive Summary ES-1
Build Alternatives ES-1
Affected Environment ES-1
Construction Effects and Mitigation ES-2
Operational Effects and Mitigation ES-2

CHAPTER 1. Project Description 1
1.1 Project Background 1
1.2 Project Area Limits and Zones 2
1.3 Project Alternatives 3
1.4 No Action Alternative 3
1.5 Design Features Common to the Build Alternatives 4
1.5.1 Seawall 5
1.5.2 Habitat Improvements 5
1.5.3 Upland Improvements 6
1.6 Project Construction 7
1.6.1 Construction Schedule 7
1.6.2 Temporary Roadway and Construction Work Zone 7
1.6.3 Construction Methods 8
1.6.3.1 Soil Improvement 9
1.6.3.2 Braced Soldier Piles 9
1.6.4 Soil Dewatering and Spoils Disposal 9
1.6.5 Utility Protection and/or Relocation 10
1.7 Build Alternatives 11
1.7.1 Alternative A 11
1.7.1.1 Seawall 11
1.7.1.2 Roadway 11
1.7.1.3 Habitat Improvements 12
1.7.1.4 Upland Improvements 12
1.7.1.5 Construction and Schedule 12
1.7.2 Alternative B 15
1.7.2.1 Seawall 15
1.7.2.2 Roadway 15
1.7.2.3 Habitat Improvements 15
1.7.2.4 Upland Improvements 16
1.7.2.5 Construction and Schedule 16
1.7.3 Alternative C 19
1.7.3.1 Seawall 19
1.7.3.2 Roadway 19
1.7.3.3 Habitat Improvements 19
1.7.3.4 Upland Improvements 20

1.7.3.5 Construction and Schedule 20

CHAPTER 2. Methodology 35
2.1 Analysis of Existing Conditions 35
2.2 Analysis of Environmental Effects 35
2.2.1 Construction Effects: Public Services 35
2.2.2 Construction Effects: Utilities 35
2.2.3 Operational Effects: Public Services 36
2.2.4 Operational Effects: Utilities 36
2.2.5 Determining Mitigation Measures 36

CHAPTER 3. Coordination and Information Sources 37
3.1 Data Needs and Sources 37
3.2 Coordination 38

CHAPTER 4. Affected Environment 39
4.1 Public Services 39
4.1.1 Fire Suppression and Emergency Medical Services 39
4.1.1.1 Fire Suppression 39
4.1.1.2 Emergency Medical Services 40
4.1.2 Law Enforcement Services 40
4.1.2.1 Seattle Police Department 40
4.1.2.2 Port of Seattle Police 41
4.1.2.3 Burlington Northern Santa Fe Railway Police Solutions Team 41
4.1.2.4 United States Coast Guard 41
4.1.3 Disaster Preparedness 41
4.1.3.1 Seattle Emergency Management 42
4.1.3.2 Ferries 42
4.1.3.3 Port of Seattle 42
4.1.3.4 Emergency Traffic Management and Closure Plan for the Alaskan Way Viaduct and Alaskan Way Surface Street 42
4.1.4 Solid Waste Collection, Disposal and Recycling 43
4.1.5 Public Schools 43
4.1.6 Postal Services 43
4.2 Utilities 44
4.2.1 Electrical Power 44
4.2.2 Water Supply 45
4.2.3 Stormwater Drainage 45
4.2.4 Sanitary and Combined Sewer Flows 46
4.2.4.1 North – Flows to Denny Way 47
4.2.4.2 Central – Flows to Pike Street Adit 47
4.2.4.3 South – Flows to King Street 48
4.2.5 Outfalls and Drainage System 48
4.2.5.1 Outfalls 48
4.2.5.2 Drainage System – East Side of Alaskan Way 49
4.2.6 Natural Gas 50
4.2.7 Steam 50
4.2.8 Telecommunications 51

CHAPTER 5. Construction Effects and Mitigation 53

5.1 Public Services 53
5.1.1 No Action Alternative 53
5.1.2 Build Alternatives 53
5.1.2.1 Fire Suppression and Emergency Medical Services 53
5.1.2.2 Law Enforcement 57
5.1.2.3 Disaster Preparedness 57
5.1.2.4 Solid Waste Collection, Disposal and Recycling 57
5.1.2.5 Public Schools 58
5.1.2.6 Postal Services 58
5.1.3 Mitigation Measures 58
5.2 Utilities 59
5.2.1 No Action Alternative 60
5.2.2 Build Alternatives 60
5.2.2.1 Electrical 63
5.2.2.2 Water 63
5.2.2.1 Sewer, Combined Sewer and Storm Drainage 65
5.2.2.2 Natural Gas 66
5.2.2.3 Steam 66
5.2.2.4 Communication 67
5.2.3 Mitigation Measures 68

CHAPTER 6. Operational Effects and Mitigation 69
6.1 Public Services 69
6.1.1 No Action Alternative 69
6.1.1.1 Minimal Damage Scenario 69
6.1.1.2 Loss of Functionality Scenario 69
6.1.1.3 Collapse of Seawall Scenario 69
6.1.2 Build Alternatives 69
6.1.2.1 Fire and Emergency, Law Enforcement, and Emergency Medical Services 69
6.1.2.2 Disaster Preparedness 70
6.1.2.3 Solid Waste Collection, Disposal, and Recycling 70
6.1.2.4 Public Schools 70
6.1.2.5 Postal Services 70
6.1.3 Indirect Effects 70
6.1.4 Mitigation Measures 70
6.2 Utilities 71
6.2.1 No Action Alternative 71
6.2.1.1 Minimal Damage Scenario 71
6.2.1.2 Loss of Functionality Scenario 71
6.2.1.3 Collapse of Seawall Scenario 71
6.2.2 Build Alternatives 71
6.2.2.1 Electrical 71
6.2.2.2 Sewer, Combined Sewer, and Storm Drainage 72
6.2.2.3 Natural Gas 72
6.2.2.4 Steam 72
6.2.2.5 Communication 72
6.2.3 Indirect Effects 72

6.2.4 Mitigation Measures..... 72

CHAPTER 7. References..... 73

LIST OF TABLES

No.	Title	Page No.
Table 1-1.	Comparison of Features of the Three Elliott Bay Seawall Project Build Alternatives	23
Table 5-1.	Alternatives A, B, and C Traffic Analysis Stage I Travel Time for Emergency Vehicles	54
Table 5-2.	Alternatives A and C, Traffic Analysis Stage II Travel Time for Emergency Vehicles	55
Table 5-3.	Alternative B, Traffic Analysis Stage II Travel Time for Emergency Vehicles	55
Table 5-4.	Alternatives A, B, and C, Traffic Analysis Stage III Travel Time for Emergency Vehicles	56
Table 5-5.	Alternatives A, B, and C, Traffic Analysis Stage IV Travel Time for Emergency Vehicles	56
Table 5-6.	Electrical Distribution in the Project Area that would be Impacted during Construction	63
Table 5-7.	Water Systems in the Project Area that would be Impacted during Construction	64
Table 5-8.	Gravity Sewer, Combined Sewer, and Storm Drains in the Project Area that would be Impacted during Construction	65
Table 5-9.	Natural Gas PipeLines in the Project Area that would be Impacted during Construction	66
Table 5-10.	Steam Pipelines in the Project Area that would be Impacted during Construction	67
Table 5-11.	Communication Lines in the Project Area that would be Impacted during Construction	67

LIST OF FIGURES

No.	Title	Page No.
Figure 1-1.	Elliott Bay Seawall Project Area	1
Figure 1-2.	Elliott Bay Seawall Zone Designations	2
Figure 1-3.	Conceptual Rendering of Proposed Habitat Improvements	6
Figure 1-4.	Construction Work Zone and Temporary Roadway	8
Figure 1-5.	Representative Cross Section Showing Typical Existing Utility Locations within Project Limits	10
Figure 1-6.	Alternative A, Stage 1	13
Figure 1-7.	Alternative A, Stage 2	13
Figure 1-8.	Alternative A, Stage 3	14
Figure 1-9.	Alternative A, Stage 4	14
Figure 1-10.	Alternative B, Stage 1	17
Figure 1-11.	Alternative B, Stage 2	17
Figure 1-12.	Alternative B, Stage 3	18
Figure 1-13.	Alternative B, Stage 4	18
Figure 1-14.	Alternative C, Stage 1	21
Figure 1-15.	Alternative C, Stage 2	21
Figure 1-16.	Alternative C, Stage 3	22
Figure 1-17.	Alternative C, Stage 4	22
Figure 1-18.	Alternative A: Central Seawall Plan	27
Figure 1-19.	Alternative A: North Seawall Plan	28
Figure 1-20.	Alternative B: Central Seawall Plan, Option 1	29
Figure 1-21.	Alternative B: Central Seawall Plan, Option 2	30
Figure 1-22.	Alternative B: North Seawall Plan	31
Figure 1-23.	Alternative C: Central Seawall Plan	32
Figure 1-24.	Alternative C: North Seawall Plan	33
Figure 5-1.	Existing Utilities, Alternative A, Zone 3	61
Figure 5-2.	Existing Utilities, Alternative B, Zone 3	62

ACRONYMS, ABBREVIATIONS AND DEFINITIONS

BMP	Best Management Practice
BNSF	BNSF Railway
BSP	braced soldier pile
CFR	Code of Federal Regulations
City	City of Seattle
CS	combined sewer
CSO	combined sewer overflow
CY	cubic yards
DNR	Washington State Department of Natural Resources
EBI	Elliott Bay Interceptor
EBSP	Elliott Bay Seawall Project
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
LPS	light-penetrating surface
Metro	King County Metro
MOT	Maintenance of Traffic
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
PSE	Puget Sound Energy
SDOT	Seattle Department of Transportation
SCL	Seattle City Light
SEM	Seattle Emergency Management
SEPA	(Washington) State Environmental Policy Act
SODO	South of Downtown
SFD	Seattle Fire Department
SPD	Seattle Police Department
SPU	Seattle Public Utilities
USACE	United States Army Corps of Engineers
USPS	United States Postal Service
WSDOT	Washington State Department of Transportation
WSF	Washington State Ferries

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EXECUTIVE SUMMARY

The seawall corridor (S. Washington Street to Broad Street) is located on the water's edge in downtown Seattle and adjacent to businesses, residences, transportation facilities (streets, ferries, cruise ships, etc.), public services (fire station, utilities), City parks and other recreational elements. Construction of the new seawall may have effects (both beneficial and adverse) on public services and utilities. The project's joint National Environmental Policy Act (NEPA)/Washington State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) will examine the effects of the project on these resources.

BUILD ALTERNATIVES

Three alternatives have been developed to allow for a range of design ideas that potentially can be merged and/or combined in future design phases to reflect public, agency, technical and stakeholder input. The intent is to present a wide range of project design possibilities, associated impacts and proposed mitigation to sufficiently "bookend" the project; thus defining and capturing the range of options and associated impacts. It is anticipated that the preferred alternative ultimately adopted will fall somewhere between the two "bookend" alternatives documented in the Draft EIS.

In Alternative A, the seawall would be reconstructed more or less in its existing alignment, with some pullback to facilitate construction without requiring the removal of the existing wall first. Alternative A proposes a soil improvement seawall structural option, but a braced soldier pile (BSP) structural option could be used and still maintain the wall location, habitat improvements, and other proposed features.

In Alternative B, the seawall would be pulled back to the east of its existing alignment. Alternative B employs a BSP seawall structural option, but the soil improvement option or some combination of the BSP option, soil improvement option and buttress fill systems could be used and still maintain the wall location, habitat improvements and other proposed features.

Alternative C is a true hybrid alternative, representing features from both Alternatives A and B, as shown in Table 1-1. The construction methods described for Alternative A (i.e., soil improvement) also apply to Alternative C.

AFFECTED ENVIRONMENT

The study area for the evaluation of public services and utilities impacts extends eastward from the seawall to several blocks east (generally to First Avenue) of Alaskan Way and northward from S. Washington Street to Broad Street. Certain services, such as fire and emergency services have a larger impact area (greater downtown Seattle/Belltown/ SODO).

A number of utilities within the study area (including municipal agencies and private companies) provide electricity, water, wastewater and stormwater collection, natural gas, steam, oil/petroleum, and telecommunications services. The primary public-utility providers in the study area include Seattle Public Utilities for water, sanitary sewer, and stormwater systems, and Seattle City Light for electrical power. Private utilities include Puget Sound Energy, Seattle Steam, Waste Management, CenturyLink (formerly Qwest), Comcast and other private communications companies.

CONSTRUCTION EFFECTS AND MITIGATION

The schedule analysis indicates that the Central Seawall would take three construction seasons to complete for Alternatives A and C and five construction seasons to complete for Alternative B. The schedule analysis also indicates the North Seawall would take four construction seasons to complete for Alternatives A, B, and C (though Alternative B is expected to take slightly longer). During construction, public services would be affected by increased traffic congestion and delays on the primary roads affected by construction and on roads around the construction area. This would have a direct effect on emergency-vehicle access to and through the construction area. Response times for police, fire and emergency medical aid to locations within and near the construction area may increase in some circumstances. Increased travel time would likely be experienced by other public services, such as solid-waste, recycling-collection and disposal services, postal services, and school buses. In addition, there could be increased demand for public services such as police or emergency medical services caused by the construction activities; however, this should be at most a minor effect.

SDOT and the contractor would work closely with SPD and SFD to ensure that reliable access is provided for emergency services during construction, and that appropriate steps are taken to minimize delays in response times due to construction activities and detours.

The project would comply with all federal, state, and local utility-offset standards and criteria. SDOT would work closely with utility owners to coordinate each utility's criteria and coordinate space planning and construction sequencing to reduce overall risk, cost, and impact. Utility relocation or modification accomplished, where feasible, prior to project construction would reduce operational risks associated with major construction. In addition, SDOT would work with utility purveyors to provide maintenance and emergency access to all utilities throughout construction.

OPERATIONAL EFFECTS AND MITIGATION

Under Alternative B, access routes between the restored roadway and the Seattle Aquarium would need to be supported through piles or other means to support emergency vehicles. This would also include the north-south space alongside the Seattle Aquarium to aid in fire suppression and other emergency needs. The lack of a cantilevered sidewalk under Alternative C may also necessitate pike supported access points to the aquarium. No additional mitigation for operational effects would be necessary.

Project design would comply with current City and Washington State code requirements, including any utility policy and strategy listed in the adopted City of Seattle Comprehensive Plan, Utilities Element. It is expected that utility services would be the same, or improved, once project construction is complete. SDOT would coordinate with customers at service connections and provide overall coordination of design efforts to be provided by each utility owner.

CHAPTER 1. PROJECT DESCRIPTION

1.1 PROJECT BACKGROUND

The City of Seattle Department of Transportation (SDOT) is proposing to construct the Elliott Bay Seawall Project (EBSP), which will replace the existing seawall along the shoreline of downtown Seattle. Extending from S. Washington Street to Broad Street, the seawall supports and protects the adjacent upland areas, which contain residences, commercial businesses and restaurants, parks and public facilities, transportation infrastructure (including sidewalks, streets, and a rail line), and a large number of utilities (Figure 1-1). The harbor area in Elliott Bay is used by ferries, cruise ships, and commercial vessels, as well as for recreation. Overall, the waterfront is an important center of commerce and recreation for the entire city and region.

Figure 1-1. Elliott Bay Seawall Project Area

The existing seawall includes three types of structures, all constructed between 1911 and 1936 and ranging in size from approximately 15 to 60 feet wide. Over time, these structures have deteriorated as a result of various natural and physical processes. The seawall's poor condition makes it vulnerable to significant damage during a major storm or seismic event. Therefore, the EBSP is a critical public safety project. The completed seawall will provide protection from coastal storm damages, seismic damages, and shoreline erosion, and will thereby contribute to the preservation of Seattle's downtown, the local economy, and the region's economic competitiveness and quality of life. Seawall replacement will also provide the foundation and structural support for the downtown Seattle waterfront, including improvements planned as part of Waterfront Seattle.

The project's purpose is to reduce the risks of coastal storm and seismic damages and to protect public safety, critical infrastructure, and associated economic activities along Seattle's central waterfront. Additionally, the project will improve the degraded ecosystem functions and processes of the Elliott Bay nearshore in the vicinity of the existing seawall.

Construction of a new seawall would have both beneficial and adverse effects on environmental resources. This discipline report will examine the effects of the project on public services and utilities as part of the project's overall environmental documentation.

1.2 PROJECT AREA LIMITS AND ZONES

The project area for the EBSP extends from S. Washington Street to Broad Street, from the eastern edge of pavement below State Route (SR) 99 to the waters of Elliott Bay. The project has been divided into six zones. Zones 1 through 4 constitute the Central Seawall Study Area. The two remaining zones, Zones 5 and 6, make up the North Seawall Study Area. A delineation of the zones is provided in Figure 1-2 and concept plans are included at the end of this chapter.

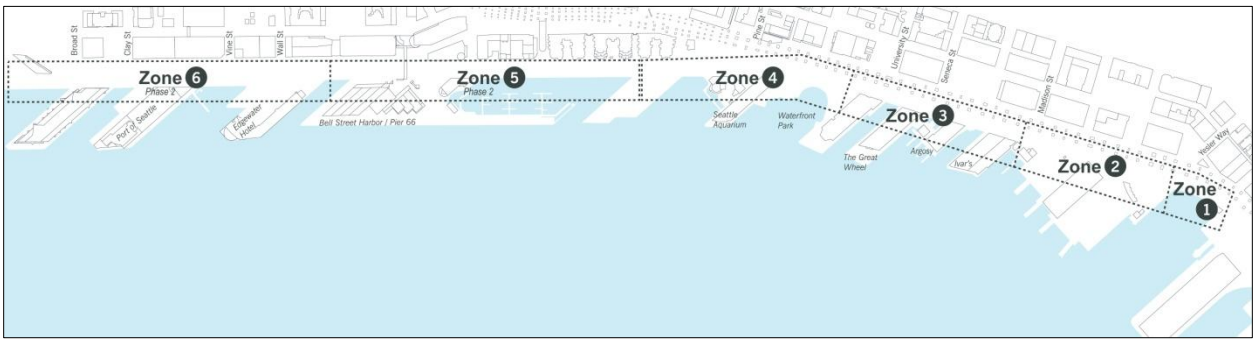


Figure 1-2. Elliott Bay Seawall Zone Designations

Central Seawall Study Area (S. Washington Street to Virginia Street):

- Zone 1, the Pioneer Square/Washington Street Boat Landing Zone, runs from S. Washington Street to Yesler Way.
- Zone 2, the Ferry Terminal Zone, stretches from Yesler Way to Madison Street, and includes the Colman Dock ferry terminal and Fire Station No. 5.
- Zone 3, the Central Pier Zone, includes the historic waterfront piers (Piers 54 to 57) and runs from Madison Street to just north of University Street.
- Zone 4, the Park/Aquarium Zone, includes Waterfront Park, the Seattle Aquarium, and Piers 62/63. This zone runs from north of University Street to approximately Virginia Street.

North Seawall Study Area (Virginia Street to Broad Street):

- Zone 5, the Bell Harbor Zone, runs from Virginia Street to Battery Street. This zone includes the Bell Harbor Conference Center, Cruise Ship Terminal, and Marina.
- Zone 6, the North Pier Zone, stretches from Battery Street to Broad Street, and includes the Edgewater Hotel, Port of Seattle Offices, and Pier 70.

1.3 PROJECT ALTERNATIVES

The EBSP Environmental Impact Statement (EIS) evaluates a No Action Alternative and three build alternatives for the project. As required by the National Environmental Policy Act (NEPA) and the Washington State Environmental Policy Act (SEPA), the build alternatives represent different ways of accomplishing the project purpose. Evaluating alternatives allows SDOT decision-makers, with input from the public, agencies, and tribes, to consider environmental impacts in conjunction with other decision factors such as cost, schedule, and feasibility.

The build alternatives for the EBSP are:

- **Alternative A**, which would reconstruct the seawall as close to its existing alignment as possible. Jet grouting, a subsurface soil improvement, would be used to form the seawall's structural support. Habitat improvements would include the addition of shoreline enhancements, installation of a continuous habitat bench, and intermittent light-penetrating surfaces (LPS) at piers.
- **Alternative B**, which would move the seawall up to 75 feet landward of its current location. Braced soldier piles (BSP) would be used to build an underground wall structure. Moving the seawall inland would allow the construction of expanded habitat enhancements and mostly continuous LPS, in addition to the habitat improvements and continuous habitat bench described for Alternative A.
- **Alternative C**, which would move the seawall up to 15 feet landward of its current location. This alternative would use subsurface soil improvements (likely including both jet grouting and deep soil mixing) to provide structural support. Alternative C would provide a continuous habitat bench and continuous LPS, in addition to shoreline enhancements similar to Alternative B.

These three build alternatives encompass a range of design ideas to establish "bookends" for the project, thus capturing a suite of potential options, impacts, and effects. Features of the alternatives could be blended in future design phases to reflect public, agency, and stakeholder input.

The following section (Section 1.4) describes the No Action Alternative. Section 1.5 discusses the features that are common to the three build alternatives and Section 1.6 provides an overview of project construction. Section 1.7 provides additional detail on specific features that differ among the build alternatives.

1.4 NO ACTION ALTERNATIVE

NEPA, SEPA, and the City of Seattle's (City's) implementing regulations (Seattle Municipal Code [SMC] 25.05) require that a No Action Alternative is evaluated in addition to the build alternatives in the EIS. The No Action Alterative provides a baseline against which the potential effects of the build alternatives can be compared.

The No Action Alternative is projected over the next 50 years. Given the age and condition of the seawall, continued deterioration and some level of failure will likely occur within the 50-year timeframe. Because the existing seawall is vulnerable to various types of damage, the No Action Alternative must

anticipate the possibility of degrees of seawall failure. Therefore, three No Action scenarios have been evaluated:

1. Minimal Damage: This scenario would not require a significant repair of the seawall, and any needed repairs could be undertaken by the City. Small failures caused by tidal erosion (as are currently happening today) or minor seismic events would result in settlement of the wall or collapse of the roadway or sidewalk on Alaskan Way. This scenario assumes continued operation of the seawall with ongoing maintenance as needed.
2. Loss of Functionality: This scenario would result from sustained damage, and the seawall would no longer be considered safe for public access and could no longer perform the majority of its essential functions. As with the Minimal Damage scenario, this scenario could result from either tidal or seismic events.
3. Collapse of the Seawall: This scenario would occur only as a result of seismic damage; however, collapse resulting from a seismic event could trigger additional damage from tidal erosion. Seawall failure would have significant impacts on the public, Seattle, the Puget Sound region, Washington State, and the nation. Loss of the seawall's function would disrupt or destroy the critical transportation infrastructure that runs along the Seattle waterfront, potentially displacing hundreds of thousands of vehicles on roadways, 30,000 daily ferry passengers who use Colman Dock ferry terminal, and 24 freight trains and six passenger trains that run near the waterfront. It would also jeopardize critical utility corridors that serve downtown Seattle and the region, and would impair the viability of the waterfront as a major tourist destination and regional economic engine.

Conditions without the project were defined as part of a separate Elliott Bay Seawall Feasibility Study, conducted by the United States Army Corps of Engineers (USACE). The "without project" conditions serve a similar purpose in the feasibility study as does the No Action Alternative under SEPA. The without project conditions are summarized below to provide additional detail about the No Action scenarios.

- The City would continue to repair minimal damage failures unless three or more sections of the seawall fail in a single year, at which point the seawall is assumed to have lost its functionality.
- The City would stabilize the shoreline following seawall collapse to minimize erosion impacts. This stabilization would help to prevent the permanent loss of landward structures, utilities, and the Burlington Northern Santa Fe (BNSF) rail line to erosion.
- If functionality of the seawall were lost, the City would construct a trestle bridge to maintain access to Colman Dock Ferry Terminal and Fire Station No. 5.
- If functionality of the seawall were lost, the City would repair or relocate affected utilities.

