SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT
and SECTION 4(F) EVALUATION
SR 520 BRIDGE REPLACEMENT AND HOV PROGRAM

DECEMBER 2009

SR 520: I-5 to Medina Bridge Replacement and HOV Project

Construction Techniques and Activities Discipline Report

Washington State Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

SR 520: I-5 to Medina Bridge Replacement and HOV Project Supplemental Draft EIS

Construction Techniques and Activities Discipline Report

Prepared for

Washington State Department of Transportation
Federal Highway Administration

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Acronyms and Abbreviations

BMP	best management practice
CTC	Concrete Technology Corporation
EB	Eastbound
EIS	environmental impact statement
FHWA	Federal Highway Administration
HCT	High-capacity transit
HOV	high-occupancy vehicle
I-5	Interstate 5
MOHAI	Museum of History and Industry
MSE	mechanically stabilized earth
NEPA	National Environmental Policy Act
SDEIS	supplemental draft environmental impact statement
SEM	sequential excavation method
SPCC	spill prevention control and countermeasure
SPUI	single-point urban interchange
SR	State Route
WB	westbound
WSDOT	Washington State Department of Transportation

Introduction

The purpose of the Construction Techniques and Activities Discipline Report is to 1) provide a general description of types of construction methods and techniques that would be used to construct the I-5 to Medina: Bridge Replacement and High-Occupancy Vehicle (HOV) Project, and 2) to describe the construction activities, sequencing, and durations associated with the 6-Lane Alternative and Options A, K, and L. This report supports the Description of Alternatives (Appendix A) of the Supplemental Draft Environmental Impact Statement (SDEIS) and provides context for understanding the evaluation of potential construction effects discussed in the discipline reports and SDEIS.

What is the I-5 to Medina: Bridge Replacement and HOV Project?

The Interstate 5 (I-5) to Medina: Bridge Replacement and High-Occupancy Vehicle (HOV) Project is part of the State Route (SR) 520 Bridge Replacement and HOV Program (SR 520 Program) (detailed in the text box below) and encompasses parts of three main geographic areas—Seattle, Lake Washington, and the Eastside. The project area includes the following:

- Seattle communities: Portage Bay/Roanoke, North Capitol Hill, Montlake, University District, Laurelhurst, and Madison Park

What is the SR 520 Program?

The SR 520 Bridge Replacement and HOV Program will enhance safety by replacing the aging floating bridge and keep the region moving with vital transit and roadway improvements throughout the corridor. The 12.8-mile program area begins at I-5 in Seattle and extends to SR 202 in Redmond.

In 2006, WSDOT prepared a Draft EIS—published formally as the SR 520 Bridge Replacement and HOV Project—that addressed corridor construction from the I-5 interchange in Seattle to just west of I-405 in Bellevue. Growing transit demand on the Eastside and structure vulnerability in Seattle and Lake Washington, however, led WSDOT to identify new projects, each with a separate purpose and need, that would provide benefit even if the others were not built. These four independent projects were identified after the Draft EIS was published in 2006, and these now fall under the umbrella of the entire SR 520 Bridge Replacement and HOV Program:

- I-5 to Medina: Bridge Replacement and HOV Project replaces the SR 520 roadway, floating bridge approaches, and floating bridge between I-5 and the eastern shore of Lake Washington. This project spans 5.2 miles of the SR 520 corridor.
- Medina to SR 202: Eastside Transit and HOV Project completes and improves the transit and HOV system from Evergreen Point Road to the SR 202 interchange in Redmond. This project spans 8.6 miles of the SR 520 corridor.
- Pontoon Construction Project involves constructing the pontoons needed to restore the Evergreen Point Bridge in the event of a catastrophic failure and storing those pontoons until needed.
- Lake Washington Congestion Management Project, through a grant from the U.S. Department of Transportation, improves traffic using tolling, technology and traffic management, transit, and telecommuting.

- Eastside communities: Medina, Hunts Point, Clyde Hill, and Yarrow Point
- The Lake Washington ecosystem and associated wetlands
- Usual and accustomed fishing areas of tribal nations that have historically used the area's aquatic resources and have treaty rights

The SR 520 Bridge Replacement and HOV Project Draft Environmental Impact Statement (EIS), published in August 2006, evaluated a 4-Lane Alternative, a 6-Lane Alternative, and a No Build Alternative. Since the Draft EIS was published, circumstances surrounding the SR 520 corridor have changed in several ways. These changes have resulted in decisions to forward advance planning for potential catastrophic failure of the Evergreen Point Bridge, respond to increased demand for transit service on the Eastside, and evaluate a new set of community-based designs for the Montlake area in Seattle.

