

Final Revised Screening of Design Concepts



Submitted to:
Washington State Department of Transportation
Urban Corridors Office
401 Second Avenue S, Suite 560
Seattle, WA 98104-3850

Submitted by:
Parsons Brinckerhoff Quade & Douglas, Inc.

Prepared by:
Parametrix, Inc.



SR 99: Alaskan Way Viaduct & Seawall Replacement Project

Revised Screening of Design Concepts

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The SR 99: Alaskan Way Viaduct & Seawall Replacement Project is a joint effort between the Washington State Department of Transportation (WSDOT), the City of Seattle, and the Federal Highway Administration (FHWA). To conduct this project, WSDOT contracted with:

Parsons Brinckerhoff Quade & Douglas, Inc.

999 Third Avenue, Ste 2200
Seattle, WA 98104

In association with:

BERGER/ABAM Engineers Inc.
BJT Associates
David Evans and Associates, Inc.
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EnviroIssues, Inc.
Harvey Parker & Associates, Inc.
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ROMA Design Group
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Taylor Associates, Inc.
Tom Warne and Associates, LLC
William P. Ott

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Revised Screening of Design Concepts

EXECUTIVE SUMMARY

The Alaskan Way Viaduct and Alaskan Way Seawall are both at the end of their useful lives. Improvements to both are required to protect public safety and maintain the transportation corridor. Because these facilities are at risk of sudden and catastrophic failure in an earthquake, the Washington State Department of Transportation (WSDOT), City of Seattle (City), and Federal Highway Administration (FHWA) are proposing major improvements to the Alaskan Way Viaduct (AWV) Corridor and Alaskan Way Seawall. The AWV Corridor includes portions of East Marginal Way, the SR 99 roadway from S. Spokane Street to S. Holgate Street, the Alaskan Way Viaduct structure, the Battery Street Tunnel, a section of SR 99 north of the Battery Street Tunnel, the Alaskan Way surface street, and the Alaskan Way Seawall. In the project area SR 99 includes an at-grade section from S. Spokane Street to S. Holgate, the Alaskan Way Viaduct structure, the Battery Street Tunnel, and the at-grade roadway section north of the Battery Street Tunnel.

WSDOT, the City, and FHWA have considered dozens of options designed to improve the Alaskan Way Viaduct Corridor and the Alaskan Way Seawall. The purpose of this memorandum is to present the design options that were considered, and to describe the screening process utilized to determine the alternatives that will be evaluated in the project Environmental Impact Statement (EIS).

Seventy-six design concepts were developed through a collaborative process with WSDOT, the City, FHWA, other public agencies, and the public. The 76 concepts were considered in this screening evaluation. They were screened using screening criteria developed and approved by WSDOT, FHWA, City of Seattle, and participating agencies in the Resource Agency Leadership Forum¹. The screening process resulted in 26 design concepts that will be incorporated into alternatives evaluated in the project EIS.

¹ The Resource Agency Leadership Forum is comprised of regulatory agencies party to the Signatory Agency Committee (SAC) Agreement and local agencies having jurisdiction in the project area.

access surface street with three lanes in each direction. This segment of the AWW Corridor does not meet current design standards for traffic safety.

Alaskan Way Surface Street

The Alaskan Way surface street is a three to five lane street with signalized intersections providing access along the Seattle waterfront. This roadway parallels Elliott Bay on the west and the Alaskan Way Viaduct to the east. Its southern boundary is S. Royal Brougham Way and its northern boundary is Broad Street. Surface street connections contribute to the AWW Corridor in this segment.

Alaskan Way Seawall

The Alaskan Way Seawall is located along Seattle's downtown waterfront from South Washington Street on the south to Myrtle Edwards Park (near Pier 70) on the north. The Seawall supports the fill soils that the Alaskan Way surface street is built upon. In an earthquake, the Seawall provides support to soils the Alaskan Way Viaduct is built upon.

The Alaskan Way Seawall was constructed in 1916 and 1934. The majority of the Seawall is an anchored bulkhead system. The upper 20 feet of the Seawall is constructed with a pre-cast concrete panel. The concrete panel is supported by a steel bulkhead. The structural details and height of the bulkhead varies. In some places the bulkhead is buried in fill, in other locations it is exposed to the marine waters in Elliott Bay. The steel bulkhead and concrete wall are anchored to a timber relieving platform supported by timber batter piles. The relieving platform supports approximately 13 feet of roadway fill that the Alaskan Way surface street is built upon. A small section of the Seawall in the south end near the Colman ferry dock is constructed of unreinforced, or lightly reinforced, concrete gravity walls supported on piles and concrete sidewalks supported on piles.

The Alaskan Way Seawall is in a state of disrepair and is nearing the end of its useful life. Due to its poor condition, it is vulnerable to earthquakes and unable to resist loads associated with liquefaction of the loose fills on which it is constructed. In an earthquake, liquefaction of these soils is anticipated to result in large displacements of the wall and/or complete failure of the wall. This type of seawall failure could result in damage to adjacent waterfront piers, significant damage to utilities, and potential collapse of Viaduct sections.

Phase 1 Screening Process

Two screening processes called Phase 1 and Phase 2 were conducted to screen design concepts for the Alaskan Way Viaduct Corridor prior to the screening process described in this memorandum. The Phase 1 and Phase 2 screening

processes, and the reasons for the various screening processes are summarized and referenced in the sections below.