1.5 DESIGN FEATURES COMMON TO THE BUILD ALTERNATIVES

If implemented, the EBSP would replace the failing seawall that runs along Elliott Bay and underneath Alaskan Way and would restore and enhance aquatic habitat along the seawall's new face. A new

seawall would reduce the risk of seismic damage and protect Seattle's downtown waterfront from wind-driven storm waves and erosive tidal forces; safeguard major public and private utilities, including power for downtown Seattle and the region, natural gas, and telecommunications; support SR 99, Colman Dock ferry terminal, and rail lines; and enhance habitat for juvenile salmon and other marine life. Additionally, the project would be compatible with future improvements currently being planned at and near the waterfront.

All build alternatives encompass three major categories of design features: the new seawall itself, improvements to aquatic habitat, and improvements to upland areas. Each of these categories is described briefly below.

1.5.1 Seawall

The primary function of the new seawall is to provide protection from storm and wave erosion, impacts from floating objects, and resistance from lateral pressures such as those caused by an earthquake. A new seawall face would generally be placed either close to or somewhat landward of its current position. Depending on the build alternative selected, the final location of the seawall face would vary from approximately 3 feet waterward to 75 feet landward of the existing alignment. It would be most efficient to leave the existing seawall in place during construction of the new seawall and to build the new structure either behind or in front of the existing face.

The new seawall would also reduce the risks related to seismic activity. How these risks are reduced would differ between the alternatives. Soil improvement in the form of jet grouting with or without deep soil mixing (Alternatives A and C) would minimize the risk of liquefaction by physically stabilizing liquefiable soils behind the seawall, while the BSP method (Alternative B) would not prevent liquefaction but rather would resist the lateral spreading and migration of soil that results from liquefaction. Both methods would stabilize the seawall during seismic events. The design life of the new seawall is 75 years.

1.5.2 Habitat Improvements

Rebuilding the seawall would provide the opportunity to improve adjacent aquatic habitat. Habitat improvement measures would be implemented as part of each build alternative. These measures would be designed to restore a functional intertidal migration corridor along the seawall for juvenile salmonids, and would also improve ecosystem productivity to enhance the marine nearshore food web. Figure 1-3 shows a conceptual rendering of the proposed habitat improvements.

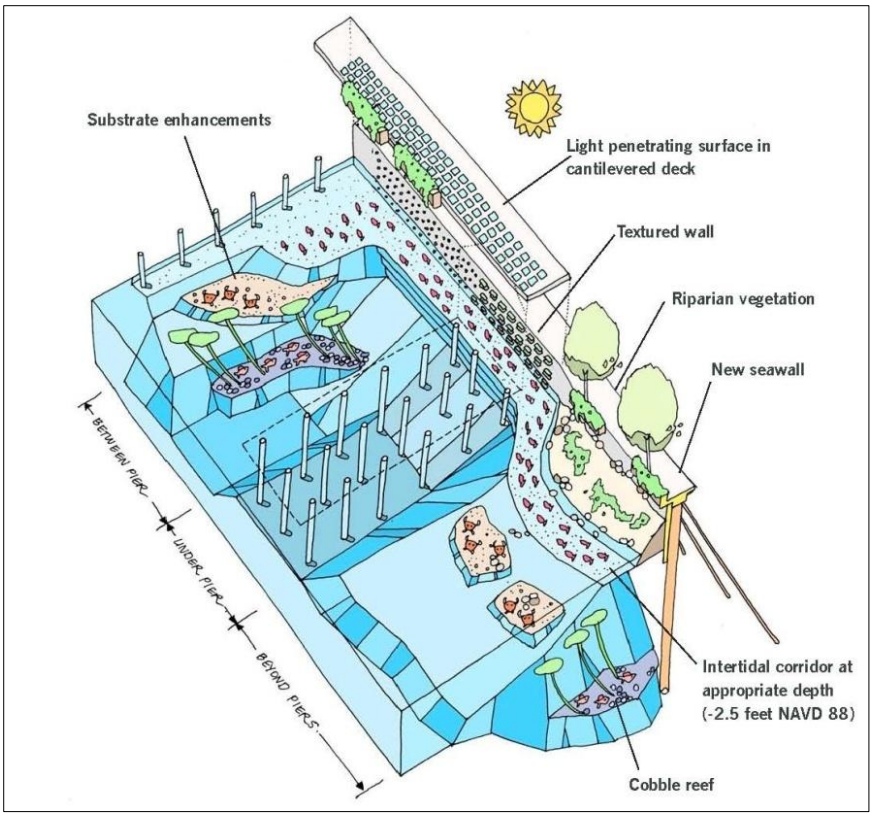


Figure 1-3. Conceptual Rendering of Proposed Habitat Improvements

The intertidal migration corridor for juvenile salmonids would be improved by:

- Modifying substrate depths to create a habitat bench and achieve appropriate intertidal and shallow-water habitat elevations;
- Improving the diversity of off-shore substrate by supplementing it with coarse substrate;
- Increasing textures on the seawall face to encourage the development of marine nearshore habitat and attachment of aquatic organisms;
- Adding riparian plants along the wall and sidewalk to provide food (insects and detritus) for migrating salmon; and
- Increasing daylight illumination of the habitat bench and other nearshore habitat by including LPS in a cantilevered or pile-supported sidewalk.

Enhanced ecosystem productivity would generally be accomplished by:

- Enhancing substrate by supplementing it with cobble, pea gravel, and shell hash; and
- Constructing the textured wall face, riparian plantings, LPS, and suitable bench substrate.

1.5.3 Upland Improvements

In addition to replacing the seawall and restoring aquatic habitat, the three build alternatives would provide a number of upland improvements. The existing Alaskan Way roadway, multi-use trail, and parking would be restored to their original function and capacity after construction. The restored

sidewalk along the waterfront would range from 15 to 30 feet in width and include a cantilevered portion with LPS that would benefit the marine habitat below. Viewing areas would be provided waterward of the sidewalk and would offer opportunities for public gathering space. New railings, formal and informal seating, bicycle racks, wayfinding elements, and other design amenities would also be included as project improvements. All build alternatives would restore the historic Washington Street Boat Landing, either maintaining its current location or moving it 15 feet waterward.

Currently, there are no water quality facilities for treating surface water runoff from Alaskan Way. Stormwater drainage pipes in the project area would be reconstructed and stormwater quality would be improved through the installation of treatment to meet code by removing the bulk of suspended solids, oils, and greases. These actions would improve water quality in the nearshore of the project area. It would be expected that new stormwater structures would initially require less maintenance than those currently in place and, as a result, have fewer detrimental impacts on the environment. As the project design moves forward, other stormwater management strategies could be identified that provide greater environmental benefit without increasing environmental impacts.

1.6 PROJECT CONSTRUCTION

1.6.1 Construction Schedule

Central Seawall construction is expected to begin in fall of 2013 and would progress from north to south, beginning in Zone 4 and ending in Zone 1. Based on current schedules, Central Seawall construction would last three to five construction seasons depending on the alternative, with construction seasons extending from approximately Labor Day to Memorial Day to avoid major disruption during the peak tourist season. The North Seawall would be built as a separate construction phase and would require an additional four construction seasons.

1.6.2 Temporary Roadway and Construction Work Zone

To accommodate construction activities during replacement of the seawall, the existing Alaskan Way roadway would be relocated beneath the Alaskan Way Viaduct. Three lanes of traffic would be maintained underneath the viaduct throughout construction. The resulting space along the waterfront would be used as a work zone during construction of the Central Seawall (Figure 1-4). During North Seawall construction, this dedicated construction work zone would not be available, and the temporary roadway would be accommodated in the available right-of-way.

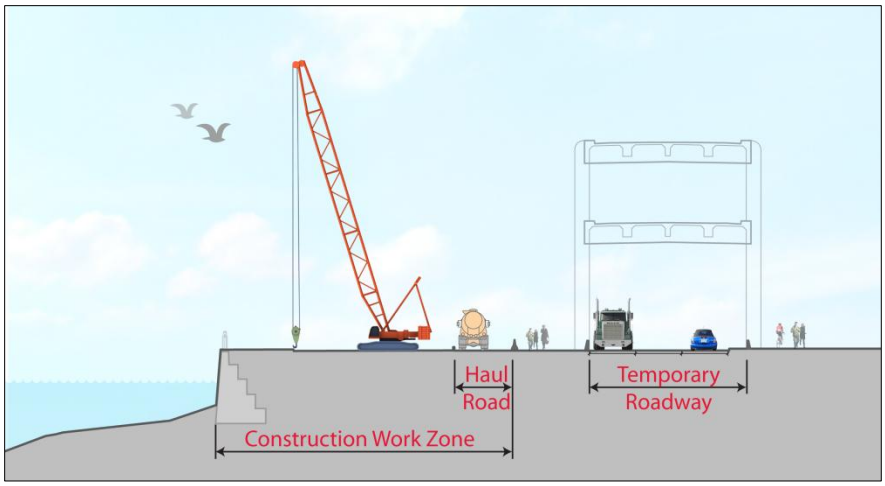


Figure 1-4. Construction Work Zone and Temporary Roadway

The construction work zone would extend from the western edge of the existing multi-use path on Alaskan Way to the water. Existing street trees would be removed to provide additional space within this area and would either be replaced as riparian plantings with the EBSP or replaced during future waterfront improvement projects. The existing streetcar tracks that run along Alaskan Way would also be removed during construction.

Construction would be staged from several locations within the work zone. Staging areas would vary in size and would be used for delivery and storage of construction materials and equipment. The staging areas would be sited to avoid disrupting access to piers, residences, and businesses along the waterfront. In addition to the upland staging areas, construction activities may also be staged from barges and tugs in Elliott Bay.

During Central Seawall construction, some temporary parking spaces could be provided as part of each construction stage. During the first stage of construction, parking could be provided on the existing Alaskan Way roadway south of the active work zone. During the later stages when construction has progressed to the southern portion of the project area, parking could be provided on the restored roadway to the north of active construction. During North Seawall construction, a similar program of temporary parking would be implemented, to the extent possible.

To the greatest extent possible, construction materials and personnel would be transported to the construction work zone and staging areas via freeways and arterials. However, other city streets could provide access to the site when needed. The eastern border of the construction work zone along Alaskan Way would serve as a haul road to channel truck traffic within the project area.

The existing multi-use trail would be maintained (with the potential for temporary detours), and access to the piers would be maintained throughout construction.

1.6.3 Construction Methods

The seawall would be replaced using soil improvement, BSP, or a combination of these two methods. A brief description of each method is provided below.

1.6.3.1 Soil Improvement

Soil improvement is a general term for a variety of techniques that are used to stabilize existing soils by improving their internal structure and strength. Two techniques that are being considered for the EBSP are jet grouting and deep soil mixing. Jet grouting consists of adding grout to existing soils to form a "block" of improved soil mass that extends down to the competent foundation below. This technique has been identified as a feasible way to strengthen the material underlying the project area, which includes an existing timber relieving platform, buried timber piles, utilities, and other potential obstructions.

Jet grouting creates circular columns of soil cement by means of a hollow drill pipe measuring a few inches in diameter that is inserted into the soil. Grout is then sprayed into the surrounding soil under high pressure through horizontal nozzles in the rotating drill pipe. This process cuts the existing soil and mixes the soil with the grout. The strength of the soil would be substantially improved through this process, thus greatly reducing the soil's potential for liquefaction during an earthquake.

The grout columns would be constructed in a grid pattern to create a block of improved soil. The grid pattern would be installed between the timber piles of the existing seawall to eliminate the need to remove the existing piles. The finished arrangement of the grouted columns would create a "spine" for the new seawall. The grouting process generates spoils that would be disposed of using appropriate means, in accordance with applicable regulations.

Deep soil mixing, another technique that could be used for soil improvement, uses an auger that penetrates the ground surface to mix and consolidate the underlying soils to a depth of up to 20 feet. With deep soil mixing, no grout is applied under pressure and there are minimal spoils for disposal.

1.6.3.2 Braced Soldier Piles

BSP is an alternative structural stabilization method. This method would involve drilling large holes (approximately 8 feet in diameter) to a depth of approximately 75 feet below the present street level of Alaskan Way where the firm layer of glacial till is located. An oscillator, a specialized piece of drilling equipment, would install a steel casing as the drilling progresses to prevent the holes from collapsing and to contain the soils to be excavated. The leading edge of the casing would be equipped with cutting teeth to carve through the timber boards and piles of the existing relieving platform and into the soils below.

Once the holes have been drilled and excavated to the final depth, a steel reinforcing cage would be placed into the shaft casing and the casing would be filled with concrete. The casing would be extracted as the concrete is poured and would leave behind a reinforced concrete cylinder, or soldier pile. A line of these soldier piles would be constructed to form the spine of the seawall. Soil anchors would then be installed to brace or tie back these soldier piles.

1.6.4 Soil Dewatering and Spoils Disposal

Regardless of the construction method that is selected, excavations into soils in the construction zone would need to be dewatered, which generally involves disposing of the wastewater offsite or pumping

the excess water to a location where it can be settled and/or before discharge. Wet spoils from jet grouting or other soil improvement activities must be managed or disposed of as well. SDOT is currently exploring various methods for managing and disposing wastewater and jet grout spoils, which would be detailed in the project's dewatering and erosion control submittals required as part of the Clean Water Act Section 401 and National Pollutant Discharge Elimination System (NPDES) construction general stormwater permit processes, as well as by the City's standard construction specifications.

1.6.5 Utility Protection and/or Relocation

The project area contains a large number of utilities, including water, sanitary sewer, combined sewer, stormwater, electrical transmission and distribution, steam, gas, fire alarm, and numerous telecommunication systems. These utilities range from major transmission lines serving portions of Seattle and the region to individual connections serving adjacent properties. As shown in Figure 1-5, some of these utilities are directly beneath the Alaskan Way roadway and sidewalk and above the relieving platform of the existing seawall, while others extend through the seawall to the piers.

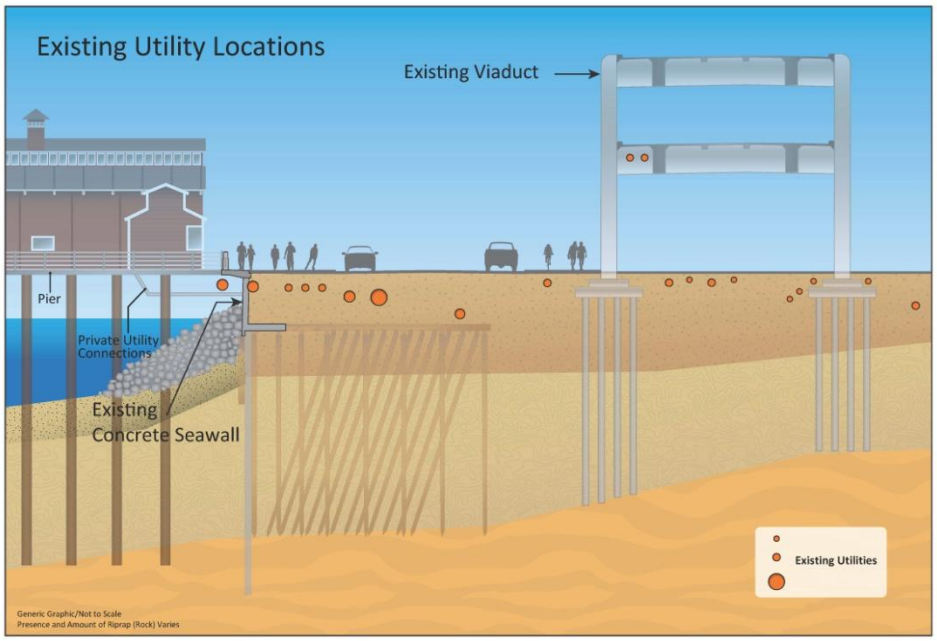


Figure 1-5. Representative Cross Section Showing Typical Existing Utility Locations within Project Limits

SDOT's objective will be to maintain utility service to the greatest extent possible during construction, although the means and methods for doing so would vary depending on the construction method used. Alternatives A and B assume that all soil overlying the relieving platform would need to be excavated. Excavation would require temporary or permanent relocation of the majority of existing utilities. Alternative C assumes that most soil improvement could be accomplished through small penetrations at street level, which would allow the majority of the utility lines above the relieving platform to remain in place during that construction activity. With either method, most individual service lines would be temporarily relocated and reinstalled in their final locations as seawall construction progresses. Final points of service to the waterfront piers would remain the same to alleviate the need to update the

facilities to the current Uniform Building Code. The final construction method chosen will not preclude the ability of utilities to provide future new services to the downtown waterfront area.

1.7 BUILD ALTERNATIVES

The preceding sections provided information on project elements that would be similar among the three build alternatives. The following discussion focuses on the primary differences among Alternatives A, B, and C in terms of the seawall's location, the configuration of Alaskan Way, habitat improvements, public amenities, and construction sequence and schedule. Table 1-1 (at the end of this chapter) compares key features of the alternatives.

1.7.1 Alternative A

Alternative A would reconstruct the seawall as close to its existing alignment as possible, with jet grouting forming the structural support. Habitat improvements would include the addition of shoreline enhancements and the installation of a continuous habitat bench and LPS at piers. Figures 1-18 and 1-19 at the end of this chapter depict Alternative A.

1.7.1.1 Seawall

In Alternative A, the new seawall would be reconstructed as close to the alignment of the existing seawall as possible, with only a minimal setback (as outlined in the bulleted list below). This placement would allow construction to proceed without requiring the removal of the existing wall first.

The approximate proposed location of the seawall face for Alternative A relative to the existing seawall face would be:

- Zone 1 – in place (no change),
- Zone 2 – 15 feet landward,
- Zone 3 – 3 feet waterward, and
- Zones 4, 5, and 6 – 10 feet landward.

In Zone 1, the seawall would be reconstructed in its existing location to minimize potential conflicts with construction of the SR 99 bored tunnel, which is being built as part of a separate project. In Zones 2, 4, 5, and 6, the new wall would be constructed behind (east of) the existing wall, and then the existing seawall west of the new seawall face would be demolished. In Zone 3, the new seawall structure would be constructed to the west of the existing wall, resulting in the new seawall face being set three feet waterward of its current location.

1.7.1.2 Roadway

The existing Alaskan Way is generally four lanes (two lanes in each direction), except in the vicinity of Colman Dock (Yesler Way to Spring Street), where it consists of one northbound lane and two southbound lanes. Alternative A would add a permanent northbound lane between S. Washington and

Madison Streets[1] to handle traffic in this segment headed to Colman Dock and through to other destinations. A temporary second northbound lane (constructed by the Washington State Department of Transportation [WSDOT]) is currently in place. Parking and loading zones in the finished configuration would be similar to today.

A sidewalk of approximately the same width as the existing sidewalk (15 to 20 feet) would be provided on the west side of the street. The sidewalk would be cantilevered or pile supported in Zones 2 through 6 and would extend back to the piers in all zones, with LPS provided where feasible. The mixed-use trail on the east side of Alaskan Way would be extended from its existing terminus north to Clay Street. At Clay Street, the trail would cross Alaskan Way and continue on the west side of Alaskan Way to Broad Street, where it would connect to the existing trail system that runs along Olympic Sculpture Park and Myrtle Edwards Park.

1.7.1.3 Habitat Improvements

Alternative A would provide an effective intertidal corridor along the seawall to support juvenile salmonid migration and would enhance ecosystem productivity. Habitat benches, a sidewalk with LPS, a textured wall face, subtidal substrate enhancements, cobble reefs, and riparian plants would be installed. No net loss of ecological function or intertidal elevation would occur.

1.7.1.4 Upland Improvements

Under Alternative A, public amenities would include the restored historic Washington Street Boat Landing, improved water-viewing opportunities at various locations, new or replaced railings, new sidewalks, waterfront planters, and street plantings. Reconstructed sidewalks would extend from the curb line of the restored Alaskan Way to the western edge of the existing sidewalk. These improvements would add variety to the waterfront by defining gathering spaces, viewing areas, and building entries.

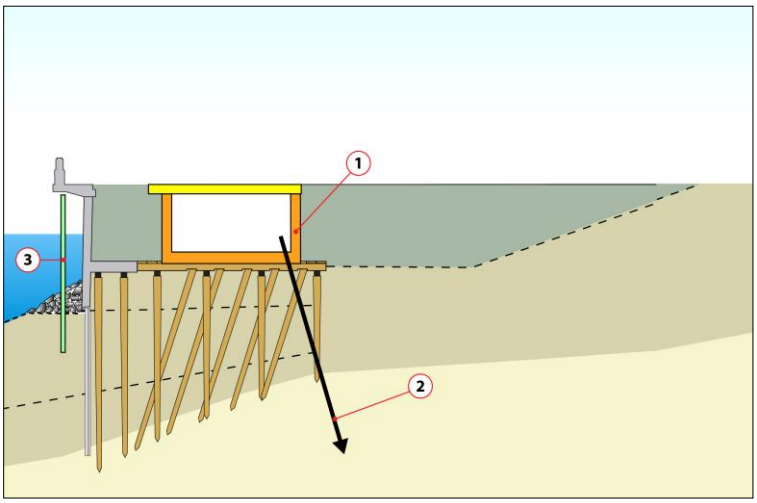
1.7.1.5 Construction and Schedule

Under Alternative A, the construction method proposed for the primary structural element of the seawall is soil improvement. With this method, construction of the Central Seawall would require approximately three construction seasons with two summer shutdown periods. Construction of the North Seawall would require an additional four construction seasons with three summer shutdown periods. The current plan for Alternative A is to begin construction of the Central Seawall in Zone 4, move southward to Zone 3, and then progress to Zones 2 and 1. The Central Seawall construction would be followed by the North Seawall construction in Zones 6 and 5.

The anticipated construction activities and probable sequence for Alternative A, using jet grouting for the soil improvement, are depicted in Figures 1-6 through 1-9. The figures describe four primary stages of work that would occur along the waterfront. The construction activities within each zone would vary

[1] The Elliott Bay Seawall Project would build the additional lane from S. Washington Street to Madison Street. The portion between S. King Street and S. Washington Street would be constructed as part of the Alaskan Way Viaduct Replacement Project.

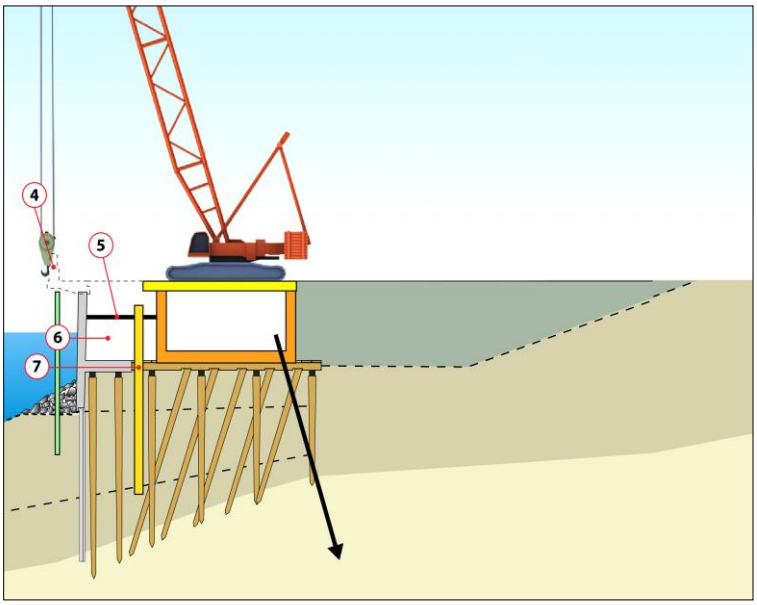
depending on the type of existing seawall. The figures depict the Type A seawall. (Type A seawall is a sheet-pile supported, reinforced, concrete face panel, which is tied back to a buried timber relieving platform supported by vertical and battered timber piles.) For Alternative A, it was assumed that the area above the existing relieving platform would be excavated before jet grouting begins.