To respond to these changes, the Washington State Department of Transportation (WSDOT) and the Federal Highway Administration (FHWA) initiated new projects to be evaluated in separate environmental documents. Improvements to the western portion of the SR 520 corridor—known as the I-5 to Medina: Bridge Replacement and HOV Project (the *I-5 to Medina project*)—are being evaluated in a Supplemental Draft EIS (SDEIS); this discipline report is a part of that SDEIS. Project limits for this project extend from I-5 in Seattle to 92nd Avenue NE in Yarrow Point, where it transitions into the Medina to SR 202: Eastside Transit and HOV Project (the *Medina to SR 202 project*). Exhibit 1 shows the project vicinity.

Exhibit 1. Project Vicinity Map

What are the project alternatives?

As noted above, the Draft EIS evaluated a 4-Lane Alternative, a 6-Lane Alternative (including three design options in Seattle), and a No Build Alternative. In 2006, following Draft EIS publication, Governor Gregoire identified the 6-Lane Alternative as the state's preference for the SR 520 corridor, but urged that the affected communities in Seattle develop a common vision for the western portion of the corridor. Accordingly, a mediation group convened at the direction of the state legislature to evaluate the corridor alignment for SR 520 through Seattle. The mediation group identified three 6-lane design options for

SR 520 between I-5 and the floating span of the Evergreen Point Bridge; these options were documented in a Project Impact Plan (WSDOT 2008). The SDEIS evaluates the following:

- No Build Alternative
- 6-Lane Alternative
  - Option A
  - Option K
  - Option L

These alternatives and options are summarized below. The 4-Lane Alternative and the Draft EIS 6-lane design options have been eliminated from further consideration. More information on how the project has evolved since the Draft EIS was published in 2006, as well as more detailed information on the design options, is provided in the Description of Alternatives Discipline Report (WSDOT 2009a).

What is the No Build Alternative?

Under the No Build Alternative, SR 520 would continue to operate between I-5 and Medina as it does today: as a 4-lane highway with nonstandard shoulders and without a bicycle/pedestrian path. (Exhibit 2 depicts a cross section of the No Build Alternative.) No new facilities would be added to SR 520 between I-5 and Medina, and none would be removed, including the unused R.H. Thomson Expressway ramps near the Washington Park Arboretum. WSDOT would continue to manage traffic using its existing transportation demand management and intelligent transportation system strategies.

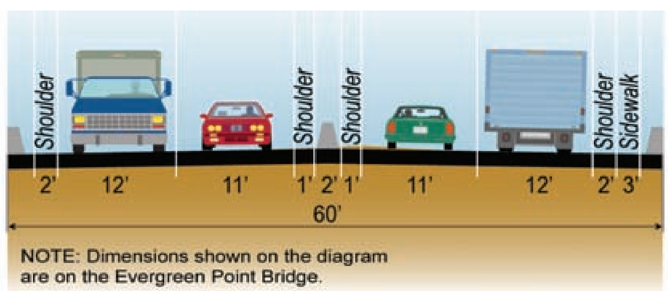
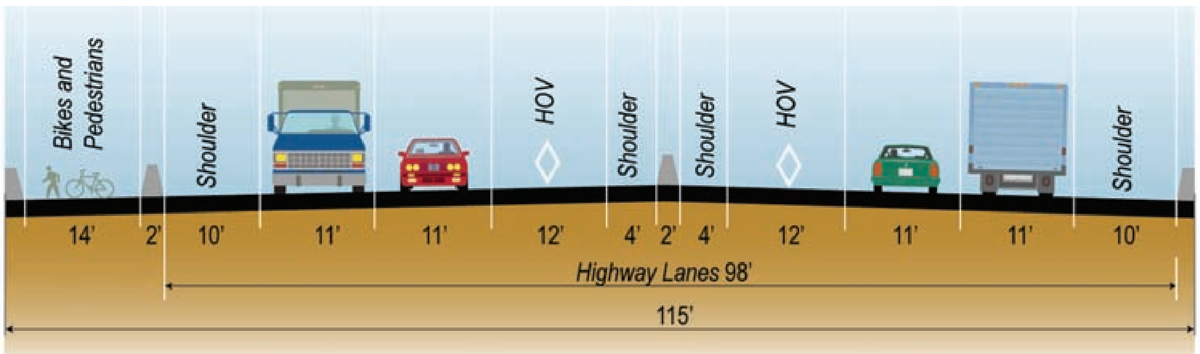