WSDOT led the Phase 1 screening process, which was completed in August 2001. The AWW project and Phase 1 screening began as a result of the Nisqually earthquake. The earthquake, which occurred on February 28, 2001, damaged the Viaduct and resulted in closure of the Viaduct for a brief period. The Viaduct was repaired, but structural evaluations were conducted. These structural investigations indicated that the Viaduct was vulnerable to future earthquakes and was nearing the end of its usable design life. Due to its seismic vulnerability, WSDOT began the Phase 1 screening process to develop a range of concepts for retrofitting or replacing the Alaskan Way Viaduct and improving areas located in the AWW Corridor. WSDOT's Phase 1 screening process included the following:

- Developing design concepts
- Developing screening criteria
- Screening initial concepts
- Summarizing primary concepts

Design Concept Development

WSDOT and the Phase 1 consultant team developed an initial list of design concepts in May 2001. The range of concepts listed included corridor-wide concepts as well as concepts specific to the existing elevated Viaduct structure. The initial list was presented to a project Technical Advisory Committee, the Leadership Group², the public, various agencies, and local tribes in June 2001 for input and refinement. This resulted in a comprehensive list of 20 concepts with several design sub-options that were narrowed in the Phase 1 screening process.

Screening Criteria Development

Screening criteria were developed based on the project purpose and need. Concepts not meeting the screening criteria were dropped from further evaluation. The following four criteria were used to screen Phase 1 concepts.

- Does the concept meet the program's objectives?
- Is the concept feasible to implement?
- Are the construction impacts manageable?
- Would the concept likely receive required permits and approvals?

² The Leadership Group represents a broad group of stakeholders including WSDOT, the City of Seattle, FHWA, area neighborhoods, business interests, and other organizations and agencies.

Screening Initial Concepts and Summarizing Primary Concepts

The initial list of Phase 1 concepts were screened using the criteria above. The screening process resulted in a list of concepts to be considered for further evaluation. Additional details on the Phase 1 Screening Process are found in a report titled "*Alaskan Way Viaduct Study Development and Screening of Concepts, Working Paper #7 and 8*", dated August 2001 by Mirai Associates.

Phase 2 Screening Process

Design Concept Development

Further project definition and refinement took place in Phase 2, which began shortly after the end of Phase 1 in August 2001 and continued through January 2002. In addition, the Federal Highway Administration and the City of Seattle became project co-leads with WSDOT. At this time, additional information was collected regarding the condition of the Alaskan Way Seawall. The information showed that the Seawall was also seismically vulnerable and in a state of disrepair. The information also showed that the structural integrity of the Viaduct is dependent on the Seawall. As a result, the project purpose and need statement was revised to include the Seawall, and the project screening criteria were revised to support the new purpose and need statement. Additional design concepts were developed and evaluated as part of the Phase 2 screening process to consider both the AWV Corridor and the Seawall. These concepts were suggested in meetings involving WSDOT, the City of Seattle, FHWA, neighborhood groups, business interests, organizations and agencies, and the public.

Phase 1 design concepts and Phase 2 design concepts for the Viaduct structure were merged into a list of 64 total concepts to be evaluated in the Phase 2 screening process. These 64 design concepts are listed in Appendix A. Seawall concepts were developed and evaluated separately in the Phase 2 process and are discussed in a separate section below.

Screening Criteria Development

The Phase 2 screening criteria were developed based upon the draft project Purpose and Need statement dated November 2, 2001. The project purpose as stated in the November 2, 2001 statement was "to maintain or improve mobility for people and goods along the existing SR 99 corridor and to improve safety, including the ability of the transportation facilities and the Seawall to resist earthquakes." With this project purpose in mind, the screening criteria were developed to include nine goals. These nine goals were agreed upon by WSDOT, the City, and FHWA.

Phase 2 Screening Results

The Phase 2 screening criteria in combination with qualitative and quantitative analyses were used to reduce the number of design concepts for the Viaduct and related improvements from 64 to 19. Details related to the Phase 2 screening activities are documented in the *Screening of Initial Concepts Technical Memorandum*, dated January 2002 by Parsons, Brinckerhoff, Quade, and Douglas Inc.

The 19 design concepts that made it through the screening process were refined into five conceptual alternatives for further evaluation and engineering analysis. Additional information regarding the development of conceptual alternatives is documented in the *Development of Conceptual Alternatives Technical Memorandum*, dated February 2002 by Parsons, Brinckerhoff, Quade, and Douglas, Inc.

Seawall Screening Process

Seawall design concepts were screened as a part of the overall Phase 2 screening process. The results of that process are documented in the *SIR: Alaskan Way Viaduct and Seawall Project Screening of Seawall Concepts*, dated March 2002 written by Berger/ Abam Engineers.

REVISED SCREENING PROCESS

Purpose of Revised Screening Process

Conceptual engineering conducted as part of the Phase 2 process resulted in additional information on design options and cost. This information indicated that the estimated cost of constructing several of the conceptual Viaduct and Seawall alternatives were high given potential funding sources. In addition, in November 2002, voters rejected Referendum 51, a tax plan that would have provided some funding for the Alaskan Way Viaduct and Seawall Replacement Project. Due to the lack of project funding, conceptual design options were re-examined to identify additional design options that might be more financially feasible to implement. To broaden the range of options that could be considered, the screening criteria were revised. Because the screening criteria were changed, all of the design concepts from Phase 1 and Phase 2 were re-screened.