Alternative A, Stage 1

1. Excavate to the top of relieving platform, relocate utilities, and install shoring
2. Install soil anchors
3. Remove existing riprap and install temporary containment wall

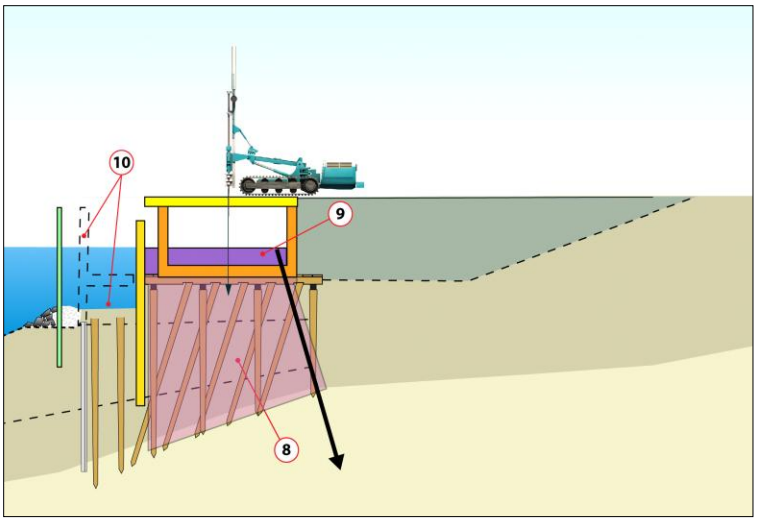
Figure 1-6. Alternative A, Stage 1



Alternative A, Stage 2

4. Remove existing cantilever sidewalk
5. Brace existing concrete face panel
6. Excavate remaining soil
7. Install concrete face panel

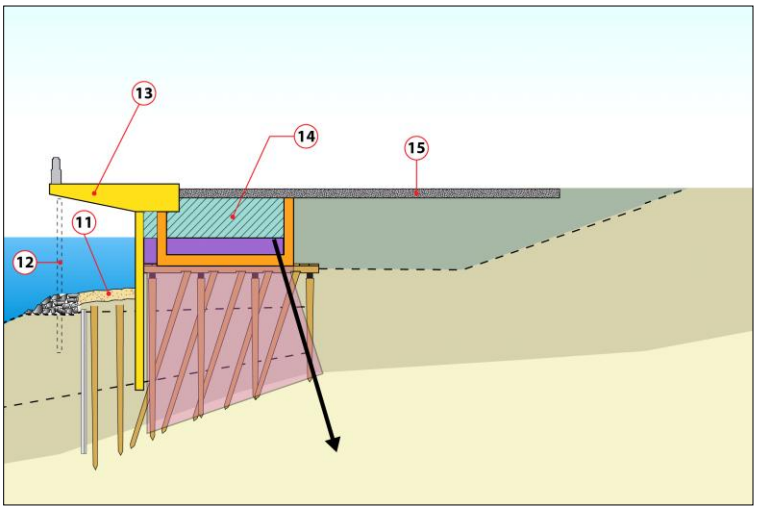
Figure 1-7. Alternative A, Stage 2



Alternative A, Stage 3

8. Install soil improvement (jet grouting)
9. Install anchor slab
10. Remove portion of existing wall

Figure 1-8. Alternative A, Stage 3



Alternative A, Stage 4

11. Place substrate
12. Remove temporary containment wall
13. Install sidewalk
14. Restore utilities and backfill
15. Complete restored roadway

Figure 1-9. Alternative A, Stage 4

1.7.2 Alternative B

Alternative B would move the seawall up to 75 feet landward of its current location, with BSP forming an underground wall structure to protect against coastal storm damage and seismic forces. In addition to the habitat improvements described for Alternative A, this alternative would construct a continuous habitat bench and continuous LPS at the piers. Figures 1-20, 1-21, and 1-22 at the end of this chapter depict Alternative B.

1.7.2.1 Seawall

Under Alternative B, the new seawall would be constructed up to 75 feet east of the existing seawall alignment and would provide a range of potential design opportunities. The approximate proposed location of the seawall face for Alternative B, relative to the existing seawall face, would be:

- Zone 1 – 0 to 15 feet landward,
- Zone 2 – 15 feet landward,
- Zone 3 – 30 feet landward,
- Zone 4 – 30 to 75 feet landward following the restored road curb alignment, and
- Zones 5 and 6 – 10 feet landward.

In Zones 1, 2, 5, and 6, the new wall would be constructed 10 to 15 feet east of the existing wall. In Zones 3 and 4, the new wall would be constructed 30 to 75 feet farther east, allowing greater flexibility for future habitat and public amenity spaces. This eastward realignment would largely reshape the downtown Seattle waterfront. After the new seawall was in place, the existing seawall would be demolished.

1.7.2.2 Roadway

Under Alternative B, the lane configuration of Alaskan Way would remain identical to the current configuration because of the confined space that would be available between the location of the seawall (eastward of the existing seawall) and the existing Alaskan Way Viaduct structure. A temporary northbound lane between Yesler Way and Spring Street has been installed by WSDOT, and it may be used during seawall construction.

Similar to the other build alternatives, the existing roadway, sidewalk, and multi-use trail would be restored to their original function and capacity after construction, with the multi-use trail connecting to the existing trail system that runs along Olympic Sculpture Park and Myrtle Edwards Park. However, due to space constraints, southbound parking and loading in Zone 3 may be restricted between University and Madison Streets.

1.7.2.3 Habitat Improvements

Alternative B would include the installation of habitat benches, a sidewalk with LPS, a textured wall face, subtidal substrate enhancements, cobble reefs, and riparian plants. However, the intertidal habitat

would be larger because the seawall would be set back farther east (landward). Alternative B would provide substantial enhancements within the new aquatic land available in Zones 1, 3, and 4.

Zone 1 would include an intertidal habitat bench and backshore that would be bordered by riparian plants, rocks, and drift logs. In Zone 3, the 30-foot seawall setback would allow the installation of a confined-substrate habitat bench with LPS installed above. In Zone 4, the 75-foot seawall setback would allow expanded upland riparian planting or increased intertidal habitat.

1.7.2.4 Upland Improvements

Alternative B would improve water viewing at various locations and provide additional public gathering spaces, as well as interpretive, recreational, and cultural opportunities. The new sidewalks would be enhanced with LPS and reconfigured with planters and new or replaced railings along the length of the seawall. These additional and enhanced gathering and overlook spaces would be provided in Zones 1, 3, 4, 5, and 6.

In Zone 1, Washington Street Boat Landing would be restored and reinstalled within the Washington Street right-of-way, west of its current location to improve its connection to the water. A new gangway and short-stay boat moorage could be created to restore the landing's historic connection with Elliott Bay. North of the boat landing, steps and a boardwalk (Option 1) or boulders (Option 2) could be added for seating and for physical access to or viewing of the new intertidal habitat bench.

Zones 3, 5, and 6 would include viewpoints between the piers. These viewpoints would create opportunities for public gathering, seating, and water viewing. The viewpoints would be parallel with the adjacent piers, thereby directing the view out to Elliott Bay. The viewpoints would include seating steps and stairs to bring people closer to the water.

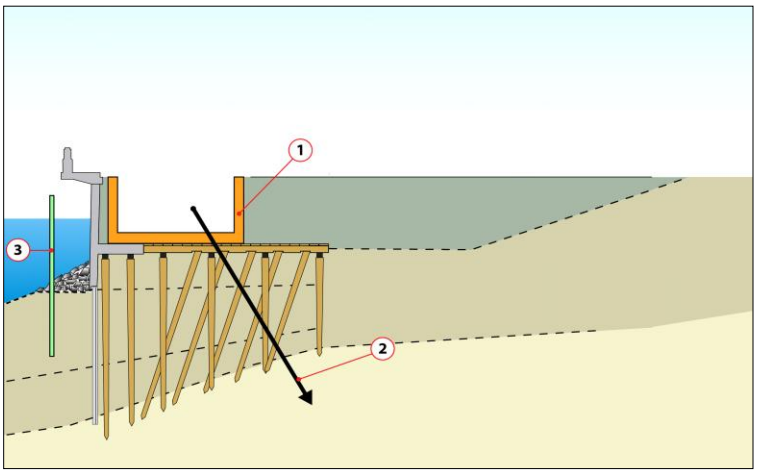
In Zone 4, the proposed seawall setback of 30 to 75 feet would provide two types of opportunities: a water plaza (Option 1) or a land plaza (Option 2). In Option 1, openings in the expansive plaza and walk would allow users to view tide pools and aquatic life below. In Option 2, raised planters would be filled with riparian plants, logs, and stones that would be reminiscent of Puget Sound shorelines.

1.7.2.5 Construction and Schedule

Under Alternative B, the design option proposed for the primary structural element of the seawall is BSP installed by means of a drilled-shaft construction method. With this method, construction of the Central Seawall would require approximately five construction seasons with four summer shutdown periods. Construction of the North Seawall would require an additional four construction seasons, similar to Alternatives A and C, although the duration may be slightly longer.

Access during construction would be more difficult than for either Alternatives A or C because the eastward setback of the seawall would restrict the construction staging areas to the project ends (i.e., north and south extents), instead of alongside the construction work zone. Under Alternative B, it would not be possible to maintain a continuous construction haul road because of the seawall setback in Zones 3 and 4. The construction of a land plaza or water plaza in Zone 4 would increase the duration of construction.

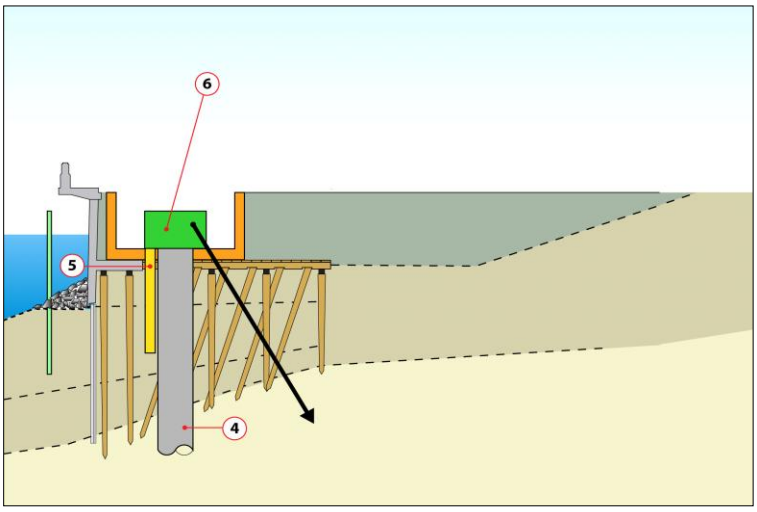
Construction of the Central Seawall would begin in Zone 4, move southward to Zone 3, and then progress to Zones 2 and 1. The Central Seawall construction would be followed by the North Seawall construction in Zones 6 and 5. The anticipated construction stages for Alternative B (assuming a Type A existing seawall) are shown in Figures 1-10 through 1-13.



Alternative B, Stage 1

1. Excavate to top of relieving platform, relocate utilities, and install shoring
2. Install soil anchors
3. Remove existing riprap and install temporary containment wall

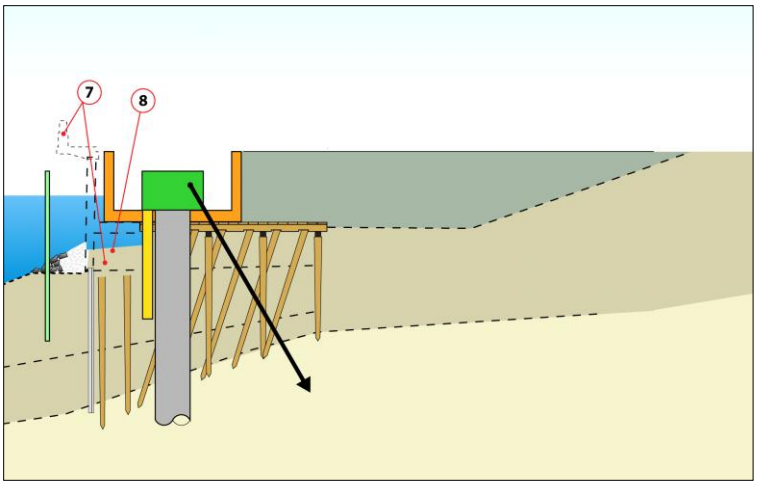
Figure 1-10. Alternative B, Stage 1



Alternative B, Stage 2

4. Drill shaft
5. Install concrete face panel
6. Cast concrete anchor cap

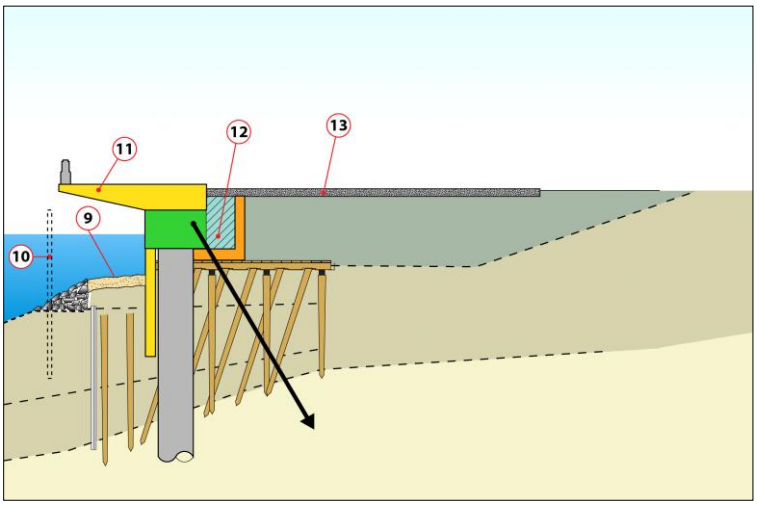
Figure 1-11. Alternative B, Stage 2



Alternative B, Stage 3

7. Remove existing cantilever sidewalk
8. Remove portion of existing wall

Figure 1-12. Alternative B, Stage 3



Alternative B, Stage 4

9. Place substrate
10. Remove temporary containment wall
11. Install sidewalk
12. Restore utilities and backfill
13. Complete restored roadway

Figure 1-13. Alternative B, Stage 4

1.7.3 Alternative C

Alternative C would move the seawall up to 15 feet landward of its current location and would use soil improvements (likely including both jet grouting and deep soil mixing) to provide structural support. Alternative C would also provide a continuous habitat bench and continuous LPS in addition to shoreline enhancements. Figures 1-23 and 1-24 at the end of this chapter depict Alternative C.

1.7.3.1 Seawall

Under Alternative C, the seawall would be constructed approximately 10 to 15 feet landward of the existing seawall alignment along its entire length. The setback proposed for Alternative C would allow soil improvements to proceed without first removing the existing seawall. The approximate proposed location of the seawall face for Alternative C relative to the existing seawall face would be:

- Zones 1 and 2 – 15 feet landward,
- Zone 3 – 10 to 15 feet landward, and
- Zones 4, 5, and 6 – 10 feet landward.

1.7.3.2 Roadway

The existing roadway is generally four lanes (two lanes in each direction), except in the vicinity of Colman Dock (Yesler Way to Spring Street), where it consists of one northbound lane and two southbound lanes. Alternative C would add a permanent northbound lane between S. Washington and Madison Streets[2] to support traffic bound for Colman Dock and other destinations. A temporary second northbound lane (constructed by WSDOT) is currently in place and could be used during seawall construction. Parking and loading zones would be similar to those present today.

A sidewalk of approximately the same width as the existing sidewalk (15 to 20 feet) would be provided on the west side of the street after construction. The sidewalk alignment would be cantilevered or pile supported and would extend back to the piers in all zones. The mixed-use trail on the east side of Alaskan Way would be extended north from its existing terminus to Clay Street, where it would cross Alaskan Way and continue on the west side of the street to Olympic Sculpture Park and Myrtle Edwards Park.

1.7.3.3 Habitat Improvements

Like Alternatives A and B, Alternative C would include a number of habitat improvements. These improvements would extend 10 to 45 feet from the face of the new seawall. An intertidal bench would be installed at the base of the seawall to form a shallow angle to the seafloor and provide shallower water for juvenile salmon migration. Installation of a textured seawall face panel would support the development of marine nearshore habitat. Restoration of riparian areas along the back beach area in Zone 1 would include species of riparian and beach shrubs native to Puget Sound.

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[2] The Elliott Bay Seawall Project would build the additional lane from S. Washington Street to Madison Street. The portion between S. King Street and S. Washington Street would be constructed as part of the Alaskan Way Viaduct Replacement Project.

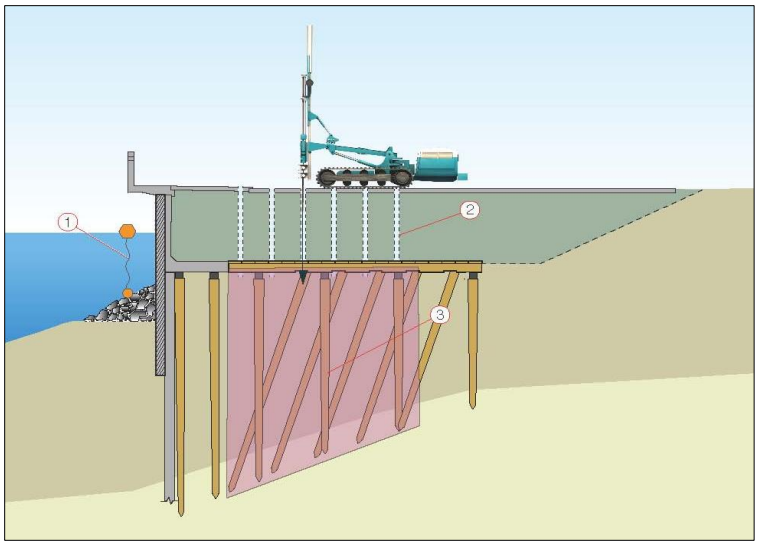
1.7.3.4 Upland Improvements

Under Alternative C, the restored sidewalk space would be enhanced with LPS and include new or upgraded railings, historic elements, wayfinding features, and lighting. Water-viewing opportunities would be preserved or enhanced at various locations, and additional viewing opportunities would be included at Spring and University Streets in Zone 3. In Zone 1, the Washington Street Boat Landing would be restored and reinstalled within the S. Washington Street right-of-way.

1.7.3.5 Construction and Schedule

For Alternative C, the construction method proposed for the primary structural element of the seawall is soil improvement. Alternative C assumes that the soil improvement would be accomplished from street level, without excavating the soils over the relieving platform. After seawall stabilization, the area above the relieving platform would be excavated to allow for installation of the new seawall face and sidewalk. With this method, construction of the Central Seawall would require approximately three construction seasons with two summer shutdown periods. Subsequent construction of the North Seawall would require an additional four construction seasons.

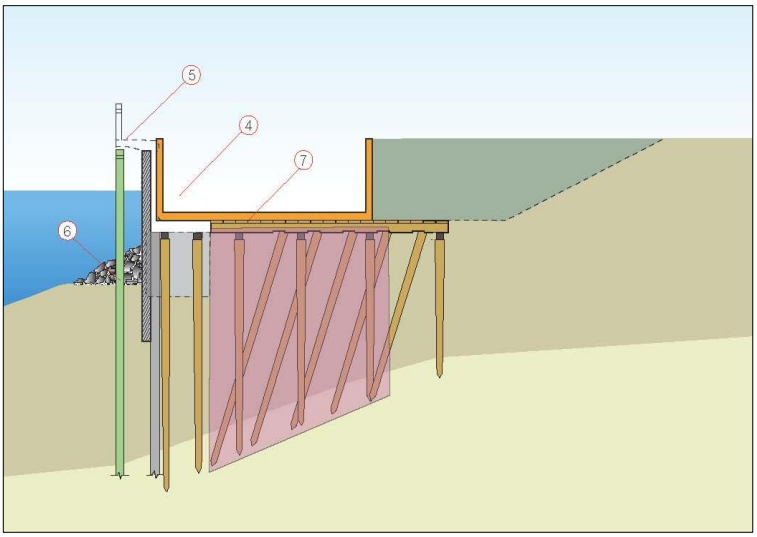
The anticipated construction activities and probable sequence for Alternative C, using soil improvement, are depicted below. The figures describe four primary stages of work that would occur along the waterfront. The activities within each zone would vary depending on the type of existing seawall present. Figures 1-14 through 1-17 are representative of the expected Alternative C construction sequence and depict the Type A seawall.



