

WSHB LONG-TERM REPLACEMENT PLANNING

EXECUTIVE SUMMARY

In March 2020, the City of Seattle closed the West Seattle Bridge to protect public safety due to the accelerated growth of new and existing structural cracks on the West Seattle High Bridge (WSHB), which is the portion of the West Seattle Bridge that crosses the west channel of the Duwamish Waterway, as illustrated in Figure ES-1.

The West Seattle Bridge has historically been the City's most used bridge, carrying an average of over 100,000 people every day. The closure has caused major traffic disruptions in West Seattle, nearby neighborhoods, and in Seattle as a whole. The WSHB is currently being repaired to address the structural deficiency and restore the bridge to service.

Understanding the repaired structure will eventually need to be replaced to maintain regional mobility, the City has undertaken a long-term planning process to identify potential replacement concepts. The planning team that undertook this study consisted of Seattle Department of Transportation (SDOT) staff and a consultant team, in consultation with SDOT subject matter experts and partner agency representatives. This long-term planning assumes the existing bridge will be repaired and open to traffic to the greatest extent possible at the time of replacement.

1. Corridor Overview

The WSHB is a portion of the longer West Seattle Bridge, which is the primary east-west route for accessing West Seattle, the portion of the City located west of the Duwamish Waterway. The WSHB and surrounding facilities in the corridor are illustrated on Figure ES-1.

Figure ES-1. WSHB Context



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West Seattle, the part of the City to the west of the WSHB, is known for its marine setting and distinct neighborhoods, which include Admiral, Alki, Arbor Heights, Delridge, Fauntleroy, Morgan, and West Seattle Junction. The areas served by the West Seattle Bridge also include the western portions of the Duwamish Manufacturing and Industrial Center (MIC), one of two designated MICs in Seattle, as identified by the Puget Sound Regional Council (PSRC) and the City. The land uses immediately under the bridge are mostly transportation, port, and industrial, but there are residential and neighborhood commercial areas to the south and west. The lower Spokane Street Bridge is located just north of the WSHB. The next nearest Duwamish Waterway crossing is more than 3 miles to the south.

The WSHB is located in or near several environmentally critical areas, including the Duwamish Waterway itself. There are seismic (liquefaction) hazard areas, steep slopes, landslide hazard areas, and flood zones, and four superfund sites in the area. The Duwamish Waterway is critical habitat for Green River Chinook and Steelhead species that are protected under the Endangered Species Act, and several tribes have traditional and accustomed fishing rights.

2. Purpose and Need for Replacement

The purpose and need for a WSHB replacement is:

To maintain the long-term transportation capacity, safety, mobility, and access needed for efficient travel across the Duwamish Waterway between West Seattle, the Duwamish Valley, and the region, while also:

- Providing for the needs of navigation on the Duwamish Waterway and supporting the maritime, intermodal shipping, and industrial activities of the Port of Seattle, Northwest Seaport Alliance, and the Duwamish Manufacturing and Industrial Center.
- Creating greater racial and social equity by avoiding impacts and seeking benefits to nearby communities, the natural and built environments, the economy, and transportation.
- Maintaining effective mobility functions on the local and regional transportation system, including the west channel of the Duwamish Waterway, both long term and during the construction of a crossing replacement.

Based on the long-term need to preserve and enhance mobility for the larger corridor between West Seattle and I-5, additional needs to be considered in future potential planning at the corridor level include:

- Provide a safe and resilient Duwamish Waterway crossing that is compatible with future corridor developments.
- Maintain essential public infrastructure connecting West Seattle to the region, allowing the corridor to avoid long-term closures and to withstand natural disasters, such as a major seismic event, flooding, or inundation related to the corridor's location within the Cascadian Subduction Zone and near the Puget Sound.
- Efficiently accommodate future multimodal transportation demand for cross-Duwamish Waterway trips between West Seattle and the local and regional transportation system, as West Seattle and the region continue to add people, jobs, and economic activity in the coming decades.

The purpose and need for the WSHB replacement is further discussed in Appendix A, Purpose and Need Memorandum.