Information related to screening for the Viaduct design options are contained in this memorandum. Information related to screening for the Seawall options are contained in a separate memorandum called *SR 99 Alaskan Way Viaduct and Seawall Project Revised Screening of Seawall Concepts*, dated June 2003 submitted by Parsons, Brinckerhoff, Quade, and Douglas.

Design Concept Development

Design Concepts from Phases 1 and 2

A total of 64 design concepts were developed and evaluated in the Phase 1 and Phase 2 screening processes. These 64 concepts are listed in Appendix A and were included for re-evaluation using the new screening criteria. Two of the concepts were merged into one, leaving 63 concepts that were re-evaluated.

Design Concepts Added

Thirteen additional concepts were developed as a result of ongoing conceptual engineering and additional public input. These additional concepts are described in greater detail in this document and include the following:

- Retrofit the existing single-level Viaduct structure
- Rebuild the existing double-level Viaduct structure
- Enclosed one-level aerial replacement – west of existing location
- Combined one-level, two-way express tunnel with two-way surface street
- Combined one or two-level, two-way express aerial with two-way surface street

- Fire, life, safety upgrade to the existing Battery Street Tunnel
- Seismic upgrade to the existing Battery Street Tunnel
- Lowered SR 99/ Aurora
- Widened Mercer
- Existing Mercer with Signals on SR 99 north of Battery Street Tunnel

Three concepts previously developed have been further refined in to specific design options. These refined design options include the following:

- Double-level cut-and-cover tunnel through Belltown
- Single bored or mined tunnel under Belltown
- Multiple bored or mined tunnels under Pelltown

Screening Criteria Development

To determine the range of options to be included in the EIS, the screening criteria were revised to reflect changed financial conditions. The screening criteria were revised to support the project purpose and need and are expressed as a series of ten goals. The revised screening criteria were approved by WSDOT, FHWA, City of Seattle, and participating agencies in the Resource Agency Leadership Forum³, and are listed below.

- Goal 1: An alternative must provide facilities that meet current seismic design standards.
- Goal 2: An alternative must maintain the current transportation functions of the Alaskan Way Viaduct Corridor.
- Goal 3: An alternative should not further degrade the operation of other major transportation facilities.
- Goal 4: An alternative should improve traffic safety.
- Goal 5: An alternative should maintain regional transportation linkages.
- Goal 6: An alternative should support bicycle and pedestrian accessibility and mobility.
- Goal 7: An alternative should be compatible with local, express, and high-capacity transit.
- Goal 8: An alternative should support land use and shoreline plans and policies pertaining to development of the downtown Seattle waterfront.
- Goal 9: An alternative should support improved habitat for fish and wildlife along the Alaskan Way Seawall.

³ The Resource Agency Leadership Forum is comprised of regulatory agencies party to the Signatory Agency Committee (SAC) Agreement and local agencies having jurisdiction in the project area.

OVERVIEW OF DESIGN CONCEPTS AND SCREENING RESULTS

There are 76 design concepts identified for rebuilding, replacing, or improving the Alaskan Way Viaduct and its associated corridor. These design concepts have been grouped into five main categories as outlined below. Refer to Appendix C for a summary of the design concepts and results.

A. AWV Improvements from S. Holgate Street to the Battery Street Tunnel

- Retrofit or rebuild the existing Alaskan Way Viaduct
- Replace the Viaduct with an aerial structure
- Replace the Viaduct with a tunnel
- Replace the Viaduct with a surface boulevard
- Replace the Viaduct with a combination of aerial, tunnel, and surface concepts

B. Battery Street Tunnel Improvements within the Existing AWV Corridor

- Upgrade existing Battery Street Tunnel
- Construct a new tunnel through Belltown

C. Roadway Improvements Outside of the AWV Corridor

- Replace the Viaduct with a tunnel outside of the AWV Corridor
- Replace the Viaduct with a bridge across Elliott Bay
- Replace the Viaduct with a submerged or floating tunnel along the waterfront on Elliott Bay
- Replace the Viaduct with a floating bridge along the waterfront on Elliott Bay
- Replace the Viaduct with I-5 improvements
- Replace the Viaduct with combined use of the existing BNSF tunnel under downtown Seattle

D. Multimodal Solutions

- Implement transit and trip reduction measures to maximize efficiency and people-moving capacity in the AWV Corridor

E. Related Improvements (would be combined with other Viaduct replacement concepts)

- Add ramps and improve access
- Extend Alaskan Way Corridor
- Extend SR 99 grade separation

- Improve connections
- Improve freight access
- Improve ferry connections
- Improve pedestrian connections and environment
- Incorporate retail, residential, and public space into aerial structure

In addition to the concepts considered in this screening process, the No Action alternative will be evaluated in the project Environmental Impact Statement (EIS), as required by the National Environmental Policy Act (NEPA).

- Goal 10: An alternative should rely on proven construction methods, minimize construction duration, and promote effective traffic management during construction.

All design concepts were screened using the ten goals above. Goals 1 and 2 had to be met for an alternative to be advanced. Concepts that did not meet goals 1 and 2 were dropped. Options that met goals one and two were evaluated against the remaining goals. Where similar options were available, the concept that best met the screening criteria goals and project purpose and need were advanced for further consideration. The screening results are summarized in Appendix C.

Screening Results

All 76 design concepts have been screened using the criteria outlined above. The rest of this memorandum describes the design options, their key features, and screening results. The Screening Evaluation Table contained in Appendix C shows how the ten screening criteria goals were used to evaluate the design concepts. The 76 design concepts evaluated were screened to 26 concepts to be carried forward for further analysis in the project EIS.