Alternative C, Stage 1

1. Place in-water containment curtain
2. Pre-drill and fill existing voids beneath timber relieving platform
3. Install soil improvement (jet grout)

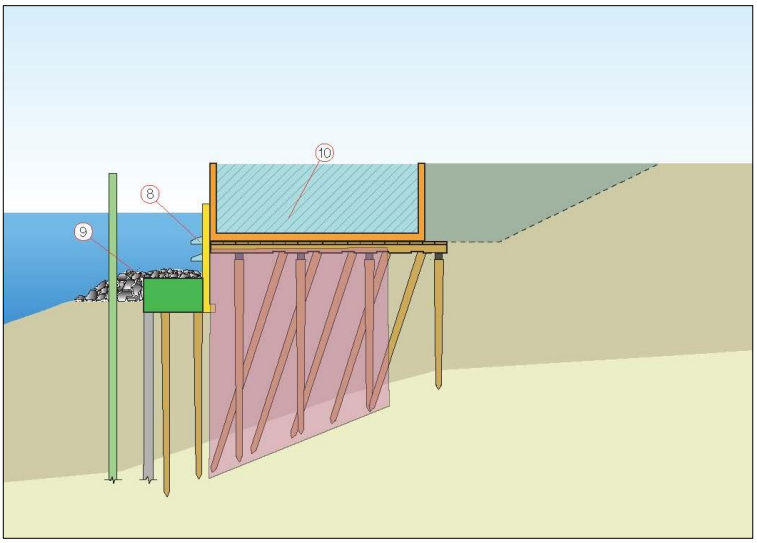
Figure 1-14. Alternative C, Stage 1



Alternative C, Stage 2

4. Relocate utilities
5. Remove existing sidewalk and pavement
6. Install temporary containment wall
7. Excavate to timber relieving platform

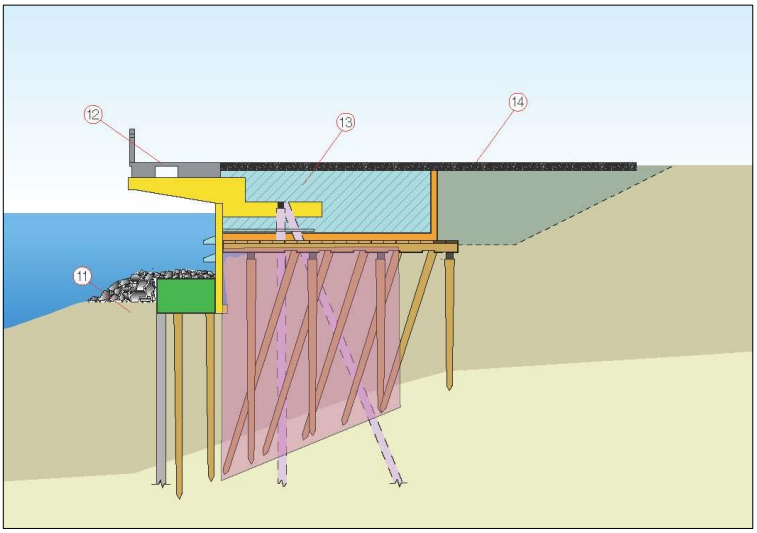
Figure 1-15. Alternative C, Stage 2



Alternative C, Stage 3

8. Remove portion of existing wall and install new face panels and habitat shelves
9. Place habitat bench

Figure 1-16. Alternative C, Stage 3



Alternative C, Stage 4

11. Remove temporary containment wall
12. Install cantilevered sidewalk with light penetrating surface
13. Restore utilities
14. Restore roadway for local traffic

Figure 1-17. Alternative C, Stage 4

TABLE 1-1. COMPARISON OF FEATURES OF THE THREE ELLIOTT BAY SEAWALL PROJECT BUILD ALTERNATIVES

Project Feature	Alternative A	Alternative B	Alternative C
Construction Method	Soil improvement	Braced soldier piles	Soil improvement
Central Seawall Construction Duration	3 construction seasons	5 construction seasons	3 construction seasons
North Seawall Construction Duration	4 construction seasons	4 construction seasons	4 construction seasons
Zone 1			
Face of Seawall Location	Existing location	0 to 15 feet landward	15 feet landward
Habitat Improvements	• Riparian plantings • Substrate enhancement • Cobble reef • Textured seawall face	• Riparian plantings • Substrate enhancement • Cobble reef • Expanded habitat bench and backshore	• Riparian plantings • Substrate enhancement • Expanded habitat bench and backshore
Upland Improvements	• Washington Street Boat Landing restoration • New or restored railings	• Washington Street Boat Landing restoration (up to 15 feet waterward of existing location) • Steps, boardwalk, and overlook (Option 1) • Short-stay boat moorage • New or restored railings	• Washington Street Boat Landing restoration (up to 15 feet waterward of existing location) • New or restored railings
Transportation Features	• Restored sidewalk • Restored multi-use trail • Restored roadway with additional northbound lane from S. Washington to Madison Street	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway with additional northbound lane from S. Washington to Madison Street
Zone 2			
Face of Seawall Location	15 feet landward	15 feet landward	15 feet landward
Habitat Improvements	• Confined substrate habitat bench • Textured seawall face • Intermittent LPS	• Confined substrate habitat bench • Textured seawall face • Continuous LPS	• Confined substrate habitat bench • Textured seawall face • Continuous LPS
Upland Improvements	• Same as existing	• Same as existing	• Same as existing
Transportation Features	• Restored sidewalk • Restored multi-use trail • Restored roadway with additional northbound lane from S. Washington to Madison Street	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway with additional northbound lane from S. Washington to Madison Street

Project Feature	Alternative A	Alternative B	Alternative C
Zone 3			
Face of Seawall Location	3 feet waterward	30 feet landward	10 to 15 feet landward
Habitat Improvements	• Confined substrate habitat bench and expanded habitat bench • Textured seawall face • Intermittent LPS at piers • Riparian plantings	• Confined substrate habitat bench and expanded habitat bench • Textured seawall face • Continuous LPS • Riparian plantings	• Confined substrate habitat bench and expanded habitat bench • Textured seawall face • Continuous LPS
Upland Improvements	• New or restored railings • Street plantings • Viewing area	• New or restored railings • Street plantings • Enhanced viewpoints with seating	• New or restored railings • Street plantings • Enhanced viewpoints
Transportation Features	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway
Zone 4			
Face of Seawall Location	10 feet landward	30 to 75 feet landward	10 feet landward
Habitat Improvements	• Confined substrate habitat bench and expanded habitat bench • Substrate enhancements • Textured seawall face • Intermittent LPS at piers • Cobble reefs • Riparian plantings	• Confined substrate habitat bench and expanded habitat bench • Substrate enhancements • Textured seawall face • Continuous LPS • Cobble reefs • Riparian plantings • Daylighting of water plaza	• Confined substrate habitat bench and expanded habitat bench • Substrate enhancements • Textured seawall face • Continuous LPS • Daylighting of portions of cantilevered sidewalk
Upland Improvements	• New or restored railings • Street plantings • Viewing area	• New or restored railings • Street plantings • Creation of a land or water plaza • Enhanced viewpoints	• New or restored railings • Street plantings
Transportation Features	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway

Project Feature	Alternative A	Alternative B	Alternative C
Zone 5			
Face of Seawall Location	10 feet landward	10 feet landward	10 feet landward
Habitat Improvements	• Confined substrate habitat bench • Riparian plantings • Textured seawall face	• Confined substrate habitat bench • Riparian plantings • Textured seawall face	• Confined substrate habitat bench • Riparian plantings • Textured seawall face • Continuous LPS
Upland Improvements	• New or restored railings • Street plantings • Viewing area	• New or restored railings • Street plantings • Expanded viewpoints	• New or restored railings • Street plantings • Enhanced viewpoints
Transportation Features	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway	• Restored sidewalk • Restored multi-use trail • Restored roadway
Zone 6			
Face of Seawall Location	10 feet landward	10 feet landward	10 feet landward
Habitat Improvements	• Confined substrate habitat bench and expanded habitat bench • Substrate enhancement • Textured seawall face • Riparian plantings • Intermittent LPS at piers • Cobble reefs	• Confined substrate habitat bench and expanded habitat bench • Substrate enhancement • Textured seawall face • Riparian plantings • Intermittent LPS at piers • Cobble reefs	• Confined substrate habitat bench and expanded habitat bench • Substrate enhancement • Textured seawall face • Riparian plantings • Continuous LPS
Upland Improvements	• Restored or new railings • Viewing area	• Restored or new railings • Enhanced viewpoints	• Restored or new railings • Enhanced viewpoints
Transportation Features	• Restored sidewalk • Extended multi-use trail • Restored roadway	• Restored sidewalk • Extended multi-use trail • Restored roadway	• Restored sidewalk • Extended multi-use trail • Restored roadway

Note: LPS – light-penetrating surfaces

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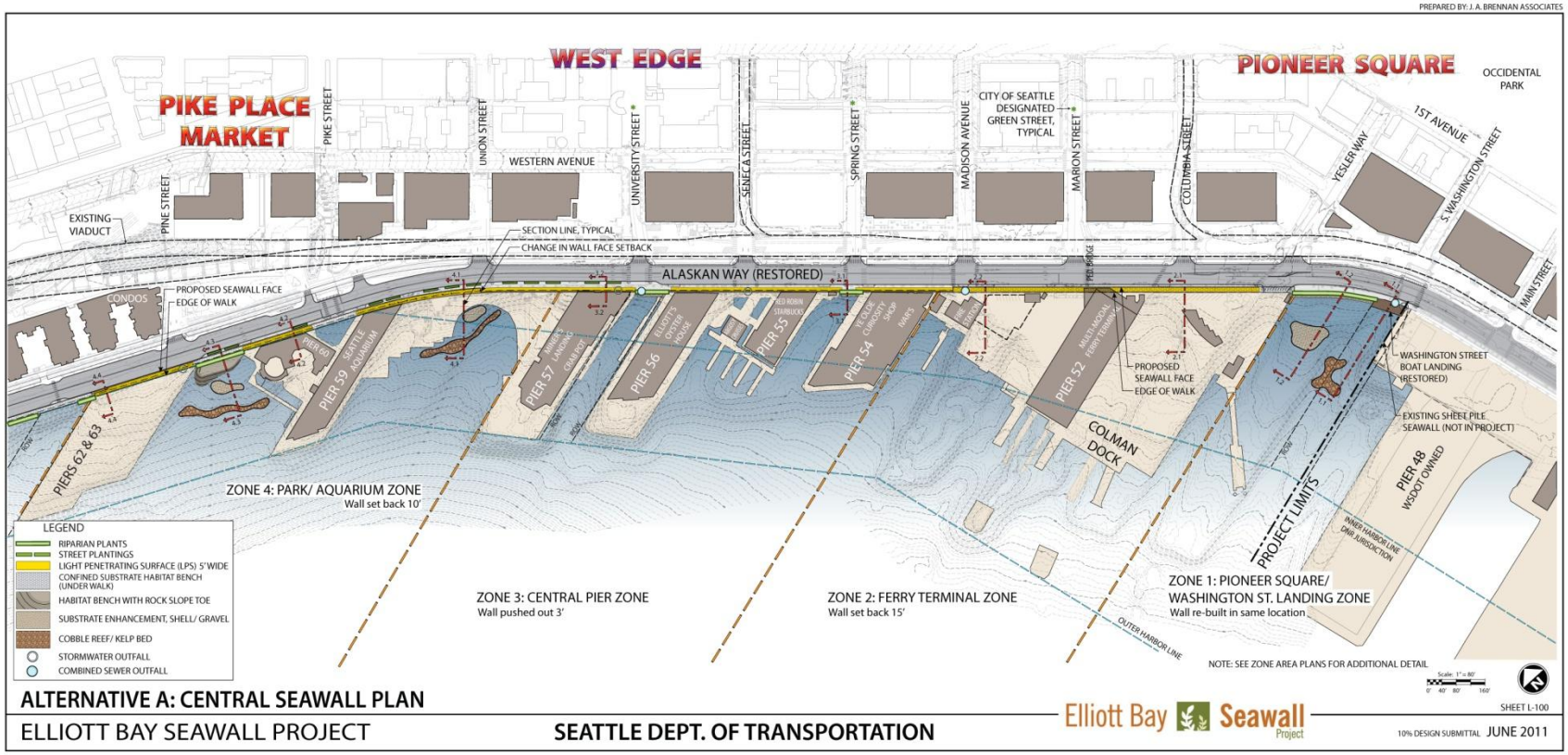