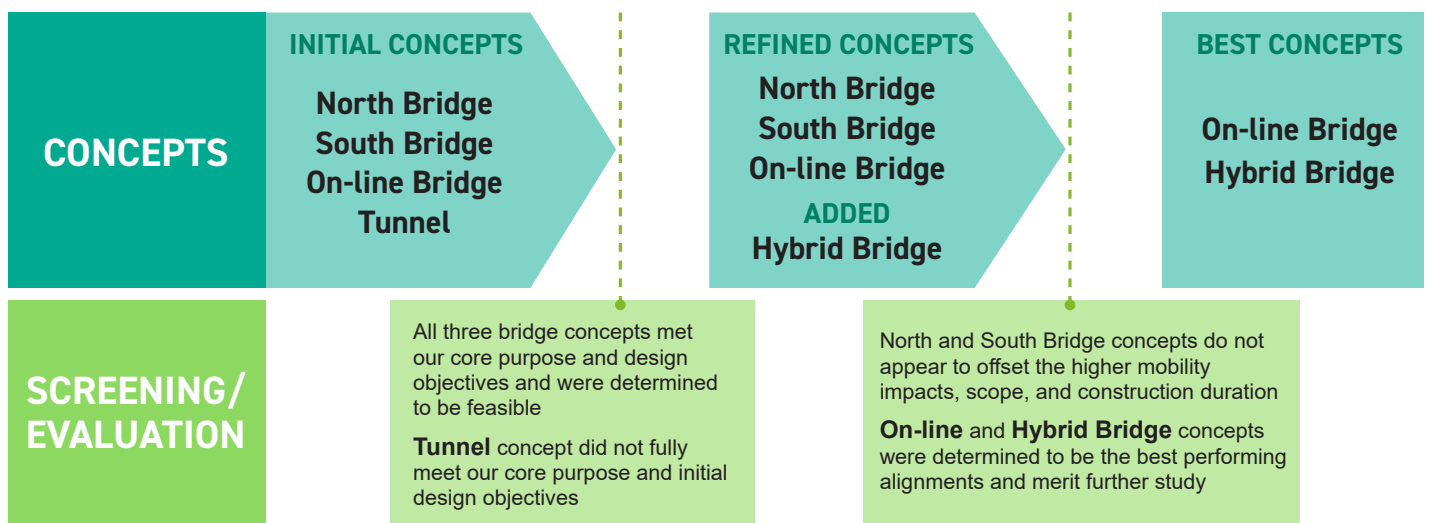
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3. Process Overview

The WSHB long-term planning effort developed its findings using a multistep planning, conceptual design, and analysis process, along with coordination with stakeholders. This process is summarized in Figure ES-2.

The first step in the WSHB long-term replacement planning process was developing a core purpose that focused on the replacement of the WSHB before the end of its service life. The planning team identified four representative concepts to screen for feasibility: three bridge concepts, including a North Bridge Concept, a South Bridge Concept, and an On-Line Bridge Concept; and a Tunnel Concept to the south of the WSHB.