**Alaskan Way Viaduct and Seawall Replacement Project
Screening Results Summary Table**

Concept	In EIS	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8	Goal 9	Goal 10	Other
A	AWV Improvements from S Holgate Street to the Battery Street Tunnel											
A1a												●
A1b	●											●
A1c		●				●						●
A1d	●											●
A2a	●						●					●
A2b	●										●	●
A2c									●			●
A3a									●			●
A3b	●											
A4a	●								●			●
A4b	●											
A5a	●											
A5b											●	●
A6												●
A7												●
A8												●
A9	●											

4

Alaskan Way Viaduct and Seawall Replacement Project
Screening Results Summary Table

Concept	In EIS	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8	Goal 9	Goal 10	Other
A10 Combine a Two-Way Bypass Aerial with a Two-Way Surface Arterial	●											
A11 Bored Tunnels under Alaskan Way											●	●
B Battery Street Tunnel Improvements Within the AWV Corridor												
B1a Fire, Life, and Safety Upgrade to the Existing Battery Street Tunnel	●											
B1b Seismic Upgrade to the Existing Battery Street Tunnel	●											
B2 Two-Level Cut-and-Cover Tunnel through Belltown											●	●
B3a Bored or Mined Tunnel Under Belltown											●	●
B3b Bored or Mined Tunnels Under Belltown											●	●
C Roadway Improvements Outside of the AWV Corridor												
C1a Twin Bored Tunnels at Western Avenue											●	●
C1b Twin Bored Tunnel Routes at 1st Ave. and 2nd Ave.											●	●
C1c Twin Bored Tunnels at 3rd Avenue		●									●	●
C1d Twin Bored Tunnel Routes at 4th and 5th Avenue - East Portal		●									●	●
C1e Twin Bored Tunnel Routes at 4th and 5th Avenue - South Portal		●									●	●
C1f Twin Bored Tunnel Route at I-5		●									●	●
C2 Signature Bridge Across Elliott Bay from West Seattle		●		●		●			●			
C3 Elliott Bay Submerged Tunnel along Waterfront Area		●		●		●			●			
C4 I-5 Improvements to Accommodate a Portion of SR 99 Demand			●									●
C5 Elliott Bay Floating Tunnel along Waterfront Area				●							●	●
C6 Signature Bridge from Stadium Area to Belltown via Elliott Bay			●	●					●			●

- This option would provide unbalanced access and travel times between NB and SB traffic. The direction of traffic traveling on the surface arterial would likely have increased travel times, but more downtown access through surface street connections. The direction of traffic traveling in the tunnel would have fewer possible access points to the waterfront, downtown and Ballard/Interbay, but travel times would likely be comparable to existing conditions. The intent of this design concept and the project purpose and screening criteria goals can be better met by other design options such as A5a, One-Level Cut-and-Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial.

A9: COMBINE ONE-LEVEL, TWO-WAY BYPASS TUNNEL WITH TWO-WAY SURFACE ARTERIAL

General Functional Description

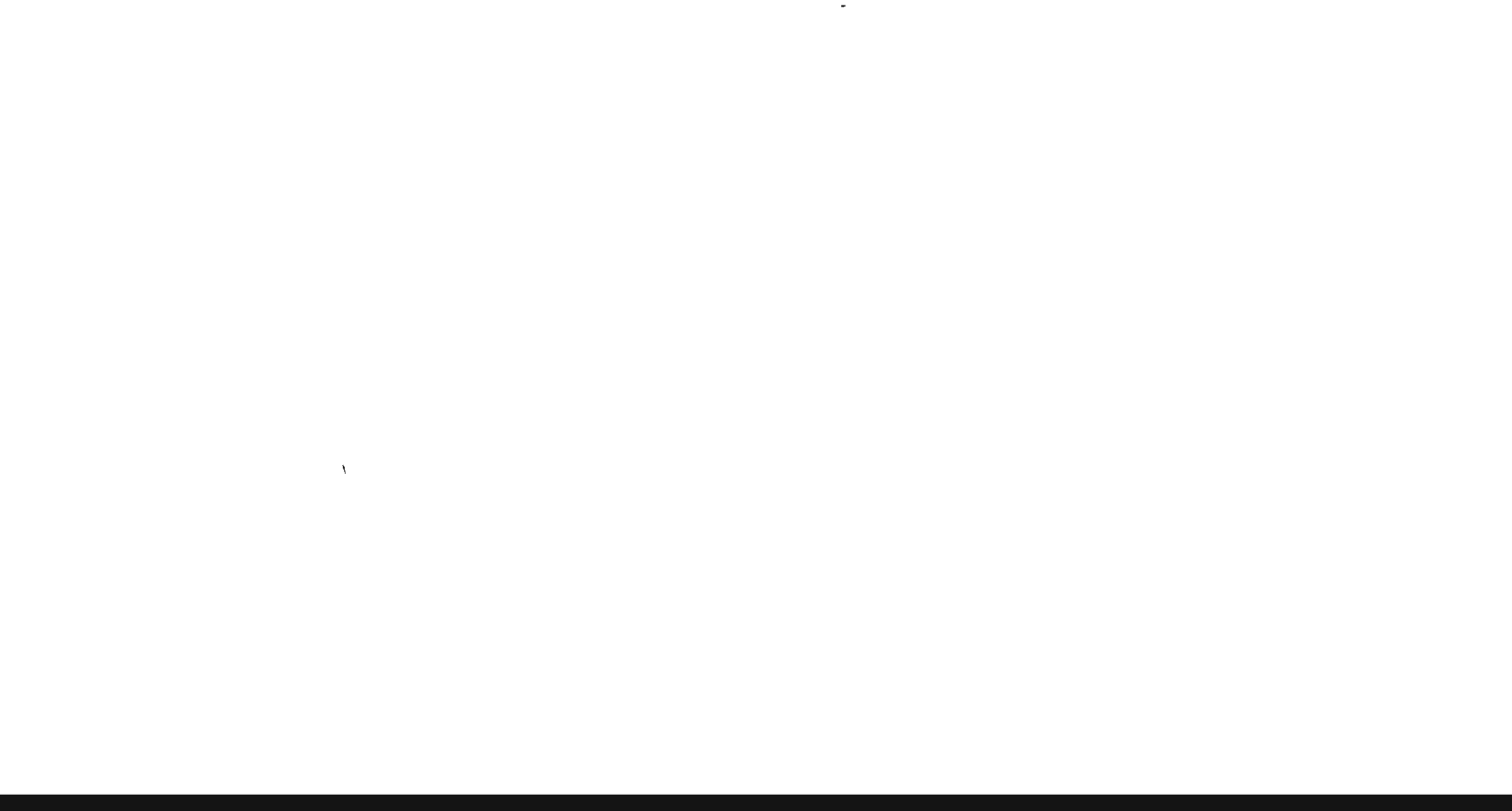
This is a combination concept that proposes to replace the Viaduct with a one-level, two-way tunnel under the Alaskan Way surface street along the downtown waterfront⁴ and a two-way surface street on the top. The tunnel would serve as an express route for through traffic and would have two lanes in each direction. Downtown ramps would be provided in the vicinity of King Street. The Alaskan Way surface street would provide access to the waterfront, downtown, and Ballard/Interbay. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Downtown ramps would be provided in the vicinity of King Street. Access to the waterfront, downtown, and Ballard/Interbay would be provided through multiple surface street connections
- Separates through and local traffic
- Removes visual barrier along waterfront
- Removal of Viaduct structure allows for a variety of urban design options
- Western tunnel wall becomes new seawall
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Tunnel requires ventilation system
- Improves traffic safety issues related to nonstandard lane and shoulder widths