Figure 1-18. Alternative A: Central Seawall Plan

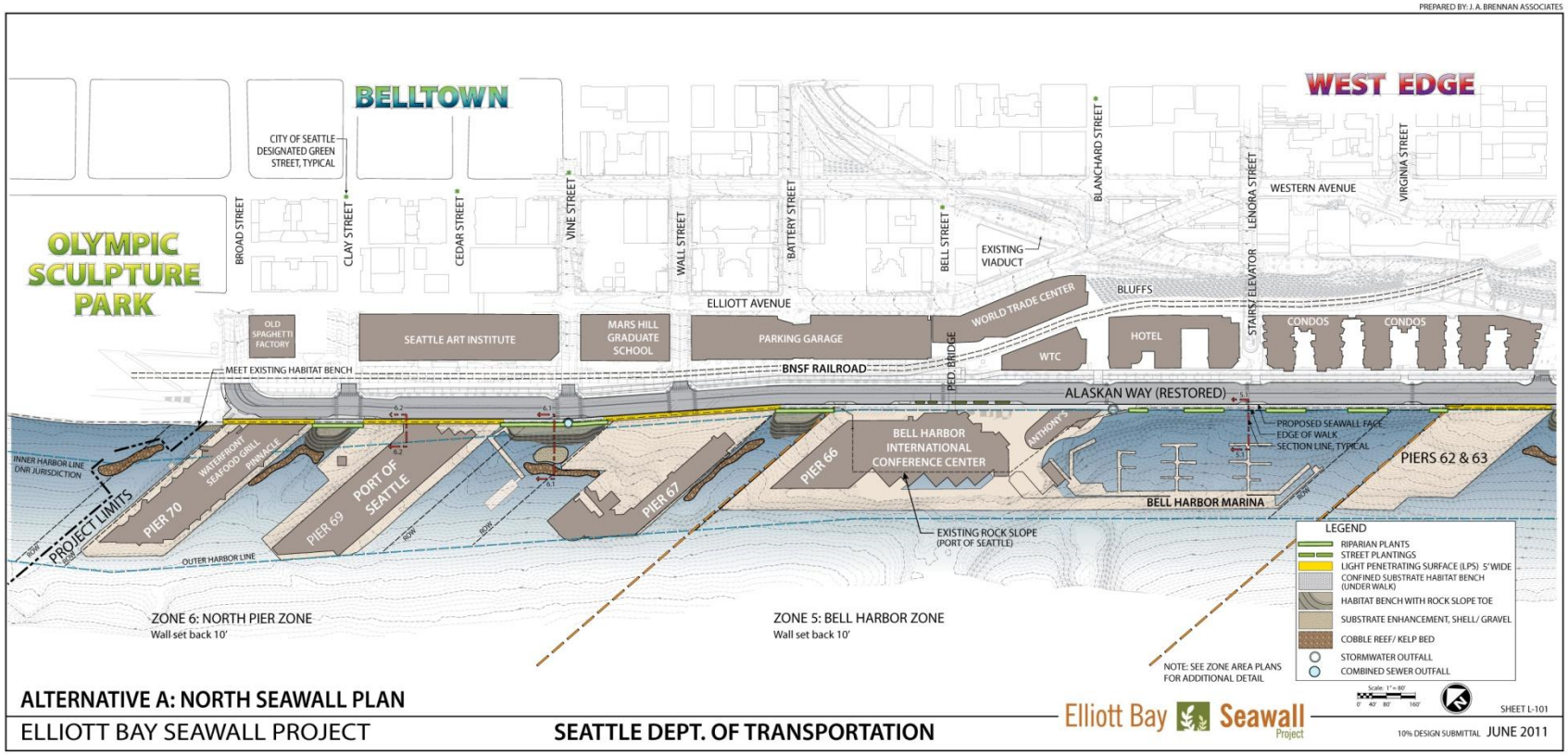

Figure 1-19. Alternative A: North Seawall Plan

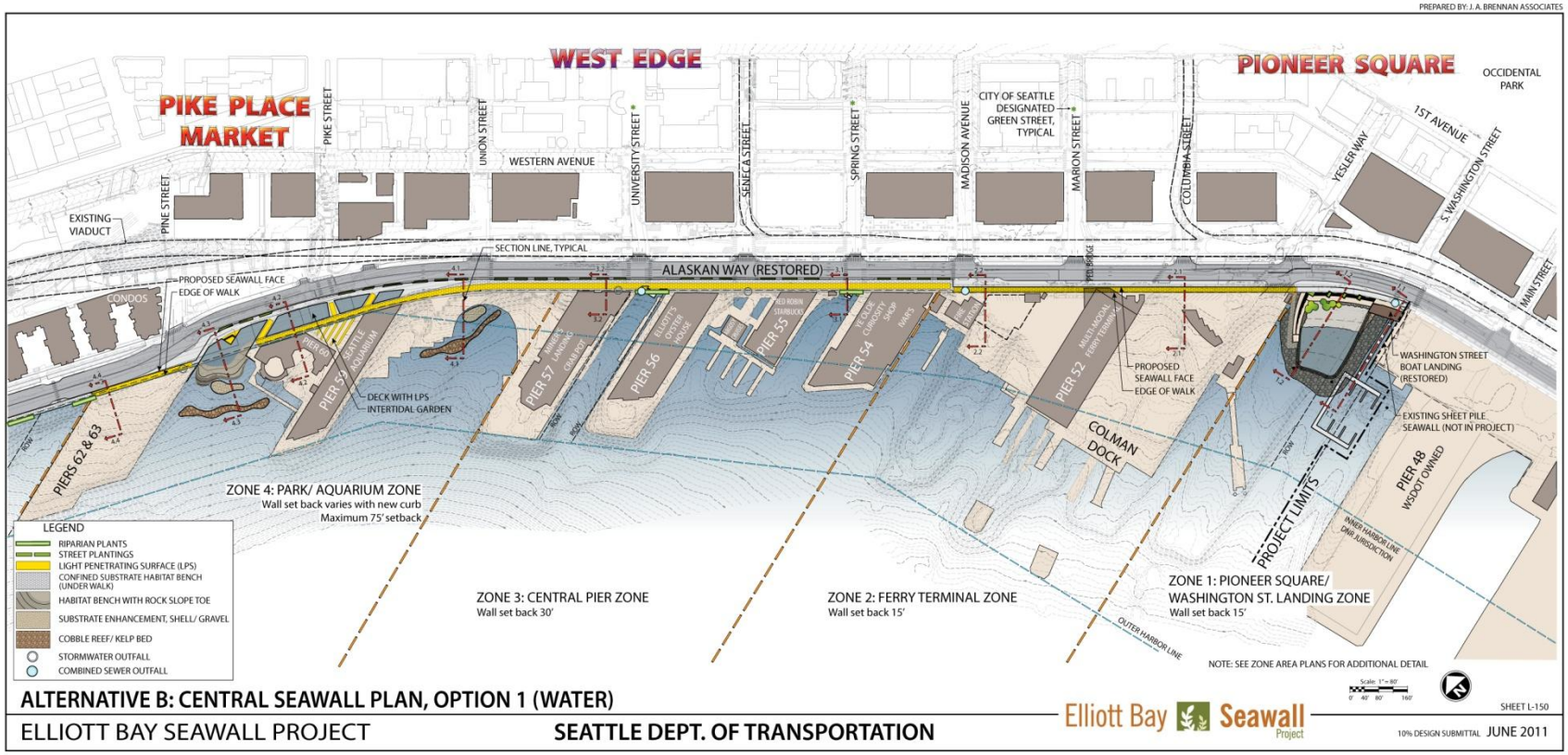

Figure 1-20. Alternative B: Central Seawall Plan, Option 1

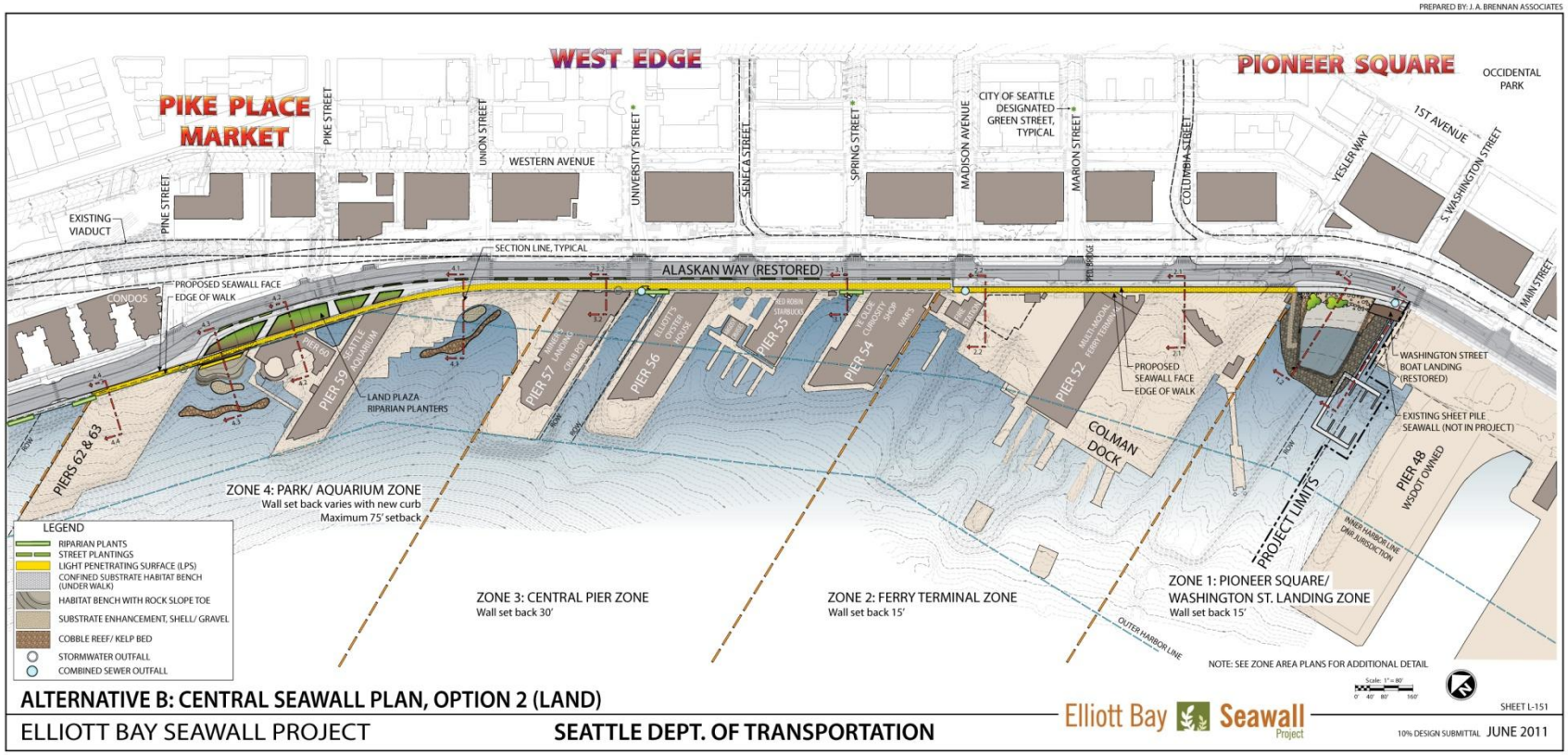

Figure 1-21. Alternative B: Central Seawall Plan, Option 2

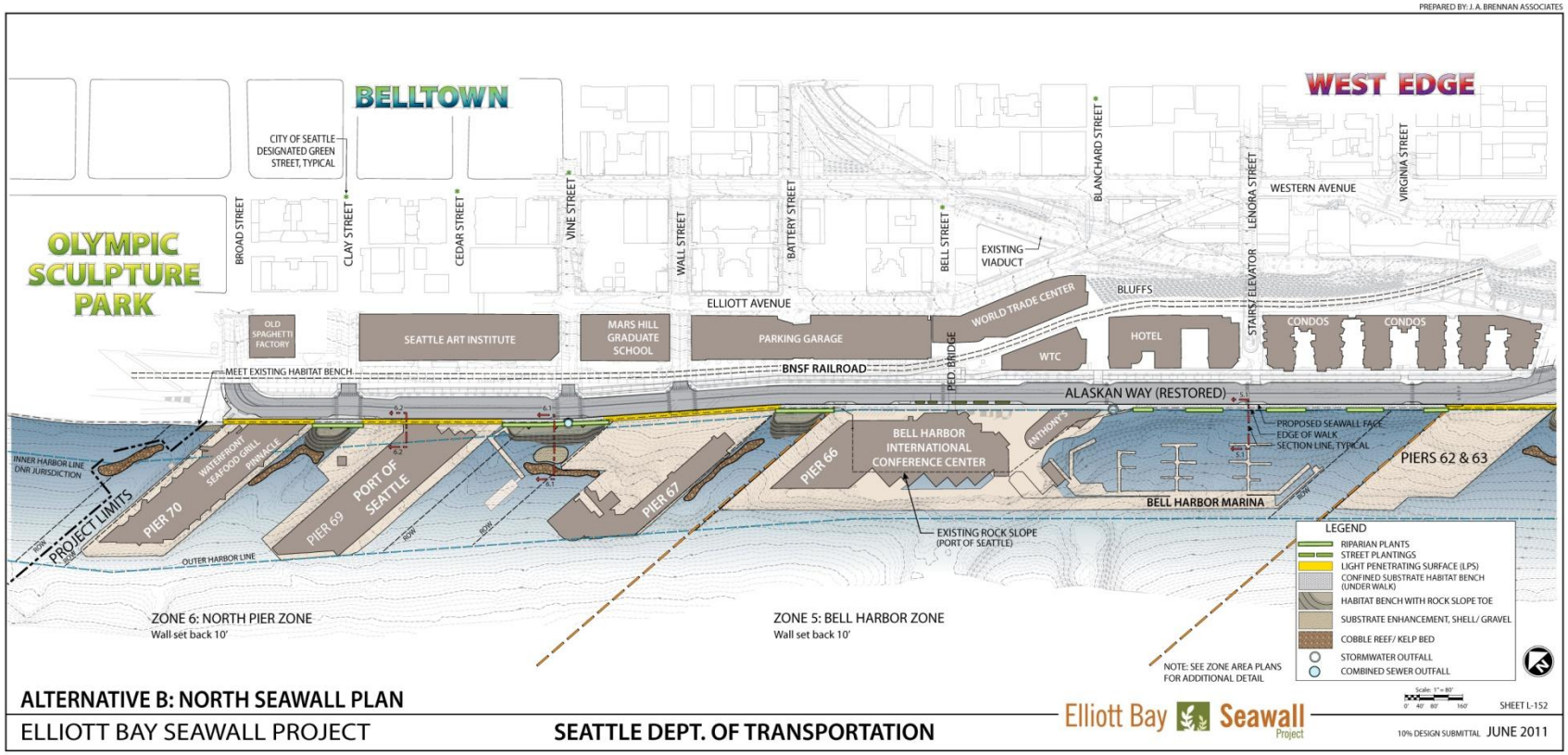

Figure 1-22. Alternative B: North Seawall Plan

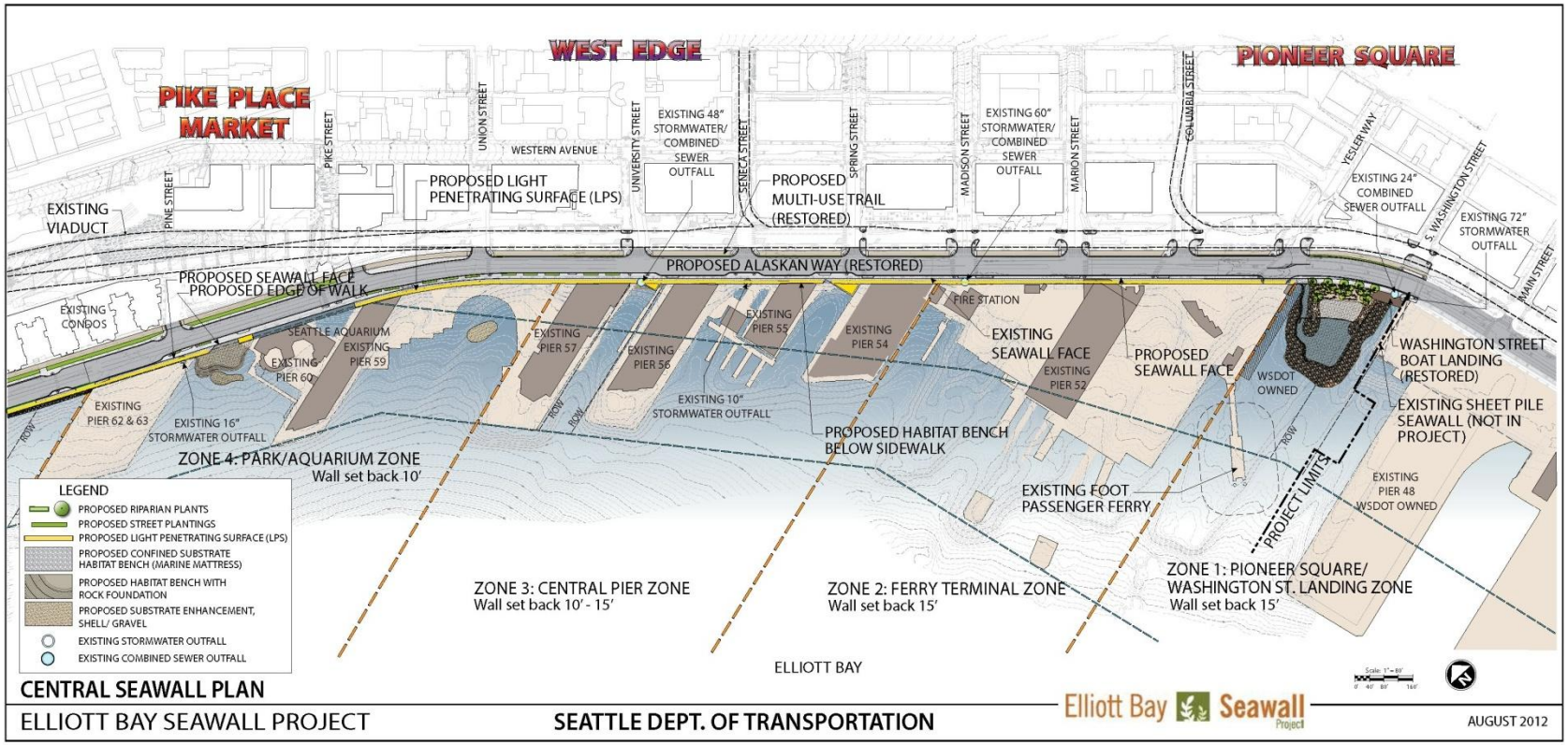

Figure 1-23. Alternative C: Central Seawall Plan

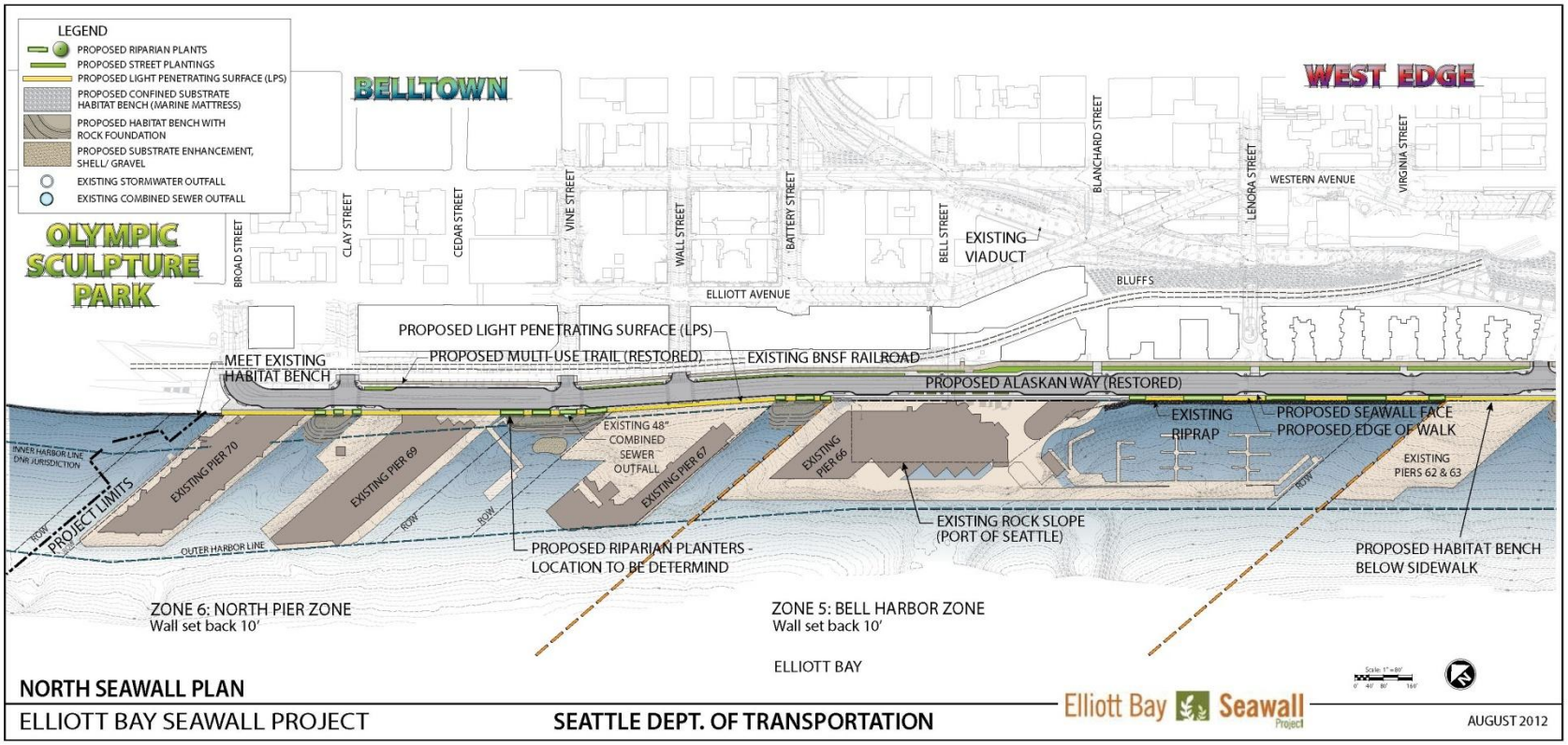

Figure 1-24. Alternative C: North Seawall Plan

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CHAPTER 2. METHODOLOGY

The *Elliott Bay Seawall Project Public Services and Utilities Methodology Technical Memorandum* (SDOT 2011) contains a detailed description of the methodology used for this Discipline Report. The following sections summarize the methodology used to describe existing conditions, assess direct project effects on public services and utilities, and assess secondary (indirect) effects of other projects on those resources.

2.1 ANALYSIS OF EXISTING CONDITIONS

The analyses of existing conditions and environmental effects are based on an update of material initially prepared for the *Existing Conditions Report, Alaskan Way Seawall Replacement Project Feasibility Study* (USACE 2008).

Existing utilities in the study area have been identified based on mapping and data collected by the EBSP design and engineering teams. Existing utilities include electrical (transmission and distribution), natural gas, sanitary sewer, steam, stormwater (combined and separated), telecommunications and water.

In addition, a number of public services have been identified that are either located within the project corridor or that serve the businesses and residents adjacent to the project corridor. These services include emergency management (including disaster preparedness), fire and emergency response services, hospitals, law enforcement, post offices, schools, public transportation and solid-waste collection/recycling. For more information regarding existing public transportation and project effects on transit and traffic, see the Transportation Discipline Report (SDOT 2012a).

2.2 ANALYSIS OF ENVIRONMENTAL EFFECTS

The Public Services and Utilities Discipline Report authors have reviewed conceptual design plans for the various alternatives, including existing utility locations and potential locations for relocated utilities. The Transportation Discipline Report (SDOT 2012a) has also been reviewed for information concerning temporary and restored roadway configurations in order to determine impacts on emergency services.

2.2.1 Construction Effects: Public Services

The transportation engineering team has developed preliminary construction traffic plans for each proposed build alternative. Level of service (LOS), lane closures, lane reductions, temporary turning-movement changes, changes to traffic signals, and changes to traffic volumes and congestion would have an effect on response times for fire, police and emergency services. These effects are identified and discussed in this discipline report. The expected increases in demand for public services due to the project have been analyzed (see Section 5.1).

2.2.2 Construction Effects: Utilities

Construction of the new seawall would have impacts on certain existing utilities located in the project right-of-way. Construction impacts have been determined by a review of the conceptual engineering drawings showing the project design and a comparison with the location of existing utilities. The

construction impacts of relocating public utilities are discussed in Section 5.2 of this report. The analysis of construction effects documents the number of utilities affected, the size of the utilities, and the linear feet that may require relocation or experience adverse effects. Adverse effects such as temporary service disruptions to nearby business and residential properties are also identified, to the extent possible. Any relocation required for electrical-transmission circuits would be accomplished prior to beginning construction of the EBSP and no long-term impacts are anticipated to the reconfigured lines.

2.2.3 Operational Effects: Public Services

The transportation engineering team conducted a traffic analysis for each alternative, including LOS calculations. The analysis looks at business and residential access along the alignment, changes in traffic movements (intersection geometrics), lane configurations and signal operations. The public services analysis (Section 6.1) identifies the potential impacts to public service providers (e.g., fire, emergency service, police, mail delivery, school bus operations). Impacts to transit and ferry services are discussed in the Transportation Discipline Report (SDOT 2012a).

2.2.4 Operational Effects: Utilities

The potential effects on the location and functionality of existing utilities have been identified for each build alternative. Utilities that need to be relocated and those that may require in-place mitigation have been and/or would be identified prior to construction. The design standards of each respective utility have been followed with all potential relocations. Impacts to existing utilities—including emergency and routine maintenance access—are discussed in Section 6.2. The types of potential operational effects analyzed include permanently/temporarily restricted maintenance access to utilities and the need to construct new facilities due to increased demand or inaccessible routing.

2.2.5 Determining Mitigation Measures

Mitigation measures will be developed to avoid, minimize and mitigate adverse effects on identified public services and utilities, to the extent practicable. The mitigation measures will be selected based in part on experience with similar projects and the results of the preliminary engineering and impact analyses. Mitigation will be based on NEPA and SEPA principles, USACE guidance and City policies. Best Management Practices (BMPs) will be included in the mitigation measures, and refined as the design process continues.

CHAPTER 3. COORDINATION AND INFORMATION SOURCES

3.1 DATA NEEDS AND SOURCES

Records and other documents from public service and utility providers have been consulted during the preparation of this Public Services and Utilities Discipline Report. Public sector providers include:

- King County Solid Waste Management,
- King County Metro Transit,
- King County Wastewater Treatment Division,
- Port of Seattle Marine Division,
- Port of Seattle Police,
- Seattle City Light,
- Seattle Department of Information Technology,
- Seattle Department of Transportation,
- Seattle Emergency Management,
- Seattle Fire Department,
- Seattle Police Department,
- Seattle Public Schools,
- Seattle Public Utilities,
- United States Postal Service,
- Washington State Department of Transportation, and
- Washington State Ferries.

Private sector providers include:

- American Medical Response
- CleanScapes (under contract to Seattle Public Utilities, north of Yesler Way),
- Puget Sound Energy,
- Seattle Steam, and
- Waste Management (under contract to Seattle Public Utilities, south of Yesler Way).

Private sector communications providers currently include:

- 360 Networks,
- Allstream,
- Broadstripe,
- CenturyLink (formerly Qwest),
- Comcast,

- Electric Lightwave,
- Global Crossing,
- Integra Telecom,
- Sprint/Nextel,
- Verizon Business, and
- Yipes Communications.

3.2 COORDINATION

In addition to reviewing the original source materials from the providers listed above, the report authors coordinated with the design and engineering teams, as well as other discipline report authors to ensure a consistent approach to environmental analysis and proposed mitigation. The report authors have considered the following agencies and service providers in identifying and address utility concerns:

- Allied Waste Systems,
- Bonneville Power Administration,
- King County Metro,
- King County Solid Waste Management,
- King County Wastewater Treatment Division,
- Port of Seattle,
- Puget Sound Energy (natural gas),
- Seattle City Light,
- Seattle Department of Information Technology,
- Seattle Department of Transportation Street-Use and Utilities Franchises,
- Seattle Emergency Management,
- Seattle Fire Department,
- Seattle Police Department,
- Seattle Public Schools,
- Seattle Public Utilities,
- Seattle Steam,
- United States Postal Service,
- Washington State Department of Transportation, and
- Washington State Ferries.

CHAPTER 4. AFFECTED ENVIRONMENT

This section provides information on public services and utilities in the study area. Public services and facilities include fire suppression, emergency medical response, law enforcement, disaster preparedness, solid waste collection, public schools and United States mail service. The primary public service providers in the study area include the Seattle Police Department (SPD), Seattle Fire Department (SFD), Seattle Public Utilities (SPU) Solid Waste Division, Seattle Office of Emergency Management (SEM), WSDOT, Washington State Ferries (WSF), King County Metro (Metro) Transit, and the Port of Seattle.

The study area for the evaluation of public services and utilities impacts generally extends eastward from the Elliott Bay Seawall to First Avenue and northward from S. Washington Street to Broad Street. Certain services—including fire and emergency services—have a larger impact area that encompasses the greater downtown Seattle/Belltown/ SODO area.

A number of utilities within the study area (including municipal agencies and private companies) provide electricity, water, wastewater and stormwater collection, natural gas, steam, oil/petroleum and telecommunications services. The primary public utility providers in the study area include SPU for water, sanitary sewer and stormwater systems, and SCL for electrical power. Private utilities include Puget Sound Energy (PSE), Seattle Steam, Waste Management, CleanScapes, Century Link (formerly Qwest), Comcast and other private communications companies.

4.1 PUBLIC SERVICES

Public services and facilities include fire suppression and emergency medical services, law enforcement services, disaster preparedness, and solid waste disposal and recycling.

4.1.1 Fire Suppression and Emergency Medical Services

4.1.1.1 Fire Suppression

SFD provides fire suppression and emergency medical services to a metropolitan urban population of over 560,000 people within a land area of approximately 83.9 square miles and approximately 193 miles of waterfront (FHWA et al. 2004). In 2010, SFD employed roughly 1,100 uniformed (1,020) and non-uniformed personnel (87) at 33 fire stations and other facilities located throughout the City. The SFD's equipment includes 33 fire engines, 12 ladder trucks, four aid units (basic life support), seven medic units (advanced life support), one air truck, four fireboats and two hose wagons (SFD 2011). Miscellaneous special equipment includes a mobile command unit, marine response unit, hazardous materials unit, mass casualty incident response unit (MCI Van), mobile generator, decontamination trailer, two mobile air compressors and a technical rescue unit (high angle, confined space, trench and dive rescue) (SFD 2011).

At least six SFD stations are available for first response to fire and medical emergencies within the study area. The City fire alarm center is located at the corner of Fourth Avenue and Washington Street. Emergency fire and medical units are generally dispatched from the station closest to the call site, although units can be dispatched from other stations as well. The SFD's average response times in 2008

(from the time units were dispatched following a 911 call to their arrival at the site) are as follows: 4.32 minutes for fire and hazardous materials responses; 3.75 minutes for basic life support responses (fire and aid cars); and 3.76 minutes for advanced life support (Medic One) (SFD 2010). The only SFD station located within the EBSP study area is Fire Station No. 5, located adjacent to Colman Dock at 925 Alaskan Way. The station houses an engine company, a medical unit and, two fireboats. All fireboats, including a third boat moored in Ballard, are staffed from Fire Station No. 5.

4.1.1.2 Emergency Medical Services

In addition to the emergency medical units provided by SFD, several hospitals are located outside of the study area but provide emergency medical services to those located in the study area transported by SFD and other private ambulance service providers. Harborview Medical Center (located at 325 9th Avenue) is one of the nation's leading academic medical centers and the only Level I adult and pediatric trauma and burn center serving Washington, Alaska, Montana and Idaho. Swedish Medical Center (located at 747 Broadway) and Swedish Medical Center at Providence (500 17th Avenue) is the largest, nonprofit health provider in the greater Seattle area. Group Health Cooperative (located at 201 16th Avenue E.) provides medical coverage and care to more than 674,278 residents in Washington State and North Idaho. Virginia Mason Medical Center (located at 925 Seneca Street) provides a variety of services in Seattle. The SFD response-time standard for the arrival of the first emergency medical unit with two emergency medical technicians is four minutes 90 percent of the time, and the response-time standard for the arrival of an advanced life support unit with two paramedics is eight minutes 90 percent of the time (SFD 2010).

4.1.2 Law Enforcement Services

4.1.2.1 Seattle Police Department

SPD provides law enforcement and responds to 911 emergency calls throughout Seattle. SPD has officers and civilian personnel in four main bureaus: Patrol Operations, Criminal Intelligence, Special Operations, and Field Support (SPD 2010). The SPD protects public safety in many ways, ranging from officers patrolling beats to the deployment of special teams and task forces. Task forces focus on a variety of issues, including auto theft, drug dealing and violence, and crimes against children.

SPD employs roughly 1,820 persons and is divided into five precincts, which include the South Precinct (3001 S. Myrtle Street), Southwest Precinct (2300 SW Webster Street), East Precinct (1519 12th Avenue), West Precinct (810 Virginia Avenue), and North Precinct (10049 College Way N.). Additionally, the Seattle Police Headquarters shares the Seattle Justice Center at 610 Fifth Avenue with Seattle Municipal Court. The study area is located entirely within the West Precinct.

In 2009, SPD received 818,557 calls and dispatched patrol units in response to 201,704 calls with an average response time for Priority 1 calls of 6.5 minutes. The City maintains statistics related to crime in its jurisdiction. Crimes are typically divided into Part I and Part II. In general, Part I crimes (also known as index crimes) include felony crimes such as homicide, rape, robbery, aggravated assault, burglary, theft, auto theft and arson. Part II crimes are considered less serious and include all other crimes, such as simple assault, vandalism, forgery, prostitution, weapons offenses, drug and liquor violations, disorderly

conduct, loitering and other offenses. In 2009, there were 4,795 Part I arrests and 18,188 Part II arrests, for a total of 22,983 arrests (SPD 2010).

Overall, major crimes were up in Seattle in 2009 by seven percent when compared with 2008. This increase followed a large reduction in crime in 2007 and a smaller decline in 2008 that resulted in the City's crime rate falling to a 40-year low (SPD 2010).

4.1.2.2 Port of Seattle Police

The Port of Seattle Police patrol major portions of the Seattle waterfront and Elliott Bay. The department was created in 1972 and currently consists of 108 commissioned police officers and 33 non-commissioned personnel. The Port police are the primary first responders for all reported crimes and incidents within its jurisdiction (Port of Seattle 2011). The Port police provide law enforcement response and patrol services for several commercial properties located at Port-owned piers and terminals in the study area. Port police address law-enforcement issues associated with the cruise-ship industry (on Port property such as Pier 66), including drug smuggling, theft aboard ship during transit, and travelers with outstanding arrest warrants. Special teams include the Bike Team, Boat and Dive teams, Bomb Disposal Unit, Crisis Negotiations Team, Criminal Investigations Unit, K-9 Team and Special Response Team (Port of Seattle 2011).

4.1.2.3 Burlington Northern Santa Fe Railway Police Solutions Team

Railroad police are granted police authority from state and local governments, and are given interstate authority by the federal government. BNSF police analyze statistical data to discover crime trends, use K-9 units and proactive uniformed patrol to combat trespassing and cargo thefts, and actively participate with other police agencies to investigate crimes committed on railroad property (BNSF 2011). Typical crimes involve cargo from containers being offloaded from ships, loaded onto rail cars or trucks, or in transit. Vandalism typically includes shooting at railroad signals or throwing rocks at railcars. Tagging (writing graffiti on railcars) is prevalent. Trespassing is another serious problem and one that often results in injury from people crossing BNSF tracks (BNSF 2011).

4.1.2.4 United States Coast Guard

The Coast Guard 14th District patrols the waters in the study area.

4.1.3 Disaster Preparedness

Because of the detailed nature of some of the emergency response plans for disasters, they are no longer publicly available due to homeland security issues (FHWA et al. 2004) and are discussed only generally in this section. In the event of an emergency or a major disaster, these plans are the primary controlling documents. The focus of the emergency response and maintenance plan includes establishing designated meeting areas, managing disaster equipment and materials, conducting initial property damage assessments, coordinating electric utility shutoffs, implementing an emergency response organization plan, and managing recovery and resumption of business (Port of Seattle 2011).

4.1.3.1 Seattle Emergency Management

The City has a comprehensive Disaster Readiness and Response Plan, which allows the City to coordinate resources to assist the needs of the community as quickly and efficiently as possible. However, the nature of disaster itself means that there would not be enough resources to help everyone who needs help. The SEM is an emergency-preparedness bureau of SPD devoted to citywide disaster preparedness, response, recovery and mitigation.

The SEM is a subset of SPD and partners with the community to prepare for, respond to and recover from disasters. The unit is generally staffed by nine people whose principal responsibilities involve encouraging individual and community preparedness, and providing a key liaison function between the City and its state and federal emergency-management counterparts. The primary functions of SEM include (1) maintaining the City's command center, (2) developing disaster plans, (3) educating the public, (4) protecting and repairing City infrastructure, (5) coordinating mitigation projects and managing recovery processes, (6) managing outside assistance, and (7) planning and running emergency exercises and training (SEM 2011).

Nine emergency gates have recently been placed along the AWV alignment with sensors that trigger gate closure based on seismic events (WSDOT 2011).

4.1.3.2 Ferries

WSF has an operations center located at Colman Dock. The center operates 24 hours per day, 365 days per year, with its primary role to respond in times of crisis, such as bomb threats, severe regional weather, emergency-vehicle transport coordination, and vessel/terminal accidents.

King and Kitsap Counties also provide passenger water taxi service in the area. The King County Emergency Coordination Center (ECC) Support Team was formed in 1995 to provide support services to the King County Office of Emergency Management (OEM) during disasters and emergencies. The Regional Disaster Plan is a growing document with new chapters (emergency support functions or appendices) released each year (King County 2011a).

Kitsap County Department of Emergency Management also has a Preparedness Website with a variety of information including access to the *Disaster Preparedness Handbook* (2005) (Kitsap County 2011).

4.1.3.3 Port of Seattle

The Port of Seattle maintains an emergency response plan for all of its facilities, including marine and seaport facilities within the study area. In the Central Harbor area, these facilities include Pier 69, which accommodates the Port of Seattle headquarters and the terminal for the Victoria Clipper; and Piers 64, 65 and 66, home to a cruise ship terminal, conference center, and marina, respectively.