Exhibit 2. No Build Alternative Cross Section

The No Build Alternative assumes that the Portage Bay and Evergreen Point bridges would remain standing and functional through 2030 and that no catastrophic events, such as earthquakes or extreme storms, would cause major damage to the bridges. The No Build Alternative also assumes completion of the Medina to SR 202 project as well as other regionally planned and programmed transportation projects. The No Build Alternative provides a baseline against which project analysts can measure and compare the effects of each 6-Lane Alternative build option.

What is the 6-Lane Alternative?

The 6-Lane Alternative would complete the regional HOV connection (3+ HOV occupancy) across SR 520. This alternative would include six lanes (two 11-foot-wide outer general-purpose lanes and one 12-foot-wide inside HOV lane in each direction), with 4-foot-wide inside and 10-foot-wide outside shoulders (Exhibit 3). The proposed width of the roadway would be approximately 18 feet narrower than the one described in the Draft EIS, reflecting public comment from local communities and the City of Seattle.



NOTE: Dimensions shown on the diagram are on the Evergreen Point Bridge.

Exhibit 3. 6-Lane Alternative Cross Section

SR 520 would be rebuilt from I-5 to Evergreen Point Road in Medina and restriped and reconfigured from Evergreen Point Road to 92nd Avenue NE in Yarrow Point. A 14-foot-wide bicycle/pedestrian path would be built along the north side of SR 520 through the Montlake area and across the Evergreen Point Bridge, connecting to the regional path on the Eastside. A bridge maintenance facility and dock would be built underneath the east approach to the Evergreen Point Bridge.

The sections below describe the 6-Lane Alternative and design options in each of the three geographical areas the project would encompass.

Seattle

Elements Common to the 6-Lane Alternative Options

SR 520 would connect to I-5 in a configuration similar to the way it connects today. Improvements to the I-5/SR 520 interchange would include a new reversible HOV ramp connecting the new SR 520 HOV lanes to existing I-5 reversible express lanes. WSDOT would replace the Portage Bay Bridge and the Evergreen Point Bridge (including the west approach and floating span), as well as the existing local street bridges across SR 520. New stormwater facilities would be constructed for the project to provide stormwater retention and treatment. The project would include landscaped lids across SR 520 at I-5, 10th Avenue East and Delmar Drive East, and in the Montlake area to help reconnect the communities on either side of the roadway. The project would also remove the Montlake freeway transit station.

The most substantial differences among the three options are the interchange configurations in the Montlake and University of Washington areas. Exhibit 4 depicts these key differences in interchange configurations, and the following text describes elements unique to each option.