Figure ES-2. WSHB Long-Term Replacement Planning Process Overview

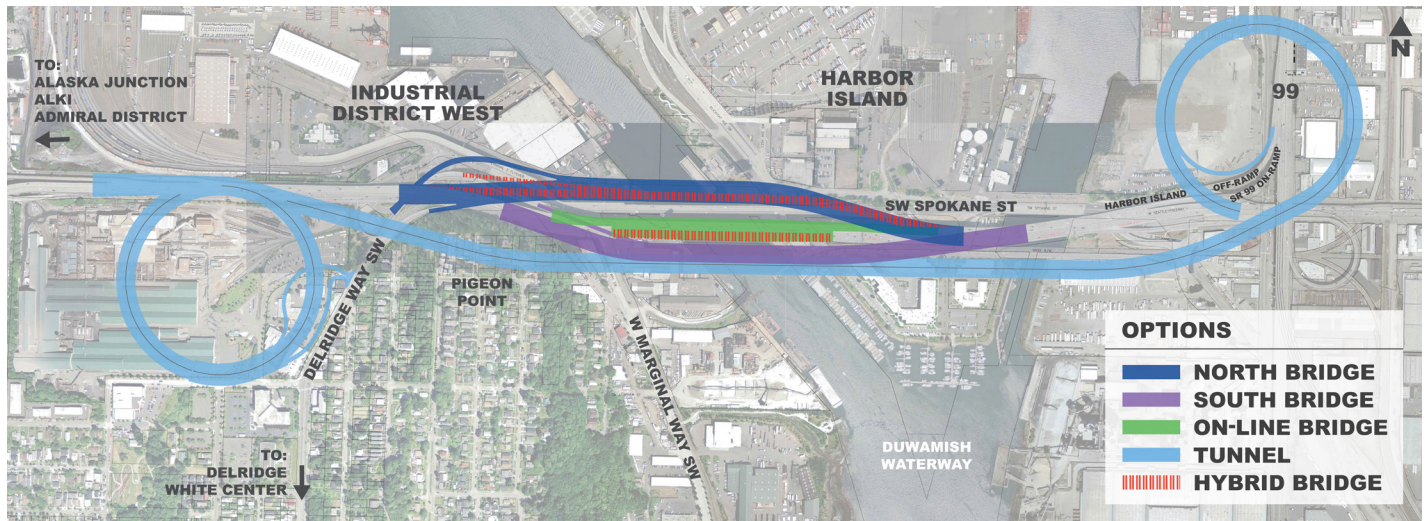


Through the feasibility screening, all of the bridge concepts were found to meet the core purpose and need of the project and were able to meet the primary design objectives. All of the bridge concepts had termini that limited replacement to the area between Delridge to the west and Harbor Island to the east. The Tunnel Concept, although technically feasible at a reduced design speed, would be the least able to replace the connections and functional services of the WSHB. The scope and scale of the Tunnel Concept would far exceed the three bridge concepts, including in terms of length, the extent of major changes to other facilities in the corridor, and in construction duration. Based on those initial feasibility findings, the planning team did not conduct additional design or construction definition for the tunnel.

Following the feasibility screening, the planning team reviewed the three representative bridge concepts to identify areas where the concepts could be improved. The team developed a new concept, the Hybrid Bridge Concept that combined the North and On-Line bridge concepts. Those four bridge concepts then underwent a more detailed evaluation that allowed the concepts to be compared across several categories, including mobility, construction challenges, construction duration, environmental impacts, racial and social equity, and order of magnitude costs. The tunnel concept was also evaluated but did not undergo further engineering detail or refinement, based on the findings from the feasibility screening showing that it had lower mobility performance and much higher magnitude scope and construction challenges. The four bridge concepts that underwent further evaluation, along with a representative Tunnel Concept, are shown in Figure ES-3.

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Figure ES-3. WSHB Representative Concepts



4. Key Findings

The planning team found the WSHB could be effectively replaced with a new bridge between Delridge Way and Harbor Island, allowing mobility to continue during construction and avoiding the need to reconstruct larger sections of the West Seattle Bridge or nearby ramps. The planning team also found:

- The On-Line and Hybrid bridge concepts best fulfilled the project purpose and need with solutions that remained primarily in the City's existing right-of-way.
- With any of the concepts, the future replacement of the WSHB would be a major capital project with a high degree of technical challenges and complexity.
- All of the concepts would reduce traffic capacity for several years during construction.
- The Hybrid Bridge Concept was the only concept that would maintain up to three lanes in each direction throughout construction (the repaired bridge has four eastbound, three westbound), compared to lengthier periods with two lanes each way for the other concepts.
- The Tunnel Concept did not warrant further detailed study, considering its poor performance compared to the other WSHB replacement concepts.

Figure ES-4 summarizes the general evaluation findings of the long-term replacement planning concepts, highlighting the primary differences in their performance.

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Figure ES-4. Summary of Concept Evaluation

	North Bridge Concept	South Bridge Concept	On-Line Bridge Concept	Hybrid Bridge Concept	Tunnel Concept
Mobility <i>Ability to maintain long-term connections, access, functions, and navigation</i>					
<i>Ability to maintain capacity during construction</i>					
Construction <i>Duration, scale, and challenges of construction</i>					
Environment <i>Potential impacts to built and natural environment</i>					
Equity <i>Impact to BIPOC and/or low-income communities and living-wage jobs</i>					

SCALE



5. Future Considerations

Beyond the key findings regarding the location and scale of a potential WSHB replacement project, the planning team also identified implementation considerations for any future project, including:

- For any WSHB replacement, it could take 14 to 20 years to deliver a project, and potentially longer if a replacement project is to be phased with other project actions in the area, such as a project involving the adjacent Spokane Street Bridge.
- Any future WSHB replacement will be a major capital project investment for the region, with a potential cost likely approaching or exceeding \$1 billion in current dollars.
- To maximize the potential for funding a future project of such importance to the region, a placeholder for the WSHB replacement in the region’s long-range Regional Transportation Plan would support a pro-active funding strategy for seeking federal, state, regional and other funding well ahead of the need for replacement.