Screening Results

This option will be carried forward for further evaluation in the EIS.



A10: COMBINE TWO-WAY BYPASS AERIAL WITH TWO-WAY SURFACE ARTERIAL

General Functional Description

This is a combination concept that proposes to replace the Viaduct along the downtown waterfront with a two-way bypass aerial structure and a two-way surface street. The new aerial facility could be either single-level or double-level aerial structure. The aerial structure would serve as an express route for through traffic and would have two lanes in each direction. Downtown ramps could be provided in the vicinity of King Street. The Alaskan Way surface street would provide access to the waterfront, downtown, and Ballard/Interbay. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Downtown ramps could be provided in the vicinity of King Street. Access to the waterfront, downtown, and Ballard/Interbay would be provided through multiple surface street connections
- May shorten duration of construction compared with other concepts
- Separates through and local traffic
- Provides access to downtown at multiple locations
- May reduce existing visual impacts along waterfront, though visual impacts would remain
- May improve noise over existing conditions
- Improves traffic safety issues related to nonstandard lane and shoulder widths

Screening Results

This option will be carried forward for further evaluation in the EIS.

A11: BORED TUNNELS UNDER ALASKAN WAY

General Functional Description

Bored tunnels under the existing Alaskan Way surface street along the downtown waterfront⁴ would replace the Viaduct. The concept includes two lanes in each direction, and the tunnel would accommodate through traffic. Access to the waterfront, downtown, and Ballard/Interbay would be provided through Alaskan Way surface street connections, a ramp near the King Street area might be feasible. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Access to the waterfront, downtown, and Ballard/Interbay would be provided through multiple surface street connections. Ramps near King Street might be feasible.
- Separates through and local traffic, with through traffic focus
- Removes visual barrier along waterfront
- Removal of Viaduct structure allows for a variety of urban design options
- Limited property impacts
- Reduces traffic noise
- Improves traffic safety issues related to nonstandard lane and shoulder widths
- Would not address seawall deficiencies unless paired with a design option to improve the seawall
- Requires complex, state-of-the-art construction with high costs and high risks
- Relatively long construction period compared with other concepts
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Requires complex design for capacity, safety, and ventilation

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 – The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States.
- In addition to construction risk, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and the project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

B2: TWO-LEVEL, CUT-AND-COVER TUNNEL THROUGH BELLTOWN

General Functional Description

A new cut-and-cover tunnel would be constructed through Belltown under Bell Street to connect to a replacement Viaduct structure on the south and SR 99 on the north. The new tunnel would be a two-level, cut-and-cover tunnel with three lanes in each direction. The existing Battery Street Tunnel would be abandoned. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Provides additional capacity to the AWW Corridor by adding one-lane in each direction through the new tunnel
- Construction duration is lengthy
- Construction risks are high due to hazardous soils and groundwater issues
- Improves traffic safety issues related to nonstandard lane and shoulder widths

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 - The risk of constructing a cut-and-cover tunnel through Belltown would be high because the width of the tunnel would come very close to existing footings of both historic and high-rise buildings.
- This concept is dropped because conceptual engineering analysis of this option revealed that it would cost more to build a new Battery Street Tunnel than what could reasonably be funded in the foreseeable future. Therefore, the project purpose and screening criteria goals can be better met by the No Action option to continue utilizing the Battery Street Tunnel; option B1a, Fire, Life, and Safety Upgrade to the Existing Battery Street Tunnel; and/or option B1b Seismic Upgrade to the Existing Battery Street Tunnel.