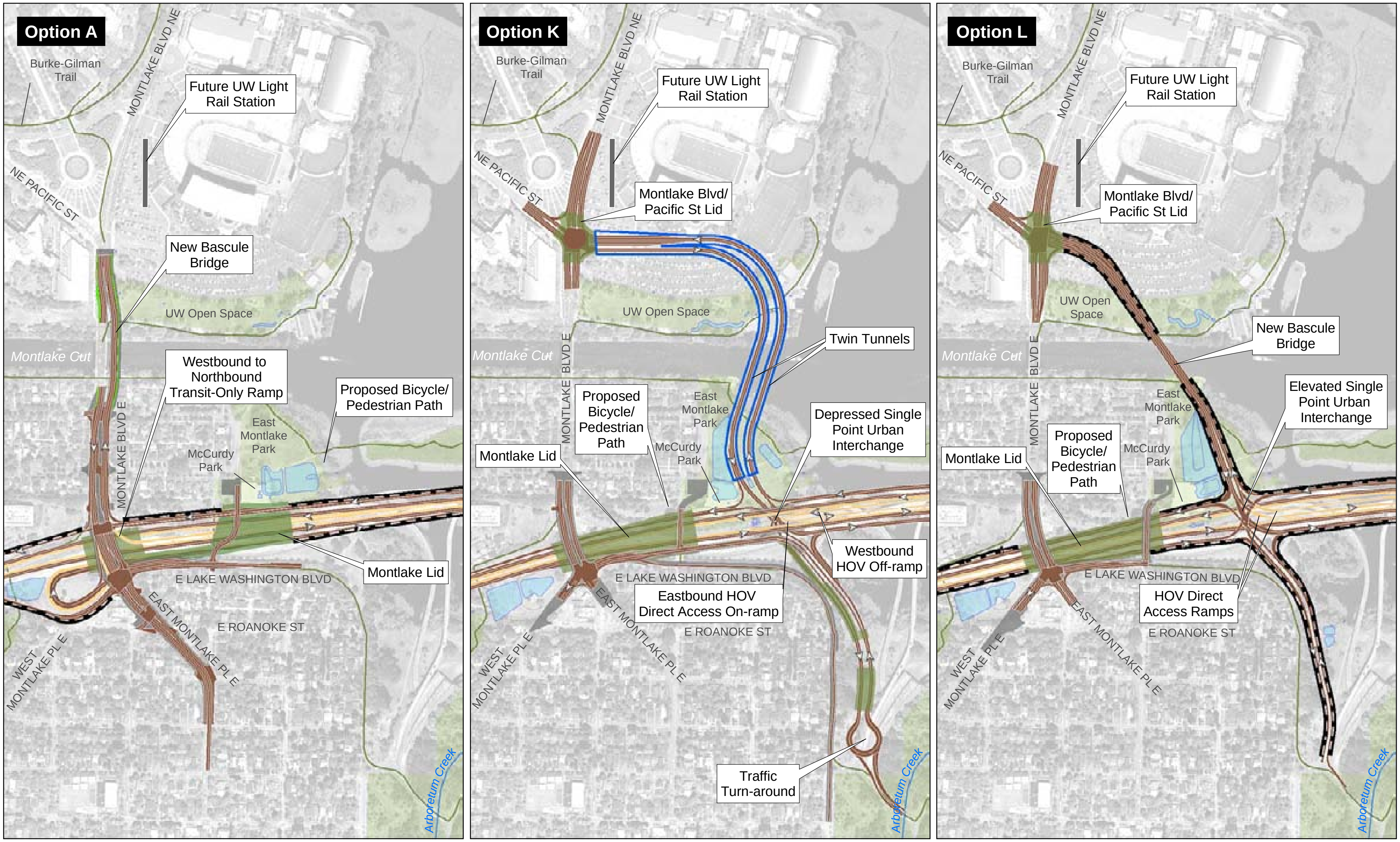
Option A

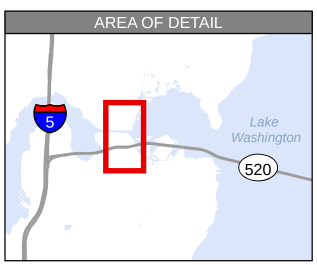
Option A would replace the Portage Bay Bridge with a new bridge that would include six lanes (four general-purpose lanes, two HOV lanes) plus a westbound auxiliary lane. WSDOT would replace the existing interchange at Montlake Boulevard East with a new, similarly configured interchange that would include a transit-only off-ramp from westbound SR 520 to northbound Montlake Boulevard. The Lake Washington Boulevard ramps and the median freeway transit stop near Montlake Boulevard East would be removed, and a new bascule bridge (i.e., drawbridge) would be added to Montlake Boulevard NE, parallel to the existing Montlake Bridge. SR 520 would maintain a low profile through the Washington Park Arboretum and flatten out east of Foster Island, before rising to the west transition span of the Evergreen Point Bridge. Citizen recommendations made during the mediation process defined this option to include sound walls and/or quieter pavement, subject to neighborhood approval and WSDOT's reasonability and feasibility determinations.

Is it a highrise or a transition span?

A transition span is a bridge span that connects the fixed approach bridge to the floating portion of the bridge. The Evergreen Point Bridge has two transition spans, one at the west end of the floating bridge transitioning traffic on and off of the west approach, and one on the east end of the floating bridge transitioning traffic on and off of the east approach. These spans are often referred to as the "west highrise" (shown) and the "east highrise" during the daily traffic report, and the west highrise even has a traffic camera mounted on it.