4.1.3.4 Emergency Traffic Management and Closure Plan for the Alaskan Way Viaduct and Alaskan Way Surface Street

In a scenario where a significant event (such as an earthquake) causes damage to the AWV, the State has the responsibility for inspecting the facility to determine its structural integrity. The State and City

would then determine together if the viaduct is safe to be reopened to traffic. The City has the responsibility to determine if city streets under the viaduct should be closed or open to traffic.

Based on foregoing understandings, each agency has clear responsibilities following an emergency. In the event that the integrity of the viaduct is in question, close coordination, communications and cooperation would be required for a successful emergency-response and contingency-plan implementation.

4.1.4 Solid Waste Collection, Disposal and Recycling

The City contracts with CleanScapes, Inc. and Waste Management of Washington, Inc. (Waste Management) for garbage, recycling, food and yard-waste collection services. The collection contracts cover all residential and commercial customers by area: Waste Management covers Northwest and South Seattle and CleanScapes covers Northeast and Central Seattle. Commercial garbage generated in the city, as well as construction, demolition and land-clearing waste are delivered to two private transfer stations: Waste Management's Eastmont Station (located in the South Park area near the City's South Recycling and Disposal Station) and the Rabanco-owned station (at Third Avenue S. and S. Lander Street). Contaminated soils are handled by Rabanco and Waste Management. Waste Management sends its soils to a separate facility, the Alaska Street Recycling Station. Municipal solid waste and construction-demolition waste are transferred by truck and rail from the transfer stations to the Argo Intermodal Facility in south Seattle, where the waste is then transported by rail to landfills.

Seattle's curbside recycling program for units ranging from single-family residences to fourplexes began in February 1988. Two private material-recovery facilities serve as the processing and transfer facilities for most of the recyclable materials collected from city residents. Since 2000, Seattle has contracted with two firms to provide all collection services, including single family and multi-family dwellings: Waste Management, Inc. provides collection of garbage, recyclable materials and yard waste to the north half of the city, and U.S. Disposal (a subsidiary of Allied Waste) provides collection services to the south half of the city. Each household receives all collection services on the same day of the week (SPU 2011a).

4.1.5 Public Schools

There are no public schools in the immediate project area, nor do public school buses normally use Alaskan Way in their daily transport of students to and from school. Public school buses do periodically serve waterfront locations, especially the Seattle Aquarium, as part of field trips.

4.1.6 Postal Services

Two United States post offices operated by the United States Postal Service (USPS) are located near the project area. The Pioneer Square facility is at 91 South Jackson Street, while the federal facility is at 909 First Avenue. USPS has regular mail deliveries along Alaskan Way.

4.2 UTILITIES

A number of public and private utilities in the study area provide electricity, water, wastewater management, stormwater collection, natural gas, steam, and communications and telecommunications services. Major providers in the study area are described below. Records indicate that there are no petroleum pipelines currently in operation within the study area. The black oil line previously used to deliver oil to the Seattle Steam plant can be abandoned, removed, or demolished if necessary (WSDOT 2007).

Typically, water lines and high-pressure gas mains are located three to six feet underground. Main-line sewer pipes are typically located at least six feet below ground level, but depth of cover may vary depending on site constraints. Sewer lateral pipes are typically installed with less cover than main-line sewers. Smaller pipes such as fiber-optic cables, telephone lines and other utilities are often less than three feet below ground level. Water-, sewer- and storm-drain pipelines typically run parallel beneath streets, placed in locations ranging from the center of the roadway to the periphery. Fiber-optic cables, telephone lines, underground electrical conduits and smaller pipes are often located beneath sidewalks (USACE 2008).

4.2.1 Electrical Power

Information on electrical power in the study area was obtained from the Draft EIS and Supplemental Draft EIS for WSDOT's Alaskan Way Viaduct and Seawall Replacement Project (AWVSRP) (FHWA et al. 2004, 2006). SCL, which supplies electric power to customers in Seattle and some portions of King County north and south of the city limits, provides electrical power to the study area. SCL owns and maintains 3,100 circuit miles of distribution lines within Seattle that deliver power from the principal distribution stations to over 350,000 customers.

Electrical power is disbursed from substations via primary voltage feeder lines to numerous smaller distribution substations and overhead and underground transformers, which reduce voltage to required levels for customers. The utility currently has capacity to generate an annual average output of approximately 1,900 megawatts (MW) of hydroelectric generation. In the study area, the SCL system uses a combination of overhead and underground electrical transmission and distribution lines. SCL has a combination of transmission and distribution lines running under Alaskan Way.

Substations near the study area include the Massachusetts Substation at Colorado Avenue and Massachusetts Street, and the Broad Substation at Sixth Avenue and Broad Street. The only substation within the study area is the Union Substation at Western Avenue and Union Street.

Four 115-kV transmission circuits emanate from the Massachusetts Substation, running north through the study area. All four transmission lines have the ability to terminate at the Union Substation. Under normal operating conditions, three of the circuits terminate at the Union Substation. The fourth circuit acts as a regional line between Massachusetts Substation and the Broad Substation north of the study area (FHWA et al. 2006). Overhead and underground distribution lines are also located along many streets in the study area. Although the system is designed and operated to minimize the likelihood of a problem in one area cascading into other areas, the system must still be approached as an integrated

whole; impacts on one area could lead to impacts on other areas. SCL has increased its system security and provision for continued reliability to minimize potential impacts of both criminal acts and natural disaster. For more information on security measures taken by SCL, refer to the Seattle All-Hazard Mitigation Plan (SEM 2009).

Network distribution feeders from Union and Massachusetts Substations are 13.8-kV underground network feeders. SCL design principles help ensure nearly 100 percent continuous service in most operating circumstances. The waterfront is presently fed with distribution feeders from Union Substation (FHWA et al. 2006).

4.2.2 Water Supply

SPU supplies water to 1.3 million people and businesses in the region. Nearly all this water is from the 90,000-acre Cedar River Watershed and the 13,300-acre South Fork Tolt River Watershed in eastern King County (SPU 2011b).

The water mains within the study area generally run parallel with the seawall and provide service to commercial and residential property on both sides of Alaskan Way, as well as provide water for fire response throughout the project corridor. The main includes sections of 12-, 20- and 21-inch pipe, running along the west side of Alaskan Way between Washington Street and Columbia Street, and on the east side of Alaskan Way between Columbia Street and Bay Street. The water main connects to downtown Seattle's looped water supply system at Broad Street, Madison Street, Yesler Way, and S. Washington Street. The Elliott Bay Seawall is located in Pressure Zone 326.

The water-distribution mains within the project corridor were built at different times over the last 100 years. Consequently, the water mains and appurtenances were built using a variety of construction techniques, materials and standards. For example, pipe materials used for the existing water mains include cast iron, ductile iron and steel. Newer water mains are ductile iron pipe with restrained joints and/or thrust blocking. Water mains constructed prior to the mid-1950s were typically installed using cast iron pipe with lead joints. Lead joints are very sensitive to construction vibration and settlement (FHWA et al. 2006).

4.2.3 Stormwater Drainage

The existing stormwater drainage system is discussed in detail in the Water Resources Discipline Report (SDOT 2012b). The system collects stormwater and discharges to either the combined sewer or Elliott Bay. Stormwater tributaries to Elliott Bay are released through several outfalls along the project corridor without water-quality treatment. These outfalls are either separated stormwater outfalls or shared outfalls with the combined sewer system. The shared outfalls receive stormwater downstream of the combined-sewer diversion structure. The University Street and Madison Street outfalls are shared.

The Washington, Madison and University Street basins contain separated drainage systems that convey stormwater from outside the project area through the project area to Elliott Bay. The Seneca Street and Pine Street basins also contain areas outside the project corridor; however, they are almost completely contained within the project corridor, relative to the other basins.

There are several small basins consisting of one or two catch-basins that drain through individual outfalls directly to Elliott Bay. These small basins are primarily located in the North Seawall Study Area, although there are a few located within the Central Seawall Study Area (GHD 2006).

4.2.4 Sanitary and Combined Sewer Flows

The storm, sanitary and combined sewer system within the study area varies by function and jurisdiction (i.e., King County and the City) and is discussed in detail in the Water Resources Discipline Report (SDOT 2012b). The project area is served by combined sewer and separated storm-drainage systems with a variety of standard and nonstandard-sized pipes, regulator structures, low-flow diversions, weirs, outfalls and combined sewer overflow (CSO) points. While it does not own facilities within the project-area limits, the King County Department of Natural Resources Wastewater Treatment Division (formerly Metro) provides wastewater treatment services for the study area. Seattle's sewer system is linked with that of King County. Virtually all of Seattle's wastewater and stormwater is conveyed via the county's large transmission pipelines to treatment facilities owned and operated by the county. Seattle ratepayers are also King County ratepayers. About 40 percent of each property owner's drainage and wastewater utility bill is designated for King County's sewage-treatment costs (SPU 2011c).

Wastewater in the study area is conveyed to the West Point Wastewater Treatment Plant (WWTP) (King County 2011b). SPU owns, inspects, repairs, operates, and maintains wastewater (sewer) and storm-drain pipes in the study area to protect public health and avoid property and environmental damage from sanitary sewer backups, surface water flooding and combined sewer system overflows and backups.

The King County Wastewater Treatment Division owns and maintains the regional wastewater conveyance system (e.g., the Elliott Bay Interceptor [EBI]), which conveys wastewater to the West Point Treatment Plant. Individual side-sewer lines are owned privately according to the property they serve (King County 2011b).

The King County Wastewater Treatment Division provides wholesale wastewater conveyance and treatment for flows from the City and 33 other cities and sewer districts. The City's wastewater-collection system contains combined sewers that collect both waste and stormwater. The City's collection system conveys flows to King County trunks and interceptors, which then convey flows to the West Point Treatment Plant located in Discovery Park. When medium to large storms occur, flows may exceed the capacity of the collection system pipes, resulting in CSOs into water bodies such as Elliott Bay. No work to identify impact zones below the outfalls has been performed in the project area.

CSOs are a recognized source of water pollution that can result in temporary increases in bacterial counts, odors, aesthetic degradation of shorelines, long-term adverse effects on sediment quality, and increased public health concerns in areas where there is potential for public contact. Since the 1970s, King County and SPU have been implementing CSO control projects to reduce overflow frequencies and improve water quality in the Seattle-King County area (King County 2010). For more discussion regarding contaminated materials, refer to the Contaminated Materials Discipline Report (SDOT 2012c).

Within the study area, sanitary and combined sewer flows are collected from businesses and services in parallel systems from both sides of Alaskan Way. There is a large-diameter combined sewer pipe within the Alaskan Way right-of-way that intercepts combined sewer flows from the upper downtown basins connected to it. Flows are directed to the Elliott Bay Interceptor (EBI) located beneath Second Avenue, which is part of King County's regional wastewater system, at the connection points described below. Combined sewer flows conveyed through the EBI are predominantly generated outside of the project area.

4.2.4.1 North – Flows to Denny Way

Wastewater collected from the area between Lenora Street and Bay Street (which encompasses the north boundary of the study area at Broad Street) flows to the Vine Street Diversion Structure, which is owned and maintained by the City. This diversion structure provides control of combined sewer flows for areas of Belltown and along Alaskan Way between Virginia and Bay Streets. Normal flows through the Vine Street Diversion Structure are directed north via a 24-inch SPU sewer line and the EBI to the WWTP for treatment. Combined sewer overflows from the Vine Street Diversion Structure are released through a 24-inch CSO outfall to Elliott Bay.

4.2.4.2 Central – Flows to Pike Street Adit

Wastewater flows from the project area between Columbia Street and Lenora Street are collected in interceptor pipes that route flows to the Pike Street Adit (an entrance to an underground mine), which is part of the regional wastewater system owned and operated by King County. The Pike Street Adit drains to the EBI and King County's regional system. Within this area, there are two diversion structures, which direct normal flows to the combined sewer interceptors and release untreated flows to nearby outfalls during CSO events (see the Water Resources Discipline Report for more information [SDOT 2012b]).

4.2.4.2.1 University Street to Lenora Street

Wastewater collected in the area from approximately University to Lenora Street flows to the Alaskan Way Interceptor, which is owned and operated by the City. The Alaskan Way Interceptor directs flows south to the University Diversion Structure, and then north to connect to the Pike Street Adit. The Pike Street Adit connects to the EBI in Second Avenue.

In high-flow events, the University Diversion Structure releases CSOs to Elliott Bay through the University Street outfall. The University Street outfall is a shared outfall, conveying CSOs and flows from the separated storm-drain system that connects to the outfall downstream of the diversion structure. The outfall penetrates the seawall as a 48-inch concrete pipe and discharges to Elliott Bay through a 24-inch drop structure on the outside of the seawall.

4.2.4.2.2 Madison Street to University Street

Wastewater collected from areas between approximately Madison Street and University Street drains to an interceptor pipe flowing north in Alaskan Way, where it joins flows from the larger contributing basin uphill from the waterfront. The wastewater is routed through the University Diversion Structure before connecting to the EBI at Pike Street via the Alaskan Way Interceptor and the Pike Street Adit. Combined

sewer overflows from the University Street Diversion Structure are released through the University Street shared outfall to Elliott Bay.

4.2.4.2.3 Columbia Street to Madison Street

Wastewater collected between approximately Madison Street and Columbia Street drains to an interceptor pipe at Alaskan Way, which flows north, toward the Madison Diversion Structure at the intersection of Madison Street and Alaskan Way. The Madison Diversion Structure is owned and operated by the City. The Madison Diversion Structure directs normal flows north, via the Alaskan Way Interceptor, past the University Diversion Structure, and further north to the Pike Street Adit and the EBI. Combined sewer overflows from the Madison Street Diversion Structure are released to Elliott Bay through a 60-inch shared outfall.

4.2.4.3 *South – Flows to King Street*

Wastewater collected from the project area between Columbia Street and S. Washington Street is routed south, to interceptor pipes in Alaskan Way. Wastewater from the west side of Alaskan Way flows directly to the King Street Regulator (owned and operated by King County), where normal flows are directed to the EBI at King Street, and high flows are discharged to Elliott Bay via the 48-inch CSO outfall.

Wastewater from areas east of Alaskan Way flow through a diversion structure at South Washington Street (owned and operated by the City) and normal flows are routed south to the sewer in King Street. Combined sewer overflows from the Washington Diversion Structure are discharged to Elliott Bay through the 24-inch CSO outfall at Washington Street.

4.2.5 Outfalls and Drainage System

In the study area, stormwater is conveyed offsite in one of three ways: (1) routed to the West Point WWTP, (2) discharged as a part of a CSO event, or (3) discharged directly to Elliott Bay through separated or shared outfalls. The following information is based on *the CSO and Stormwater Outfall Basis of Design*, prepared by Cosmopolitan Engineering Group (2007).

4.2.5.1 Outfalls

The City and King County have eight CSO outfalls that discharge to marine waters in or near the project area during overflow events. The City-owned CSO outfalls are located at the ends of Vine Street, University Street, Madison Street, S. Washington Street and S. King Street. Although the City owns the S. King Street CSO outfall, flows are owned by King County and the outfall is permitted by the King County NPDES Permit. The outfalls at University Street and Madison Street also discharge stormwater runoff from separated systems that connect downstream of the diversion structures. In this configuration, separated flows do not enter the combined sewer system; rather, the outfalls are shared between the combined and separated systems. Nearby County-owned CSO outfalls include Lander, Connecticut (S. Royal Brougham Way) and Denny Way. At the Connecticut Street CSO outfall, storm flows are owned by the City and combined sewer flows are owned by King County.

The City owns and operates three separated storm-drain system outfalls in the project study area. These storm-drain outfalls are located at the ends of Pine Street, Seneca Street and S. Washington Street.

There are two additional stormwater outfalls within the study area. One is at Bell Harbor near Pier 66. The ownership and source of flows at this outfall are uncertain and will be investigated further. The other is the Seattle Steam outfall near University Street, which discharges stormwater and water-softening regenerate under Pier 57. This outfall is permitted under an NPDES permit issued directly to Seattle Steam Company (Cosmopolitan Engineering Group 2007).

Throughout much of the project corridor, runoff from the western portion of Alaskan Way is collected in gutter flow and discharged through individual catch basins that drain directly to Elliott Bay. There are approximately 50 of these individual catch basin discharges throughout the project corridor

Within the study area, most of the area west of Alaskan Way (adjacent to the seawall) discharges directly to Elliott Bay as part of a separated system. In a large portion of this area, surface runoff from sidewalks and roadway flows to individual catch basins that drain directly through existing penetrations in the seawall and discharge into Elliott Bay. These individual outfalls are typically four-inch or six-inch diameter pipes that terminate at the seawall.

There are piped stormwater collection systems on the west side of Alaskan Way, near Pine Street, University Street, and between Madison and Washington Streets. These collection systems connect to storm outfalls at Pine Street and Washington Street and the shared outfalls at Madison Street and University Street. The shared outfall at University Street that connects the existing stormwater-conveyance system to the existing outfall operates in an interim condition: i.e., it is always submerged. To provide free drainage, the outfall would require a lower invert when replaced through the seawall.

4.2.5.2 Drainage System – East Side of Alaskan Way

A system of catch basins and pipes collects runoff from the eastern side of Alaskan Way and directs runoff to one of the many drainage systems (either the separated storm drain or combined sewer systems) located in the study area.

Between Broad Street and Lenora Street, drainage from the east side of Alaskan Way primarily flows to individual Elliott Bay outfalls via separated storm-drain systems or sheet flow. In the areas between approximately Vine and Wall Streets and Bell and Blanchard Streets, a combined sewer system collects surface runoff and directs it to the Vine Street Diversion Structure, which passively diverts low flows to the EBI and directs high flows to the Vine Street CSO outfall via an overflow weir. Stormwater runoff from the area underneath the AWV at Pike Street flows directly to the EBI via the Pike Street Adit.

From south of Pike Place Market to north of Union Street, a storm-drainage system conveys surface runoff from the vicinity of the AWV to the existing combined sewer pipe flowing south to the diversion structure at University Street. The University Diversion Structure directs low flows to the EBI (via the Pike Street Adit) and overflows to the University Street CSO outfall. The storm drain between Union Street and University Street discharges to the outfall downstream of the diversion structure.

In the vicinity of Seneca Street (just north of Seneca Street to just north of Spring Street), stormwater runoff from the area of the existing viaduct is directed to a separate storm-drain system which drains to the outfall at Seneca Street.

Between approximately Spring Street and Columbia Street, separated storm drain systems collect runoff from the vicinity of the AWV and direct it to the shared outfall downstream of the Madison diversion structure.

Between approximately Columbia and S. Washington Streets, stormwater runoff from the vicinity of the AWV is directed to the separate storm drain system outfall at S. Washington Street.

4.2.6 Natural Gas

PSE provides natural gas service along Alaskan Way. PSE's network consists of transmission and distribution pipes, pressure controls, meters and service lines. Natural gas mains, along with distribution and service lines, are located within the study area.

A 12-inch, high-pressure gas line is located between Blanchard and S. Washington Streets within the Alaskan Way right-of-way. This 12-inch, high-pressure gas line is part of PSE's gas transmission system that provides natural gas to the Seattle Steam Plant and other businesses along Alaskan Way.

The majority of local service connections between Blanchard and Union Streets are supplied by a two-inch intermediate pressure gas line. This two-inch gas line runs from a connection to the 12-inch main at Pike Street to a dead end north of Virginia Street. A two-inch gas line supplies the majority of local service connections between Union and Madison Streets. This line runs from a connection to the 12-inch main at Madison Street to a dead end north of University Street on the west side of Alaskan Way. A three-inch gas line provides the majority of local service connections between Madison and S. Washington Streets. A three-inch gas line extends from Madison Street and dead-ends just south of Columbia Street (USACE 2008).

4.2.7 Steam

The Seattle Steam Company provides steam service in the study area. The privately held Seattle Steam main plant is located on Western Avenue just west of Pike Place Market. The plant pumps steam through four main boilers with operating pressures of 140 pounds per square inch that service an 18-mile system of underground pipes dating back to the late 1880s. Originally called the Seattle Steam Heat and Power Co. when it opened in 1893, today Seattle Steam operates in Seattle via a franchise agreement with the City. Seattle Steam serves almost 200 customers, including businesses located on piers within the study area. Seattle Steam's service area extends from Blanchard Street to King Street and from the waterfront up over First Hill. Seattle Steam Company operates 24 hours a day, seven days a week, using natural gas or recovered urban wood (old pallets and used packing material) as fuel to make nearly 500,000 pounds of steam per hour (average during the winter peak season). In the summer, the steam company produces about 100,000 pounds of steam per hour. The three biggest users are Swedish, Harborview, and Virginia Mason medical centers, which use steam to heat their

buildings and to sterilize instruments. Hotels are the next biggest customers, using steam for heat and to generate hot water for showers and laundry (USACE 2008).

There is a six-inch steam line that extends along the seaward side of the Elliott Bay Seawall from Union Street to Bell Street and provides service to the Seattle Aquarium and the Bell Street harbor area. Between Union and University Streets is a line that connects the steam plant with a blow-off at the seawall. In the same location are two- and six-inch service lines that extend beyond the seawall and continue north. At S. Washington Street, there is a four-inch steam service line that extends from Western Avenue to the seawall, and at Marion Street is a four-inch steam service extends from a line in Western Avenue to the service on the west side of the seawall (USACE 2008). Seattle Steam also owns and operates an outfall under Pier 57, which discharges softening regenerate and stormwater to Elliott Bay (Cosmopolitan Engineering Group 2007).

4.2.8 Telecommunications

Information on the telecommunications systems within the study area is based on the *Existing Conditions Report, Alaskan Way Seawall Replacement Project Feasibility Study* (USACE 2008). According to as-built drawings, maps and recent utility survey information, the types of fiber-optic and communication lines within the Alaskan Way right-of-way include telephone lines, internet communications, copper lines, cable TV and other services. Some of these communication lines are listed in survey files as deactivated, empty or abandoned. Anecdotal information indicates that the City has a fiber-optic network and there may be a conduit for military communications within the study area. The telecommunications industry frequently experiences changes in ownership of various assets. Providers will be verified as design continues.

CenturyLink (formerly Qwest) provides local telephone service to users in the study area and throughout Seattle. Telephone lines in urban areas are typically located within street right-of-ways, above ground on utility poles in most areas and underground in others (including part of downtown Seattle). Century Link also has fiber-optic lines in the study area. It has underground feeders located along Broad, Wall, Pike, Spring, Marion and S. Washington Streets (FHWA et al. 2004) and provides service to the Port of Seattle.

Established in 1976, the Office of Cable Communications (OCC) has overall responsibility for issues related to cable television and cable Internet service for Seattle residents. The OCC oversees the City's non-exclusive cable television franchises with Comcast and Broadstripe (formerly known as Millennium Digital Media) through enforcement of the franchise agreements, with an emphasis on citizen concerns (City of Seattle DoIT 2011a).

Several private companies and public utilities also own fiber-optic cable and/or provide long-distance and other telecommunication services in downtown Seattle and in the study area. These providers include but are not limited to 360 Networks, AT&T Broadband, City of Seattle Fiber Optics, Comcast (formerly TCI/AT&T), CNI Locates, Electric Lightwave, Inc., Global Crossing, Time Warner (formerly GST), Level 3, Looking Glass Network, Metromedia Fiber Network Services, MCI WorldCom (formerly MFS),Sprint; Millennium Digital Media (formerly Summit), Terrabeam, US Crossings, Nextira One

(formerly Williams and Staples), Williams Communications, XO Communications and Yipes Communications (FHWA et al. 2004).

The City's Department of Information Technology (DoIT) builds and operates the City's corporate communications and computing assets. DoIT Technology Infrastructure consists of a number of programs under the Communications Technologies group and Computing Services group. Some of these programs serve City government as a whole, while others serve only specific departments (City of Seattle DoIT 2011b).