B3a: BORED OR MINED TUNNEL UNDER BELLTOWN

General Functional Description

A new bored or mined tunnel would be constructed under Belltown to connect to a replacement Viaduct structure to the south and the existing SR 99 to the

north. There are several possible alignments for the tunnel. The new tunnel would be a two-level, deep tunnel with three lanes in each direction. The existing Battery Street Tunnel would be abandoned. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Provides additional capacity to the AWV Corridor by adding one-lane in each direction through the new tunnel
- Requires complex, state-of-the-art construction with high costs and high risks
- Relatively long construction period compared with other concepts
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Requires complex design for capacity, safety, and ventilation
- Improves traffic safety issues related to nonstandard lane and shoulder widths

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 – The risk of constructing bored or mined tunnels would be high, due to the size of the tunnels required to accommodate 3 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States.
- This concept is dropped because conceptual engineering analysis of this option revealed that it would cost more to build a new Battery Street Tunnel than what could reasonably be funded in the foreseeable future. Therefore, the project purpose and screening criteria goals can be better met by the No Action option to continue utilizing the Battery Street Tunnel; option B1a, Fire, Life, and Safety Upgrade to the Existing Battery Street Tunnel; and/or option B1b Seismic Upgrade to the Existing Battery Street Tunnel.

B3b: BORED OR MINED TUNNELS UNDER BELLTOWN

General Functional Description

Similar description to design concept B4a, only two smaller diameter tunnels would be constructed under Belltown to connect to a replacement Viaduct structure to the south and the existing SR 99 to the north. Three lanes would be

provided in each direction. The existing Battery Street Tunnel would be abandoned. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Provides additional capacity to the AWV Corridor by adding one-lane in each direction through the new tunnel
- Requires complex, state-of-the-art construction with high costs and high risks
- Relatively long construction period compared with other concepts
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Requires complex design for capacity, safety, and ventilation
- Improves traffic safety issues related to nonstandard lane and shoulder widths

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 – The risk of constructing bored or mined tunnels would be high, due to the size of the tunnels required to accommodate 3 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States.
- This concept is dropped because conceptual engineering analysis of this option revealed that it would cost more to build a new Battery Street Tunnel than what could reasonably be funded in the foreseeable future. Therefore, the project purpose and screening criteria goals can be better met by the No Action option to continue utilizing the Battery Street Tunnel; option B1a, Fire, Life, and Safety Upgrade to the Existing Battery Street Tunnel; and/or option B1b Seismic Upgrade to the Existing Battery Street Tunnel.

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 - The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States.
- In addition to construction risk, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

C1b: TWIN BORED TUNNEL ROUTES AT 1ST AVE. AND 2ND AVE.

General Functional Description

In this concept, the Viaduct along the downtown waterfront* would be replaced with twin bored tunnels under 1st and 2nd Avenues. Two lanes would be provided in each tunnel and 2nd Avenue provides extra width potential for increased tunnel capacity. Ramps to downtown would not be provided but waterfront, downtown, and Ballard/Interbay access would be possible through Alaskan Way surface street connections. This concept would require bypassing the Battery Street Tunnel and constructing a new tunnel at the north end. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Ramps to downtown would not be provided, but waterfront, downtown, and Ballard/Interbay access would be possible through Alaskan Way surface street connections
- Separates through and local traffic, with through traffic focus
- Removes visual barrier along waterfront

- Removal of Viaduct structure allows for a variety of urban design options
- Requires bypassing Battery Street tunnel and constructing a new tunnel at the north end
- Limited property impacts
- Reduces traffic noise
- Improves traffic safety issues related to nonstandard lane and shoulder widths
- Would not address seawall deficiencies unless paired with a design option to improve the seawall
- Requires complex, state-of-the-art construction with high costs and high risks
- Relatively long construction period compared with other concepts
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Requires complex design for capacity, safety, and ventilation

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 – The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States.
- In addition to construction risk, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

C1c: TWIN BORED TUNNELS AT 3RD AVE.

General Functional Description

This concept proposes to replace the existing Viaduct along the downtown waterfront¹ with twin bored tunnels under 3rd Avenue, below the bus tunnel.

The tunnel would connect with SR 99 north and south of downtown. Ramps to downtown would not be provided but waterfront, downtown, and Ballard/Interbay access would be possible through Alaskan Way surface street connections. This concept would require bypassing the Battery Street Tunnel and constructing a new tunnel at the north end. The facility would be constructed to meet design standards for lane and shoulder widths, where feasible.