Today's highrises have two characteristics—large overhead steel trusses and navigation channels below the spans where boat traffic can pass underneath the Evergreen Point Bridge. The new design for the floating bridge would not include overhead steel trusses on the transition spans, which would change the visual character of the highrise. For the SDEIS, highrise and transition span are often used interchangeably to refer to the area along the bridge where the east and west approach bridges transition to the floating bridge.





Potential Sound Wall
Existing Regional Bicycle/Pedestrian Path
Tunnel
Lid or Landscape Feature
Proposed Bicycle/Pedestrian Path
Stormwater Facility
General-Purpose Lane
HOV, Direct Access, and/or Transit-Only Lane
Future UW Light Rail Station
Park

N
0 250 500 1,000 Feet

Source: King County (2006) Aerial Photo, King County (2005) GIS Data (Streams), City of Seattle (1994) GIS Data (Bike/Ped Trail), Seattle Bicycle Map (2008) GIS Data (Bike/Ped Trail) CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 4. **Options A, K, and L: Montlake and University of Washington Areas**

I-5 to Medina: Bridge Replacement and HOV Project

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Suboptions for Option A would include adding an eastbound SR 520 on-ramp and a westbound SR 520 off-ramp to Lake Washington Boulevard, creating an intersection similar to the one that exists today but relocated northwest of its current location. The suboption would also include adding an eastbound direct access on-ramp for transit and HOV from Montlake Boulevard East, and providing a constant slope profile from 24th Avenue East to the west transition span.

Option K

Option K would also replace the Portage Bay Bridge, but the new bridge would include four general-purpose lanes and two HOV lanes with no westbound auxiliary lane. In the Montlake area, Option K would remove the existing Montlake Boulevard East interchange and the Lake Washington Boulevard ramps and replace their functions with a depressed, single-point urban interchange (SPUI) at the Montlake shoreline. Two HOV direct-access ramps would serve the new interchange, and a tunnel under the Montlake Cut would move traffic from the new interchange north to the intersection of Montlake Boulevard NE and NE Pacific Street. SR 520 would maintain a low profile through Union Bay, make landfall at Foster Island, and remain flat before rising to the west transition span of the Evergreen Point Bridge. A land bridge would be constructed over SR 520 at Foster Island. Citizen recommendations made during the mediation process defined this option to include only quieter pavement for noise abatement, rather than the sound walls that were included in the 2006 Draft EIS. However, because quieter pavement has not been demonstrated to meet all FHWA and WSDOT avoidance and minimization requirements in tests performed in Washington State, it cannot be considered as noise mitigation under WSDOT and FHWA criteria. As a result, sound walls could be included in Option K. The decision to build sound walls depends on neighborhood interest, the findings of the Noise Discipline Report (WSDOT 2009b), and WSDOT's reasonability and feasibility determinations.

A suboption for Option K would include constructing an eastbound off-ramp to Montlake Boulevard East configured for right turns only.

Option L

Under Option L, the Montlake Boulevard East interchange and the Lake Washington Boulevard ramps would be replaced with a new, elevated SPUI at the Montlake shoreline. A bascule bridge (drawbridge) would span the east end of the Montlake Cut, from the new interchange to the intersection of Montlake Boulevard NE and NE Pacific Street. This option would also include a ramp connection to Lake Washington Boulevard and two HOV direct-access ramps providing service to and from the new interchange. SR 520 would maintain a low, constant slope profile from 24th Avenue East to just west of the west transition span of the floating bridge. Noise mitigation identified for this option would include sound walls as defined in the Draft EIS.

Suboptions for Option L would include adding a left-turn movement from Lake Washington Boulevard for direct access to SR 520 and adding capacity on northbound Montlake Boulevard NE to NE 45th Street.