The basic fiber-optic system typically consists of manholes, conduits and switching stations. Switching stations are usually located inside buildings, while conduits are buried. Fiber-optic companies sometimes find it necessary to lease copper wire space from the telephone company to access the switching station locations within the buildings (FHWA et al. 2004).

CHAPTER 5. CONSTRUCTION EFFECTS AND MITIGATION

5.1 PUBLIC SERVICES

During construction, public services would be affected by increased traffic congestion and delays on the primary roads affected by construction and on roads around the construction area. This traffic congestion would have a direct effect on emergency vehicle access to and through the construction area. Response times for police, fire and emergency medical aid to locations within and near the construction area would likely increase. Increased travel time could be experienced by other public services, such as solid waste and recycling collection and disposal services, postal services, and school buses.

Construction effects are specifically related to areas where earthwork is anticipated, including the removal of spoils, or where the physical placement of project-related temporary roadways adjacent to public services or travel routes of public services would occur. This activity could result in potential disruptions to access, response times and mobility in the corridor. Generally, the project-related effects on public services fall into two main categories. The first category is increased travel time for emergency vehicles due to lane or road closures, access restrictions through the construction area, impedance of emergency egress from structures, or increases in traffic in other locations. Increased travel time for emergency vehicles can be a serious problem during life-safety emergencies and for disaster preparedness. In addition, construction of the seawall, construction staging areas, and the modified roadway for construction would all have effects on public services. The second category is increased demand for public services, such as police or emergency medical services, caused by the construction activities; however, this increase for demand due to project construction should be a minor effect.

5.1.1 No Action Alternative

No construction is proposed for the No Action Alternative, thus there are no anticipated effects. Refer to Section 6.1 for a discussion of operational effects and continued maintenance likely to occur for the No Action Alternative.

5.1.2 Build Alternatives

5.1.2.1 Fire Suppression and Emergency Medical Services

Construction of the seawall, habitat improvements and restored roadway would occur in stages over a number of years. The current project schedule assumes that no work would occur during the peak summer months (Memorial Day weekend through Labor Day weekend). The project's construction traffic analysis identified four traffic analysis stages. The Transportation Discipline Report (SDOT 2012a) provides a detailed description of the construction stages and an analysis of impacts on travel times for emergency vehicles. A brief summary of these four stages is presented below.

5.1.2.1.1 Traffic Analysis Stage I

During this period, seawall construction would be underway between Virginia and Madison Streets. During Traffic Analysis Stage I, the construction detour/temporary road would be in place, utilizing the space underneath the AWV for one northbound lane, one southbound lane and one emergency/turn lane. The existing Alaskan Way roadway configuration would remain in place north of the construction zone at Virginia Street.

Table 5-1 shows that travel times would decrease for emergency vehicles heading north during this traffic analysis stage of construction. This is because these vehicles could use the emergency access lane for several blocks and could bypass congestion. Heading south, travel times would increase by about 13 seconds when traveling between Fire Station No. 5 and S. King Street. This is because vehicles turning left from the temporary road to S. King Street could impede emergency vehicles. While this increase in the southbound travel time for emergency vehicles is considered an impact, this impact could be mitigated by installing emergency vehicle pre-emption at the S. King Street signal. If this preemption were in place and the necessary traffic controls for the proposed SS 99 Bored Tunnel Design Build Project are in place, then southbound travel times for emergency vehicles could be lower than under existing conditions.

TABLE 5-1. ALTERNATIVES A, B, AND C TRAFFIC ANALYSIS STAGE I TRAVEL TIME FOR EMERGENCY VEHICLES (MINUTES)

Route	Existing (2010) PM Travel Time	Alternatives A ,B and C, Stage I PM Travel Time
Fire Station No. 5 to Broad Street	3:58	3:28
Fire Station No. 5 to S. King Street	0:58	1:11

Source: *Elliott Bay Seawall Project Transportation Discipline Report* (SDOT 2012a)

5.1.2.1.2 Traffic Analysis Stage II

Construction in Traffic Analysis Stage II occurs between Madison and S. Washington Streets. During Stage II, construction would be occurring from Madison to S. Washington Streets, directly in front of Fire Station No. 5.

Table 5-2 summarizes the results of this traffic analysis during the PM peak hour for Alternatives A and C (the PM hour is the part of the day in the afternoon when traffic congestion is at its highest). As the table shows, travel times under Alternatives A and C would decrease for emergency vehicles heading north under this stage of construction. This is because these vehicles could use the emergency access lane for several blocks and could bypass congestion. Heading south, travel times would increase by about 17 seconds, when traveling between Station No. 5 and S. King Street. This is because vehicles turning left from the temporary road to S. King Street could impede emergency vehicles. While this increase in the southbound travel time for emergency vehicles is considered an impact, this impact could be mitigated by installing emergency vehicle pre-emption at the S. King Street signal. If this were in place, then southbound travel times for emergency vehicles could be lower than under existing conditions.

TABLE 5-2. ALTERNATIVES A AND C, TRAFFIC ANALYSIS STAGE II TRAVEL TIME FOR EMERGENCY VEHICLES (MINUTES)

Route	Existing (2010) PM Travel Time	Alternatives A and C, Stage II PM Travel Time
Fire Station No. 5 to Broad Street	3:58	3:28
Fire Station No. 5 to S. King Street	0:58	1:15

Source: *Elliott Bay Seawall Project Transportation Discipline Report* (SDOT 2012a)

Table 5-3 summarizes the results of the traffic analysis for Alternative B during the PM peak hour. As the table shows, travel times under Alternative B would increase slightly for emergency vehicles heading in either direction during this period of construction. While vehicles could use the emergency access lane for several blocks to bypass congestion, there would be sufficient delay introduced by vehicles turning left from the temporary road to side streets (such as Marion Street and S. King Street), which would increase overall travel times for emergency vehicles. While these increased travel times for emergency vehicles are considered impacts, they could be mitigated by installing emergency vehicle pre-emption at select signal locations to eliminate delays from left-turning vehicles. If this were in place, then travel times for emergency vehicles could be less than under 2017 conditions without the project (i.e., No Action Alternative).

TABLE 5-3. ALTERNATIVE B, TRAFFIC ANALYSIS STAGE II TRAVEL TIME FOR EMERGENCY VEHICLES (MINUTES)

Route	2017 PM Travel Time	Alternative B, Stage II PM Travel Time
Fire Station No. 5 to Broad Street	4:28	4:34
Fire Station No. 5 to S. King Street	0:56	1:09

Source: *Elliott Bay Seawall Project Transportation Discipline Report* (SDOT 2012a)

5.1.2.1.3 Traffic Analysis Stage III

Construction in Stage III occurs between Broad and Battery Streets. Emergency services south of Battery Street would return to existing conditions. The additional northbound through lane in the vicinity of Colman Dock would likely improve the ability of SFD to move along the roadway segment between Spring Street and Yesler Way under Alternatives A and C. North of Battery Street, emergency services would be impacted if the emergency access/turn lane is blocked by vehicle queues.

Table 5-4 shows that travel times would increase slightly (eight seconds) for emergency vehicles heading north under this stage of construction. While these vehicles would have the benefit of using the emergency access lane through the construction zone, they would likely experience some congestion prior to the construction zone (as two lanes merge into a single lane). Heading south, travel times would be identical to 2020 traffic conditions without the project since assumed roadway configuration would be identical (see the Transportation Discipline Report [SDOT 2012a] for more information). While the increase in the northbound travel time for emergency vehicles is considered an impact, this impact could be mitigated by installing emergency vehicle pre-emption on the temporary roadway. If this were

in place, then northbound travel times for emergency vehicles could be less than under 2020 traffic conditions without the project.

TABLE 5-4. ALTERNATIVES A, B, AND C, TRAFFIC ANALYSIS STAGE III TRAVEL TIME FOR EMERGENCY VEHICLES (MINUTES)

Route	No Action (2020) PM Travel Time	Alternatives A, B, & C, Stage III PM Travel Time
Fire Station No. 5 to Broad Street	4:41	4:49
Fire Station No. 5 to S. King Street	0:56	0:56

Source: *Elliott Bay Seawall Project Transportation Discipline Report* (SDOT 2012a)

5.1.2.1.4 Traffic Analysis Stage IV

Emergency services north of Battery Street and south of Virginia Street would return to existing conditions during Stage IV. Response times may be improved with the inclusion of the additional northbound lane from Yesler Way to Spring Street under Alternatives A and C. However, between Battery Street and Virginia Street, the bottleneck cause by construction would impact emergency services if the emergency access/turn lane is blocked by vehicle queues.

Table 5-5 shows that travel times would decrease for emergency vehicles heading north under this stage of construction. This is because these vehicles would have the benefit of using the emergency access lane through the construction zone and northbound queues are not anticipated south of the construction zone (as two lanes merge into a single lane). Heading south, travel times would be identical to 2020 traffic conditions without the project, since assumed roadway configuration would be identical. Therefore, no impacts are expected for emergency services under this traffic analysis stage.

TABLE 5-5. ALTERNATIVES A, B, AND C, TRAFFIC ANALYSIS STAGE IV TRAVEL TIME FOR EMERGENCY VEHICLES (MINUTES)

Route	No Action (2020) PM Travel Time	Alternatives A, B, and C, Stage IV PM Travel Time
Fire Station No. 5 to Broad Street	4:41	3:29
Fire Station No. 5 to S. King Street	0:56	0:56

Source: *Elliott Bay Seawall Project Transportation Discipline Report* (SDOT 2012a)

In addition to impacts on response times, there are four other issues for emergency responders: (1) the ability to safely and adequately reach structures adjacent to the construction site; (2) the potential for increased demand for emergency services related directly to the construction activities; (3) maintaining the minimum requirement for exit from the buildings through the construction zone; and (4) maintaining utilities during construction for essential fire and life safety systems, including electric, water, and telecommunications.

During construction, fire hydrants would need to be relocated. There may also be short-term planned water-line disruptions as switchovers occur that could temporarily affect fire suppression. The City

would need to work closely with SFD and the project contractor to coordinate such disruptions and assure that public safety is met at all times.

Access to properties on the west side of Alaskan Way would be restricted when work is occurring in the immediate area. This would result in increased response times and potentially complicated access, especially for large fire department vehicles, such as ladder trucks.

Fire Station No. 5 would be directly impacted by project construction when seawall work is occurring in front of the station. Since the station not only provides support for the engine company but also for the fire boat, access to the station would need to be provided at all times.

The potential impacts on demand for emergency services during construction are expected to be relatively small. Fuel, flammable fluids, or hazardous-substance spills would require emergency response, although the likelihood and/or frequency of such events are expected to be quite small.

5.1.2.2 Law Enforcement

Construction traffic congestion would have an impact on law enforcement services. Traffic mobility during construction in heavily traveled areas is difficult, especially during peak hours, and travel times of emergency calls may increase (see the preceding discussion on emergency services for details). Construction detours may require traffic control officers during peak periods to facilitate both through movements and turning movements (especially U-turns to the ferry terminal). The construction contractor would be responsible for on-site security.

5.1.2.3 Disaster Preparedness

Construction could affect disaster preparedness and cause delayed response times. This may affect SEM, Port of Seattle, and WSF operations, especially during peak hours.

With the use of the temporary road under the existing AWV structure during construction there is an increased potential for casualties should a major earthquake strike and damage all or a portion of the viaduct.

5.1.2.4 Solid Waste Collection, Disposal and Recycling

Solid waste haulers could experience delays or disruptions in collection routes during construction activities, especially along route sections that include curbside, driveways or other collection points that could be closed or more difficult to access. Collection and haul routes outside the study area also may be affected due to changes in traffic patterns on local roads. Access to the waterfront piers in particular could be more difficult when construction activity is occurring, which could result in more time-consuming pick-up. Temporary waste collection locations may need to be established to provide necessary services to businesses.

In addition, waste and debris generated during construction would need to be collected for disposal. Spoils removed from the construction zone would be hauled away in trucks, railcars or barges to a predetermined disposal site (see the Contaminated Materials Discipline Report [SDOT 2012c] for more details).

A summary of construction quantities is located in the Contaminated Materials Discipline Report (SDOT 2012c), as well as disposal methods and BMPs to mitigate for the potential impacts associated with contaminated materials and wall construction.

5.1.2.5 Public Schools

Delays for school buses other vehicles used for field trips to the project vicinity could occur due to traffic congestion and lane or roadway closures. Construction would delay buses traveling on, crossing, or making turns on the roadway under construction. Major north-south school bus thoroughfares, including the Alaskan Way surface street and adjacent surface streets, would likely be affected at key intersections along these roads. School buses that use Alaskan Way for field trips would experience some traffic delays; though traffic analysis shows that average travel time would increase of no more than two and one half minutes (see discussion in the Transportation Discipline Report [SDOT 2012a]). Loading, unloading and parking could be more difficult and farther away from desired destinations, especially when construction work is occurring in Zones 3 (Central Piers) and 4 (Aquarium/Parks).

5.1.2.6 Postal Services

There would be no direct impacts on post offices during project construction. Postal deliveries along Alaskan Way would be subject to some delays during construction; though the traffic analysis shows average travel time increases of no more than two and one half minutes (see discussion in the Transportation Discipline Report [SDOT 2012a]). Delivery locations could be subject to variation as construction proceeds along the waterfront.

5.1.3 Mitigation Measures

SDOT and the contractor would work closely with SPD and SFD to ensure that reliable access is provided for emergency services during construction, and that appropriate steps are taken to minimize delays in response times due to construction activities and detours. A center emergency access/left-turn lane would be provided along the detour route to facilitate movement of emergency vehicles. Signal pre-emption may be provided along the detour route to minimize response time for emergency responders during construction.

Safety protocols would be developed by the contractor(s), who likely would also provide on-site first aid personnel during active construction phases. Twenty-four hour security would also be provided to minimize the likelihood of non-employees accessing potentially dangerous areas within the construction zone.

The current plan is for the engine company vehicle to always have access to a portion of the site by using a temporary covered parking spot for the engine vehicle when the current building bay is inaccessible. Fire department employees who currently park on site during their 24-hour shift may have their parking temporarily relocated to a nearby location during this period.

SDOT would work with the contractor and, as needed, SPD, to ensure that adequate traffic control is provided during construction for pedestrian and vehicular movement and to facilitate emergency access. SDOT also would facilitate coordination between SFD and SPU concerning water-line relocations

that may affect the availability of water supply for fire suppression. Alternative water-supply lines would be provided to ensure that no significant disruption of service occurs.

SDOT would coordinate with solid waste service providers to minimize effects on solid waste collection and recycling activities. SDOT and the contractor would develop plans for the appropriate disposal of construction materials and spoils. Additional details about construction materials and spoils disposal can be found in the Contaminated Materials Discipline Report and the Geology and Soils Discipline Report (SDOT 2012c and 2012d, respectively).

The Seattle School District would be notified of construction detours that may affect school bus routings to and through the project area, and USPS would be notified of construction detours and access changes that may affect postal deliveries. Access would be provided to all buildings along the construction route for postal deliveries.

SDOT would provide timely communications as construction activities proceed and details about detours, utility disruptions and other critical activities would be provided. Project construction would not occur during the peak summer months (June through August), so effects on public services would be minimized during shut-down periods.

5.2 UTILITIES

An extensive network of utilities is located in the study area. Potential construction effects on utilities are based on a review of available utility maps, discussions and meetings with utility representatives; a data and literature review; and an ongoing field survey. Exact locations and depths of critical utilities and effects on them will be researched further and verified with utility providers during the design process and prior to construction of the selected alternative. During final design, construction methods and BMPs would be developed in consultation with the utility providers to provide spacing and protection measures specific to each site. Construction methods and BMPs would be designed to minimize effects on utilities such as access issues, damage to facilities, settlement, vibration, groundwater issues and hazardous materials. Relocations would be performed according to agency regulations and permits, utility provider requirements and proper BMPs.

Utilities could be directly affected during construction, depending on their depth below grade, their material composition, the construction excavation limits, the exact location of the proposed seawall alignment and roadway and associated foundations, and other factors.

Overlapping construction schedules among the planned waterfront projects increase the risk and frequency of utility service disruption, multiple relocations, and potential for damage to existing infrastructure. Potential utility outages would affect business and residential customers as well as public services. Services to customers could be temporarily disconnected each time a utility line is relocated or damaged. Multiple relocations of utilities could affect the local economy by increasing the risk of frequent and/or accidental loss of service to retail and commercial businesses.

Utility construction sequencing for the EBSP would require extensive coordination. Finding space to relocate utilities would be difficult, especially given that the areas not directly impacted by construction would be restricted by detour routing of vehicles and pedestrians. Additionally, there are seasonal

restrictions to mitigate impacts to neighboring businesses. Since construction of the EBSP and Waterfront Seattle improvements would coincide, utilities displaced by the EBSP would ideally be relocated to a position consistent with the proposed redeveloped waterfront.

5.2.1 No Action Alternative

No construction is proposed for the No Action Alternative, thus there are no anticipated effects. Refer to Section 6.1 for a discussion of operational effects and continued maintenance likely to occur for the No Action Alternative.

5.2.2 Build Alternatives

The three build alternatives would have similar impacts on the utilities within the study area. Typical sections showing relative locations of existing utilities superimposed on Alternatives A and B are shown in Figures 5-1 and 5-2. The sections were cut in Zone 3 (Central Pier Zone), but are reflective of utility congestion throughout the project area. Alternative C is a hybrid of Alternatives A and B and is characterized in Figure 5-1. Under Alternative C, the seawall would be located approximately 10 to 15 feet landward of its existing location (see Table 1-1). Under Alternative A, the seawall would be replaced near its current alignment with a soil improvement structural method that disturbs a wide swath of the existing roadway (Figure 5-1). Under Alternative B, the seawall would be located 30 feet inland of the existing wall and would be replaced using a BSP structural method with an overall narrower footprint (Figure 5-2).

Each structural replacement method (either soil improvement or BSP) requires excavation below the existing grade into the area currently occupied by multiple utilities. The impact zone used in the following descriptions is based on an assumed 2H:1V slope from the bottom of the excavation to the existing grade east of the project.

To display the context in which relocations would be considered, Figures 5-1 and 5-2 show areas east of the anticipated disturbed area during seawall construction. Utility relocations should meet construction and spacing guidelines of the various utilities. It is anticipated that the footings (and supporting pilings) of the existing viaduct would remain in place following demolition; therefore, additional space would not be available for utilities displaced by seawall construction. Utility relocations, where required, should also be coordinated with the Waterfront Seattle, as well as AWV demolition to assure that utility locations are permanent and would meet access and maintenance requirements.

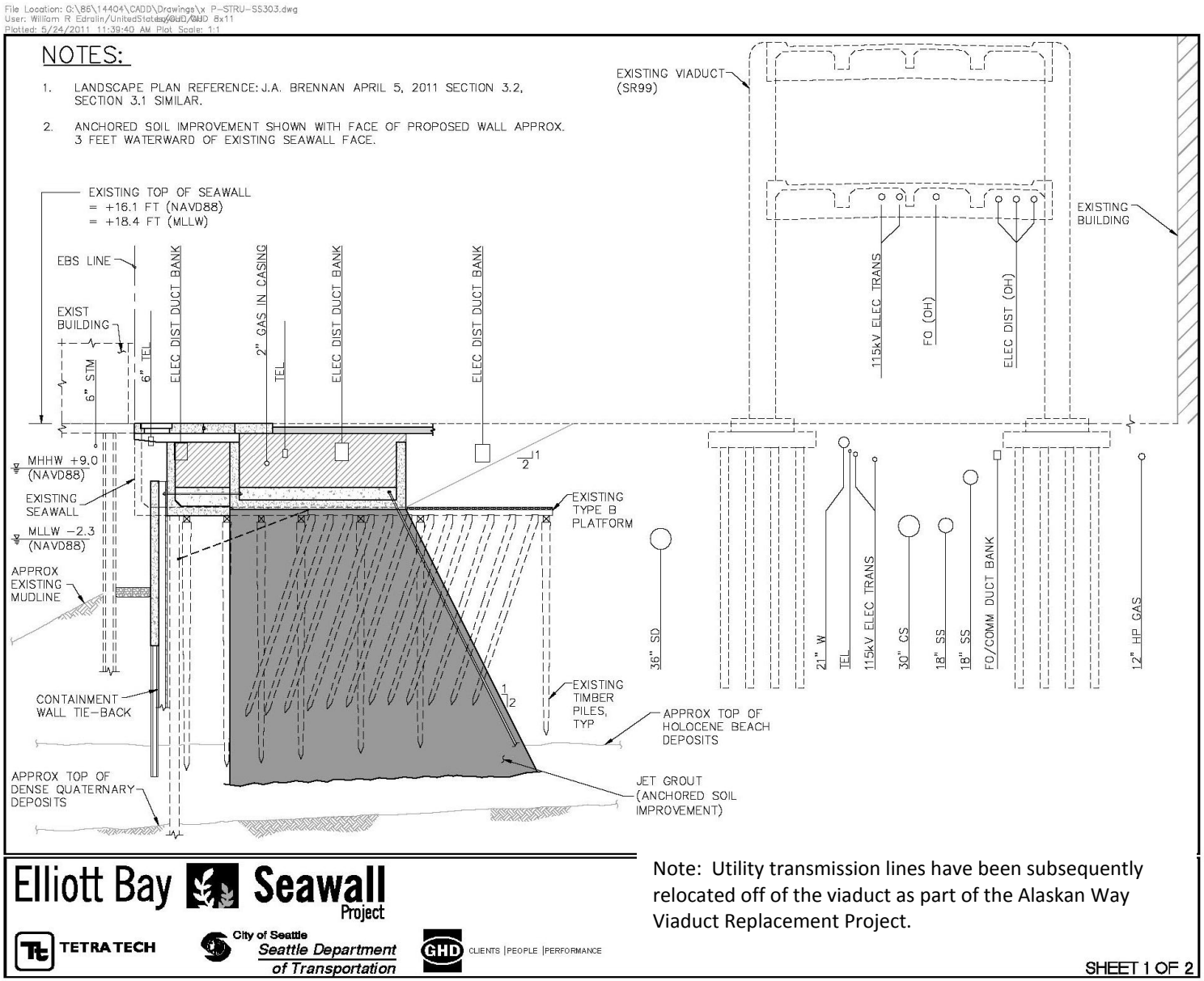

Figure 5-1. Existing Utilities, Alternative A, Zone 3

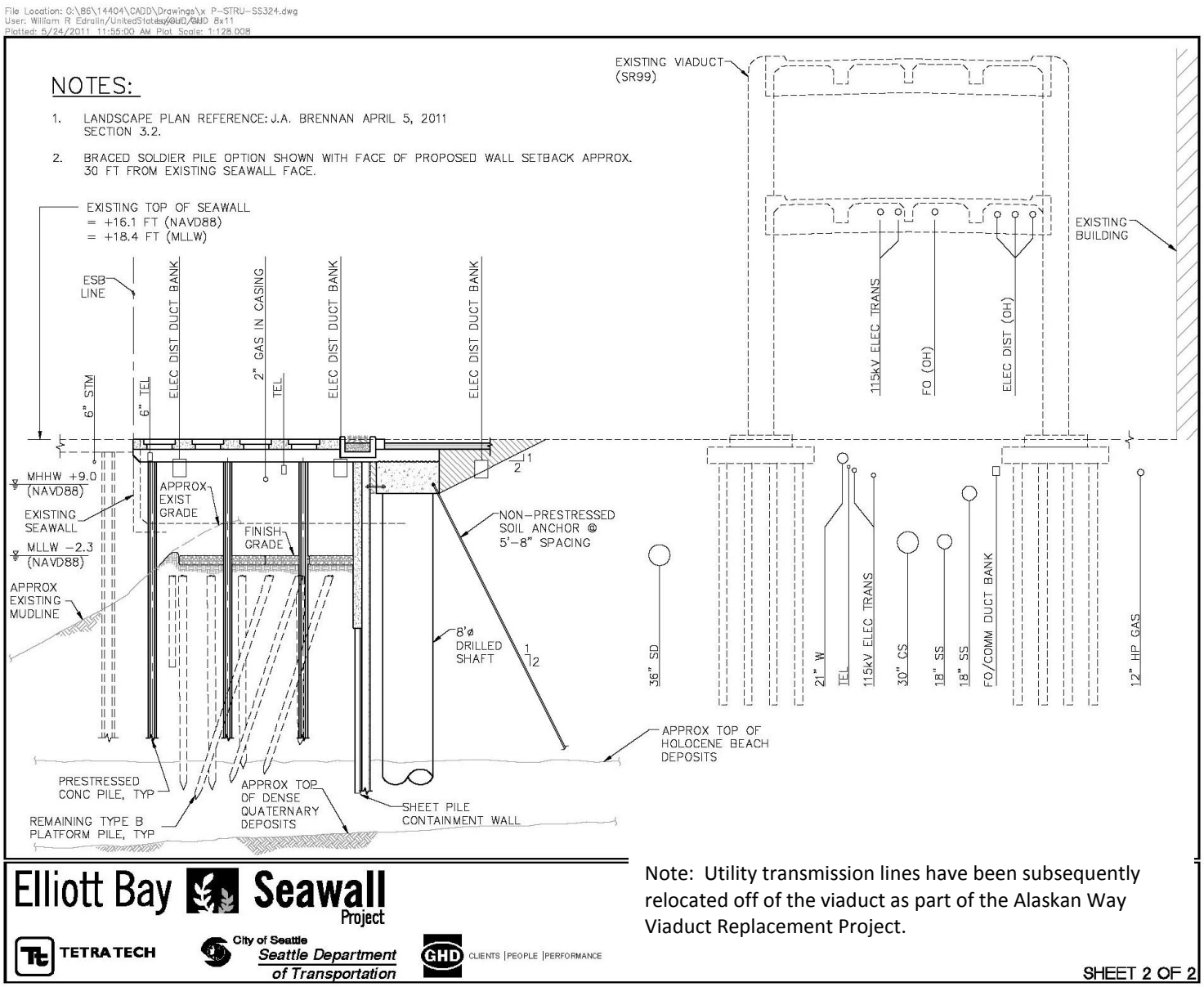

Figure 5-2. Existing Utilities, Alternative B, Zone 3

5.2.2.1 Electrical

Exact locations for utility relocation would be identified during design development and through coordination with the City of Seattle Department of Planning and Development for compliance with the Shoreline Master Plan. Temporary lines across the EBSP construction area would be required to provide continuous power to the commercial and pier facilities along the waterfront.