Key Features

- Ramps to downtown would not be provided, but waterfront, downtown, and Ballard/Interbay access would be possible through Alaskan Way surface street connections
- Separates through and local traffic, with through traffic focus
- Removes visual barrier along waterfront
- Removal of Viaduct structure allows for a variety of urban design options
- Requires bypassing Battery Street tunnel and constructing a new tunnel at the north end
- Limited property impacts
- Reduces traffic noise
- Improves traffic safety issues related to nonstandard lane and shoulder widths
- Would not address seawall deficiencies unless paired with a design option to improve the seawall
- Requires complex, state-of-the-art construction with high costs and high risks
- Relatively long construction period compared with other concepts
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Requires complex design for capacity, safety, and ventilation

Screening Results

This option has been dropped, and it will not be evaluated in the EIS because it does not meet the following goals:

- Goal 10 – The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2-3 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States.
- In addition, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that

the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

C1d: TWIN BORED TUNNEL ROUTES AT 4TH AVE. AND 5TH AVE. – EAST PORTAL

General Functional Description

This concept proposes to replace the existing Viaduct along the downtown waterfront⁴ with twin bored tunnels under 4th and 5th Avenues. They would connect with SR 99 north and south of downtown. The southern terminus would be east of the E-3 bus way at about S. Massachusetts and the north terminus would be at SR 99, just south of Mercer Street. Ramps to downtown would not be provided but waterfront, downtown, and Ballard/Interbay access would be possible through Alaskan Way surface street connections.

Key Features

- Ramps to downtown would not be provided but waterfront, downtown, and Ballard/Interbay access would be possible through Alaskan Way surface street connections
- Separates through and local traffic, with through traffic focus
- Removes visual barrier along waterfront
- Removal of Viaduct structure allows for a variety of urban design options
- Requires bypassing Battery Street tunnel and constructing a new tunnel at the north end
- Limited property impacts
- Reduces traffic noise
- Improves traffic safety issues related to nonstandard lane and shoulder widths
- Would not address seawall deficiencies unless paired with a design option to improve the seawall
- Requires complex, state-of-the-art construction with high costs and high risks
- Relatively long construction period compared with other concepts
- Hazardous soils and groundwater issues present challenges for tunnel construction
- Requires complex design for capacity, safety, and ventilation

ALASKAN WAY VIADUCT AND SEAWALL REPLACEMENT PROJECT
SCREENING RESULTS TABLE

CONCEPT		STATUS	COMMENTS
NO.	DESCRIPTION		
A11	Bored Tunnels under Alaskan Way	DROPPED	<p>Justification:</p> <ul style="list-style-type: none"> ➤ Goal 10 – The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2-3 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States. ➤ In addition to construction risk, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and the project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and-Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

ALASKAN WAY VIADUCT AND SEAWALL REPLACEMENT PROJECT

SCREENING RESULTS TABLE

CONCEPT		STATUS	COMMENTS
NO.	DESCRIPTION		
B3a	Bored or Mined Tunnel Under Belltown	DROPPED	<p>Justification:</p> <ul style="list-style-type: none"> ➤ Goal 10 – The risk of constructing bored or mined tunnels would be high, due to the size of the tunnels required to accommodate 3 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States. ➤ This concept is dropped because conceptual engineering analysis of this option revealed that it would cost more to build a new Battery Street Tunnel than what could reasonably be funded in the foreseeable future. Therefore, the project purpose and screening criteria goals can be better met by the No Action option to continue utilizing the Battery Street Tunnel; option B1a, Fire, Life, and Safety Upgrade to the Existing Battery Street Tunnel; and/or option B1b Seismic Upgrade to the Existing Battery Street Tunnel.
B3b	Bored or Mined Tunnels Under Belltown	DROPPED	<p>Justification:</p> <ul style="list-style-type: none"> ➤ Goal 10 – The risk of constructing bored or mined tunnels would be high, due to the size of the tunnels required to accommodate 3 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States. ➤ This concept is dropped because conceptual engineering analysis of this option revealed that it would cost more to build a new Battery Street Tunnel than what could reasonably be funded in the foreseeable future. Therefore, the project purpose and screening criteria goals can be better met by the No Action option to continue utilizing the Battery Street Tunnel; option B1a, Fire, Life, and Safety Upgrade to the Existing Battery Street Tunnel; and/or option B1b Seismic Upgrade to the Existing Battery Street Tunnel.

ALASKAN WAY VIADUCT AND SEAWALL REPLACEMENT PROJECT

SCREENING RESULTS TABLE

CONCEPT		STATUS	COMMENTS
NO.	DESCRIPTION		
C. ROADWAY IMPROVEMENTS OUTSIDE OF THE AWV CORRIDOR			
C1a	Twin Bored Tunnels at Western Ave.	DROPPED	<p>Justification:</p> <ul style="list-style-type: none"> ➤ Goal 10 – The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States. ➤ In addition to construction risk, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and the project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and-Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

ALASKAN WAY VIADUCT AND SEAWALL REPLACEMENT PROJECT

SCREENING RESULTS TABLE

CONCEPT		STATUS	COMMENTS
NO.	DESCRIPTION		
C1b	Twin Bored Tunnel Routes at 1 ST and 2 ND AVE.	DROPPED	<p>Justification:</p> <ul style="list-style-type: none"> ➤ Goal 10 – The risk of constructing bored tunnels would be high, due to the size of the tunnels required to accommodate 2 lanes in each direction with shoulders. The width of such tunnels would likely exceed the size of any bored tunnels constructed in the United States. ➤ In addition to construction risk, the bored tunnel concept would not address the seismic deficiencies of the existing Seawall unless it is paired with a separate Seawall option. Conceptual engineering of this option has shown that the cost to build both a new Seawall and the bored tunnels is greater than what could reasonable be funded in the foreseeable future. Therefore, the intent of this design concept and the project purpose and screening criteria goals can be better met by design options A5a, One-Level Cut-and-Cover Tunnel and/or A9, Combine One-Level, Two-Way Bypass Tunnel with Two-Way Surface Arterial. These design options address the seismic deficiencies of both the Viaduct and Seawall with fewer risks and lower costs than a bored tunnel concept.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
GOAL 1 - An alternative must provide facilities that meet current seismic design standards ¹ .		
A. Meets Current Seismic Standards	An alternative meets the current WSDOT and AASHTO seismic design standards.	Note the characteristic(s) of an alternative that appear seismically vulnerable.
B. Improves Integrity of Seawall	An alternative must improve the structural integrity of the existing Alaskan Way Seawall.	Note alternatives where structural improvements to the existing seawall are not proposed or would be precluded. Note areas (if any) where proposed seawall improvements would meet less stringent seismic standards than improvements for the roadway facility.