Table 5-6 compares the impact of seawall replacement alternatives based on the portion of the existing electrical system that is within the excavation limits of the respective construction alternatives. Linear feet of electrical distribution duct banks and service duct banks or conduit lines are tabulated, as well as the number of impacted electrical vaults.

Facilities must also be accessible for trucks and equipment at all times for maintenance during and after construction. Service connections could be disrupted during construction. It is anticipated that new connections would be provided and the existing and new connections would be sequenced and protected during construction to provide continuous service.

TABLE 5-6. ELECTRICAL DISTRIBUTION IN THE PROJECT AREA THAT WOULD BE IMPACTED DURING CONSTRUCTION

Alternative	Electrical Systems	Unit	Construction Impact Zone		
			Central	North	Total
A	Distribution Duct Bank	LF	5,900	3,800	9,700
	Service Line	LF	9,800	6,100	15,900
	Vault	EA	19	14	33
B	Distribution Duct Bank	LF	5,800	3,800	9,600
	Service Line	LF	9,700	6,100	15,800
	Vault	EA	19	14	33
C	Distribution Duct Bank	LF	5,800	3,800	9,600
	Service Line	LF	9,700	6,100	15,800
	Vault	EA	19	14	33

Note: LF – linear feet; EA – each

5.2.2.2 Water

The construction impact zone along the waterfront for the build alternatives is listed in Table 5-7. The existing 12-inch diameter water main south of Columbia Street and the 21-inch water main between Union Street and Pine Street would be impacted. Other major impacts for the three build alternatives are to lateral pipelines, crossing the EBSP construction zone to service connections, fire-protection laterals, and water-service meter vaults.

TABLE 5-7. WATER SYSTEMS IN THE PROJECT AREA THAT WOULD BE IMPACTED DURING CONSTRUCTION

Alternative	Water Systems	Unit	Construction Impact Zone		
			Central	North	Total
A	Pipe 12 inches or smaller	LF	1,800	0	1,800
	Pipe larger than 12 inches	LF	1,600	1,400	3,000
B	Pipe 12 inches or smaller	LF	1,800	0	1,800
	Pipe larger than 12 inches	LF	1,400	1,400	2,800
C	Pipe 12 inches or smaller	LF	1,800	0	1,800
	Pipe larger than 12 inches	LF	1,400	1,400	2,800

Note: LF – linear feet

Table 5-8 compares the impact of each build alternative based on linear feet of pipe (including valves and appurtenances) within the impact area. The lengths include service connections. It is assumed that individual connections and appurtenances would be the same for all build alternatives.

There is a notable difference between the build alternatives when considering the possibility of protecting existing pipes in place. Approximately 60 percent of the 21-inch main could be protected in place for Alternative A, but it would require replacement under Alternative B and C. Temporary services and fire-protection systems would be required throughout construction.

The existing water system contains some sections of old cast iron pipe; vibration associated with seawall construction may lead to operational issues if the brittle pipe joints are damaged.

Service connections would be disrupted during construction. It is anticipated that new connections would be provided as a part of construction, and existing connections, new connections, and meter vaults would be sequenced to provide continuous service.

TABLE 5-8. GRAVITY SEWER, COMBINED SEWER, AND STORM DRAINS IN THE PROJECT AREA THAT WOULD BE IMPACTED DURING CONSTRUCTION

Alternative	Gravity Systems	Unit	Construction Impact Zone		
			Central	North	Total
A	Pipe 12 inches or smaller	LF	5,100	2,900	8,000
	Pipe 15 to 30 inches	LF	1,000	0	1,000
	Pipe 36 to 60 inches	LF	600	100	700
	Outfalls	EA	3	1	4
	CSO Control Structure	EA	1	1	2
	Service Connection	EA	11	7	18
B	Pipe 12 inches or smaller	LF	5,300	2,900	8,200
	Pipe 15 to 30 inches	LF	1,000	0	1,000
	Pipe 36 to 60 inches	LF	600	100	700
	Outfalls	EA	3	1	4
	CSO Control Structure	EA	1	1	2
	Service Connection	EA	11	7	18
C	Pipe 12 inches or smaller	LF	5,300	2,900	8,200
	Pipe 15 to 30 inches	LF	1,000	0	1,000
	Pipe 36 to 60 inches	LF	600	100	700
	Outfalls	EA	3	1	4
	CSO Control Structure	EA	1	1	2
	Service Connection	EA	11	7	18

Note: CSO – combined sewer overflow, EA – Each, LF – linear feet

5.2.2.1 Sewer, Combined Sewer and Storm Drainage

Table 5-8 lists the impact of the three build alternatives based on the portion of the existing sewer, combined sewer, and drainage systems within the excavation limits of the respective build alternatives. The table includes the linear footage of pipelines, number of outfalls and control structures, and number of mapped service connections.

Temporary facilities may need to be designed to provide continuous service during construction; it is expected that facilities would only be relocated once during construction with minimal use of bypass. There are several locations where mitigation of existing gravity-pipeline impacts may be possible in the upland-slope transition zones. It may be feasible to protect as much as 90 percent of medium-diameter pipelines and more than 50 percent of large-diameter pipelines in place for any of the build alternatives.

The function of the outfalls and control structures must be maintained throughout construction in order for the City to be in compliance with NPDES permit requirements. The number of outfalls and control structures impacted would be the same for all build alternatives.

Lateral connections for both stormwater and wastewater flows could be disrupted during construction. It is anticipated that new connections would be provided, existing and new connections would be protected or sequenced, and sequencing would provide continuous service.

5.2.2.2 Natural Gas

The PSE natural gas systems in the Central Seawall Study Area are supplied by a 12-inch, high-pressure gas main that enters the construction zone between Union Street and Pike Street. The gas main would be impacted by Alternative B and C, but is located outside the zone of disturbance for Alternative A. In the North Seawall Study Area, a short section of two-inch gas main north of Vine Street would be impacted by all three build alternatives.

All three alternatives would have a major impact on service laterals serving commercial and pier activities on the west side of the waterfront corridor (Table 5-9).

TABLE 5-9. NATURAL GAS PIPELINES IN THE PROJECT AREA THAT WOULD BE IMPACTED DURING CONSTRUCTION

Alternative	Gas Systems	Unit	Construction Impact Zone		
			Central	North	Total
A	Pipeline	LF	2,500	900	3,400
B	Pipeline	LF	3,500	900	4,400
C	Pipeline	LF	3,500	900	4,400

Note: LF – linear feet

The possibility of capping lines during construction could impact operation of the intermediate pressure gas grid. PSE would develop designs to provide continuous operation of its system throughout construction during the design phase (FHWA et al. 2004).

Service connections could be disrupted during construction. It is anticipated that new connections would be provided, existing and new connections would be protected or sequenced, and sequencing would provide continuous service.

5.2.2.3 Steam

As shown in Table 5-10, the steam system along the waterfront would be impacted by the EBSP construction activities. In general, the system requires protection in place or would need to be relocated to provide continuous service.

Steam service to customers, which include Colman Dock, Anthony's Homeport restaurant, and the Seattle Aquarium, may be disrupted during construction. During design, it is anticipated that options including the use of temporary boilers or laying pipe to bypass construction would be investigated.

TABLE 5-10. STEAM PIPELINES IN THE PROJECT AREA THAT WOULD BE IMPACTED DURING CONSTRUCTION

Alternative	Steam System	Unit	Construction Impact Zone		
			Central	North	Total
A	Pipeline	LF	2,800	1,500	4,300
B	Pipeline	LF	2,800	1,500	4,300
C	Pipeline	LF	2,800	1,500	4,300

Note: LF – linear feet

5.2.2.4 Communication

The infrastructure owned and operated by communications providers in the study area is aerial and underground. These systems utilize fiber-optic, coaxial, and copper-cable materials, and have associated conduits, risers, vaults, manholes and other appurtenances. Underground lines have been direct-buried, installed in open cut trenches, or directionally drilled; others are pulled through pipelines formerly used for other utility purposes, such as gas and water (FHWA et al. 2004).

Lines from multiple communication providers run in parallel along the west side of the corridor from S Washington Street to Pine Street, and again from Bell Street to Broad Street. These systems would be impacted equally by each alternative. North of Pine Street to Bell Street, a system of duct-bank and utility vaults are located in the slope-transition zone of the EBSP construction zone for the alternatives. This section between Pine Street and Bell Street may be a candidate for protection in place. Table 5-11 lists the lengths of distribution and service line that would be affected by the three build alternatives.

TABLE 5-11. COMMUNICATION LINES IN THE PROJECT AREA THAT WOULD BE IMPACTED DURING CONSTRUCTION

Alternative	Telecommunications	Unit	Construction Impact Zone		
			Central	North	Total
A	Distribution line	LF	5,300	5,000	10,300
	Service line	LF	3,800	500	4,300
B	Distribution line	LF	5,300	5,000	10,300
	Service line	LF	3,800	500	4,300
C	Distribution line	LF	5,300	5,000	10,300
	Service line	LF	3,800	500	4,300

Note: LF – linear feet

Some of the systems are referred to as long haul or transport, while others are distribution and include lateral and service lines to customers. In general, all of the active systems are vital to the customers served and cannot be taken out of service during construction of the project, except during planned cutovers required by construction activities. Each communications provider would need to consider operational impacts to their systems during the design phase. Coordination between SDOT, the contractor(s), and communications providers would be necessary.

5.2.3 Mitigation Measures

The project would comply with all federal, state, and local utility-offset standards and criteria.

The City would work closely with utility owners to coordinate each utility's criteria and coordinate space planning and construction sequencing to reduce overall risks, costs, and impacts. SDOT would work with utility owners to develop acceptable alternatives for protecting utilities in place where possible. Outfall-replacement design would be evaluated for compatibility with proposed habitat and "water contact" (locations where people can touch the water) elements as details for these features become available.

The City would coordinate the schedule and sequencing of utility work with the overall EBSP construction schedule. This could include consideration of options to relocate some utilities to a clear corridor prior to seawall construction, coordinated with future central waterfront utility relocations and improvements.

The City would inventory existing service connections and coordinate with utility providers to evaluate options for providing continuous service to customers and to maintaining critical services like fire protection and emergency communications. For the steam utility system, adequate insulation around the steam pipes must be applied within proximity of the electrical facilities because heat reduces the capacity of the electrical lines.

SDOT would work with the contractor(s) to develop shoring options and/or construction methods to reduce the width of the disturbed area, thus reducing the direct construction impacts to utilities. SDOT would work with the contractor(s) to identify construction techniques to limit vibration impacts to utilities. Vibration monitoring would be added where required.

Utility relocation or modification accomplished, where feasible, prior to project construction would reduce operational risks associated with major construction. In addition, SDOT would work with utility purveyors to provide maintenance and emergency access to all utilities throughout construction. The project would develop (or require from private purveyors) a customer service plan and maintain contact information for each utility impacted by construction; if any inadvertent damage occurs the project would immediately contact the utility owner.

CHAPTER 6. OPERATIONAL EFFECTS AND MITIGATION

6.1 PUBLIC SERVICES

6.1.1 No Action Alternative

6.1.1.1 Minimal Damage Scenario

Under the Minimal Damage scenario, the existing seawall and Alaskan Way 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 that may occasionally result in sidewalk and/or lane closures. These short duration 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 to the provision of public services would be expected to be minor.

6.1.1.2 Loss of Functionality Scenario

Under the Loss of Functionality scenario, it is likely that sidewalk, parking, and/or travel lanes would be impacted with short-term closures or detours required as repairs are made. Should there be a series of failures or a major collapse of the seawall, access along the waterfront would be partially or severely restricted or even prohibited. Access to Fire Station No. 5 could be impacted in various ways and to varying degrees, depending on the location of the wall failure. In the worst case scenario, access to the fire station could be temporarily prohibited until a temporary access structure is constructed. This would require repositioning of the Engine Company. Access to a fire boat could be provided because there are two fire boats assigned to Fire Station No. 5 and another boat at Fisherman's terminal, which would be positioned on the waterfront if two of the three fire boats are damaged.

6.1.1.3 Collapse of Seawall Scenario

Access to commercial and residential properties along the waterfront could be severely impacted by the collapse of the seawall. The inability of ground-based emergency services—particularly fire department services—could render buildings unsafe to occupy until roadway and seawall repairs are completed. In addition, service disruptions of key utilities (such as water mains) in addition to the inability of ground-based emergency services (including SFD) to access property caused by the partial failure of the seawall could significantly disrupt fire-fighting ability in the area.

6.1.2 Build Alternatives

The long-term impacts to public services under any of the three build alternative are negligible. The new seawall should require only routine maintenance and not be in danger of collapse in whole or in part for its design life (75 years).

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

The restored roadway would have similar traffic volumes as those under the No Action Alternative; thus, emergency response times would be no different. The addition of a second northbound through lane in

the vicinity of Colman Dock with Alternatives A and C would provide a beneficial impact through reduction of traffic congestion in that area and would benefit general traffic movements and public service providers, including the police and fire departments. Overall demand for emergency services should remain nearly constant, adjusting for normal growth that would occur with or without project construction. The proposed project features could potentially result additional visitors to the area. In turn, increased use may equate to a few more emergency calls (i.e., police, ambulance), though these likely would be sporadic.

The revised traffic lanes in the vicinity of the Seattle Aquarium would put greater distance (up to 75 additional feet) between the roadway and the aquarium. This increased distance could impact fire suppression services and emergency management activities. The Plaza Options would also create additional barriers between the street and the Seattle Aquarium, potentially providing less flexibility in access for emergency services. The installation of new water connections to adjacent buildings would improve the reliability of flow for fire response overall.

6.1.2.2 Disaster Preparedness

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

6.1.2.3 Solid Waste Collection, Disposal, and Recycling

Since the restored roadway would have similar traffic volumes as under the No Action Alternative, solid waste, disposal and recycling trucks serving the area would see no significant difference in the provision of service.

6.1.2.4 Public Schools

There are no anticipated operational impacts on public schools or school bus routes as a result of the project.

6.1.2.5 Postal Services

There are no anticipated operational impacts to postal service branches or to postal deliveries as a result of the project.

6.1.3 Indirect Effects

No operational indirect effects have been identified for public services.

6.1.4 Mitigation Measures

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

6.2 UTILITIES

6.2.1 No Action Alternative

The No Action Alternative would have no immediate operational impacts on utilities. Utilities would continue standard operational and maintenance practices with system upgrades as required.

6.2.1.1 Minimal Damage Scenario

The City and private utility owners would each respond as required to repair minimal damage failures of the seawall in order to maintain services to their customers.

6.2.1.2 Loss of Functionality Scenario

The Loss of Functionality scenario would render the waterfront unsafe, but may or may not have immediate impacts on any individual utility system. Under this scenario, all utilities within the project area would be relocated and operational impacts would depend on the sequencing and efficiency of each utility's response. In the case of utilities suffering immediate damage, operational impacts would be severe.

6.2.1.3 Collapse of Seawall Scenario

Major utility systems would suffer immediate disruption in the case of a seawall collapse. Impacts 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, environmental impacts of disruptions to the combined sewer system would be significant, since drainage and sewage from major portions of downtown pass through the diversion structures within the study area.

6.2.2 Build Alternatives

The three build alternatives would have similar operational impacts on utilities within the study area. Ongoing maintenance of the seawall could cause utility service disruptions to excavation, vibration, or construction equipment. Operation of each of the utilities could be impacted if maintenance access is not provided at all times.

6.2.2.1 Electrical

Continuity of operation of the network transmission and distribution system 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 construction of the project is complete.

6.2.2.2 Sewer, Combined Sewer, and Storm Drainage

The three proposed build alternatives would have similar impacts on future operations of gravity systems in the seawall. The intent is to maintain the location of the outfalls as close as possible to their existing locations. The gravity system would remain intact and functional with no change to categorization or operation. Privately owned side-sewer connections would be longer than they are now and may have extended lengths that cannot be repaired by standard open-trench methods.

6.2.2.3 Natural Gas

Operation of the natural gas utility system is not anticipated to change as a consequence of the project. Once construction is complete the function of the system would be unchanged.

6.2.2.4 Steam

The entire steam utility system would be affected by the project; as a consequence, it is anticipated that the system would be replaced in-kind as the project is in construction. Operationally, the steam utility system will remain functional and maintain existing capacity.

6.2.2.5 Communication

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

6.2.3 Indirect Effects

No indirect effects related to utilities and utility services have been identified.

6.2.4 Mitigation Measures

It is expected that utility services would be the same or improved once project construction is completed; therefore, no mitigation is required.

CHAPTER 7. REFERENCES

BNSF (BNSF Railway). 2011. BNSF Railway, Safety and Security, Police Team. http://www.bnsf.com/communities/safety-and-security/police-team/.

City of Seattle DoIT (Department of Information Technology). 2011a. Office of Cable Communications. http://www.seattle.gov/cable/.

City of Seattle DoIT. 2011b. DoIT Operations. http://www.cityofseattle.net/doit/operations.htm/.

Cosmopolitan Engineering Group. 2007. CSO and Stormwater Outfall Basis of Design. Submitted to Washington State Department of Transportation. Submitted by Parsons Brinckerhoff Quade & Douglas, Inc. Prepared by Cosmopolitan Engineering Group, HDR Engineering and Rosewater Engineering. Seattle, Washington. April.

FHWA (Federal Highway Administration), WSDOT (Washington Department of Transportation), and SDOT (Seattle Department of Transportation). 2004. SR 99: Alaskan Way Viaduct and Seawall Replacement Project, Draft Environmental Impact Statement, including Appendices. Prepared by Parsons Brinkerhoff Quade and Douglas. Seattle, Washington.

FHWA, WSDOT, and SDOT. 2006. SR 99: Alaskan Way Viaduct and Seawall Replacement Project, Supplemental Draft Environmental Impact Statement, including Appendices. Prepared by Parsons Brinkerhoff Quade and Douglas. Seattle, Washington.

King County. 2011a. ECC Support Team. http://www.kingcounty.gov/safety/prepare/AboutUs/ECCSupportTeam.aspx. Accessed on August 2, 2011.

King County. 2011b. Wastewater Treatment, West Point Treatment Plant. http://www.kingcounty.gov/environment/wtd/About/System/West/Plant.aspx/.

King County Office of Emergency Management. 2011. http://www.kingcounty.gov/safety/prepare/EmergencyManagementProfessionals/Plans/RegionalDisasterPlan.aspx Parametrix. 2007.

Kitsap County Department of Emergency Management. 2011. http://www.kitsapdem.org/preparedness.aspx.

Port of Seattle. 2011. Port of Seattle Police Department. http://www.portseattle.org/community/portpolice/index.shtml/.

SDOT (Seattle Department of Transportation). 2005. Emergency Traffic Management and Closure Plan for the Alaskan Way Viaduct and Surface Alaskan Way. Available at: http://www.seattle.gov/transportation/docs/awv_Chapter2public.pdf/.

SDOT. 2011. Elliott Bay Seawall Project Public Services and Utilities Methodology Technical Memorandum. Final. Prepared by Tetra Tech, Inc. Seattle, Washington. January.

SDOT. 2012a. Elliott Bay Seawall Project Transportation Discipline Report. Submitted by Tetra Tech, Inc., Prepared by Fehr and Peers Transportation Consultants, Inc. Seattle, Washington.

SDOT. 2012b. Elliott Bay Seawall Project Water Resources Discipline Report. Prepared by Herrera Environmental Consultants. Seattle, Washington.

SDOT. 2012c. Elliott Bay Seawall Project Contaminated Materials Discipline Report. Submitted by Tetra Tech, Inc. Prepared by Floyd|Snider. Seattle, Washington.

SDOT. 2012d. Elliott Bay Seawall Project Geology and Soils Discipline Report. Submitted by Tetra Tech, Inc. Prepared by Shannon & Wilson, Inc. Seattle, Washington.

SEM (Seattle Office of Emergency Management). 2009. Seattle All-Hazards Mitigation Plan. July 2009 Update. Available at: http://clerk.ci.seattle.wa.us/~ordpics/31158_ex1.pdf.

SFD (Seattle Fire Department). 2010. Emergency Response Times by Company. http://www.seattle.gov/fire/statistics/runTimes/dept_responseTimes.htm/.

SFD. 2011. Department Profile. http://www.seattle.gov/fire/deptInfo/deptProfile.htm.

SPD (Seattle Police Department). 2010. Seattle Police Department 2009 Annual Report. Produced by Office of the Chief of Police. Available at: http://www.seattle.gov/police/publications/AR/AR09_secure.pdf/.

Seattle Public Utilities. 2011a. South Transfer Station. http://www.seattle.gov/util/About_SPU/Garbage_System/Plans/SolidWasteFacilityUpdate/SouthRecyclingDisposalStation/index.htm.

Seattle Public Utilities. 2011b. Current Water Supply Conditions and Outlook. http://www.seattle.gov/util/About_SPU/Water_System/Water_Supply/SPU01_001850.asp/.

Seattle Public Utilities. 2011c. Our Partners. http://www.seattle.gov/util/Services/Drainage_&_Sewer/Keep_Water_Safe_&_Clean/CSO/OurPartners/index.htm/.

USACE (United States Army Corps of Engineers). 2008. Existing Conditions Report, Alaskan Way Seawall Replacement Project Feasibility Study. Prepared for United States Army Corps of Engineers Seattle District. October.

WSDOT (Washington State Department of Transportation). 2011. SR 99 – Automated Viaduct Closure Gates System. http://www.wsdot.wa.gov/Projects/SR99/ViaductClosureSystem/default.htm/.