¹ Goals 1 and 2 must be met for any design concept to be advanced. If it does not meet goals 1 and 2, it will be dropped from consideration without further evaluation.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
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GOAL 2 - An alternative must maintain the current transportation functions of the Alaskan Way Viaduct Corridor ¹ .		
A. Transportation Functions	An alternative must maintain transportation-related functions including movement of people, freight, and goods to and from the central downtown core; between manufacturing and industrial centers, and through traffic on SR 99.	<p>Note the transportation functions that cannot be provided by an alternative. Specifically the movement of people, freight, and goods.</p> <ul style="list-style-type: none"> • To and from downtown • Between the Duwamish industrial area and Ballard/Interbay • Through downtown

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
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GOAL 3 - An alternative should not further degrade the operation of other major transportation facilities.		
A. Major Transportation Facilities	An alternative should not further degrade the operation of other major transportation facilities. An alternative could include the possibility of additional transit service and the use of TDM/TSM measures to maintain mobility.	List the location(s) where an alternative would cause degradation in operations and describe the magnitude of that impact to existing major transportation facilities.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
GOAL 4 - An alternative should improve traffic safety.		
A. Roadway Design Standards	An alternative should improve traffic safety by meeting WSDOT approved roadway design standards for lane widths, shoulder widths, and ramps.	List the location(s) where an alternative does not meet roadway design standards and briefly describe the safety implications of not meeting the standards.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
GOAL 5 - An alternative should maintain regional transportation linkages.		
A. Regional Transportation Projects	An alternative should integrate functionally with other transportation projects currently underway or planned. Planned projects may include SR 519, Spokane Street Viaduct Widening Project, and SR 509.	List the transportation system project(s) that are precluded or restricted.
B. Regional Linkages	An alternative should maintain existing regional linkages to I-5, SR 520, and the Mercer Corridor.	List the transportation system linkages that are precluded or restricted
C. Ferry System Access	An alternative must maintain vehicular and pedestrian access to the ferry system.	Note how vehicular and pedestrian access to the ferry system would be precluded or restricted by an alternative.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
GOAL 6 - An alternative should support bicycle and pedestrian accessibility and mobility.		
A. Pedestrian Accessibility and Mobility	An alternative should allow pedestrian movement between the waterfront, downtown core, stadiums, and Pike Place Market area.	Note areas in listed locations where pedestrian movement would be substantially impeded or precluded.
B. Bicycle Accessibility and Mobility	An alternative should allow bicycle travel along the corridor with connections to bicycle routes.	Note areas along the corridor where bicycle travel would be substantially impeded or precluded.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
GOAL 7 - An alternative should be compatible with local, express, and high-capacity transit.		
A. Transit Access	An alternative should support access for transit to and from the corridor with connections to multiple transit modes.	List areas where an alternative does not support transit access.
B. Transit Compatibility	An alternative should be compatible with plans for local, express, and high capacity transit.	List areas where an alternative would not be compatible with plans for local, express, and high capacity transit.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
<p>GOAL 8 - An alternative should support land use and shoreline plans and policies pertaining to development of the downtown Seattle waterfront.</p>		
A. Land Use and Shoreline Plans	An alternative should support land use and shoreline plans and policies related to the downtown urban waterfront.	List and briefly describe areas that are not compatible with existing land use and shoreline plans and policies.
B. Waterfront Connections	An alternative should allow for expanded visual, physical, and aesthetic connections between downtown Seattle and the waterfront.	List areas where expanded visual, physical, and aesthetic connections would be precluded.
C. Public Access	An alternative should maintain or improve public access to and along the waterfront.	List and briefly describe area(s) where continued development of the waterfront for public access would be inhibited.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
GOAL 9 - An alternative should support improved habitat for fish and wildlife along the Alaskan Way Seawall.		
A. Marine and Intertidal Habitat	An alternative should support improved habitat in the marine and intertidal environment.	Briefly describe how an alternative could inhibit or preclude habitat improvements.

ALASKAN WAY VIADUCT AND SEAWALL PROJECT

SCREENING CRITERIA EVALUATION TABLE

EVALUATION INDICATOR	EVALUATION CRITERIA	EVALUATION METHOD
<p>GOAL 10 - An alternative should rely on proven construction methods, minimize construction duration, and promote effective traffic management during construction.</p>		
A. Construction Time	An alternative should minimize the construction timeframe.	List and briefly describe the area(s) where the length of construction time appears to have a severe impact.
B. Construction Methods	An alternative should rely on proven construction methods to avoid or minimize construction risks.	List and briefly describe the area(s) where adverse construction risks appear particularly severe.
C. Traffic Management	An alternative should promote effective traffic management within the corridor during construction.	List and briefly describe the area(s) where adverse traffic management impacts appear particularly severe.