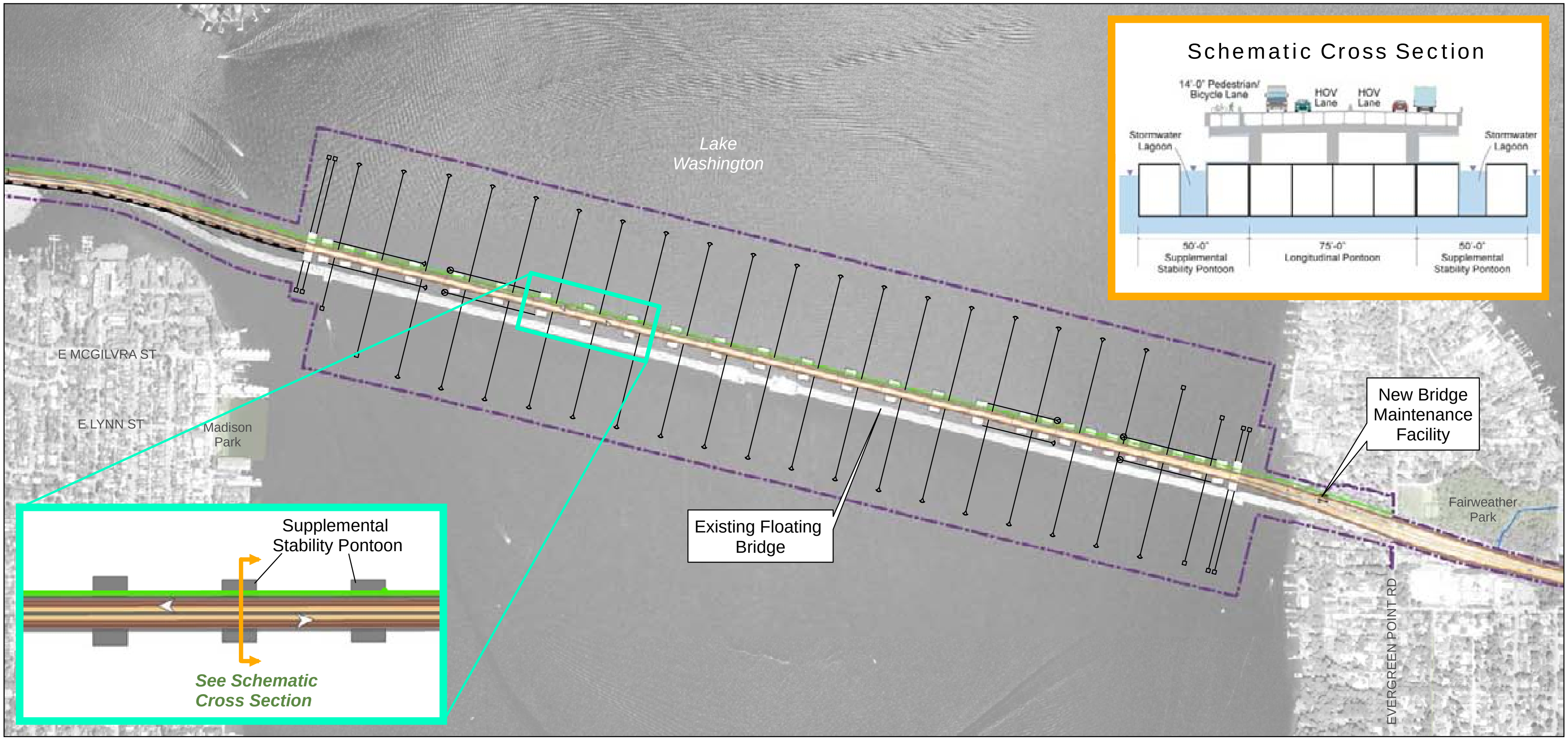
Lake Washington

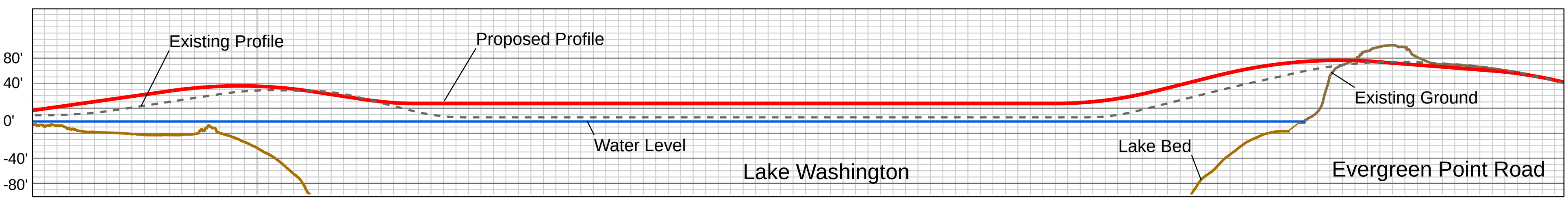
Floating Bridge

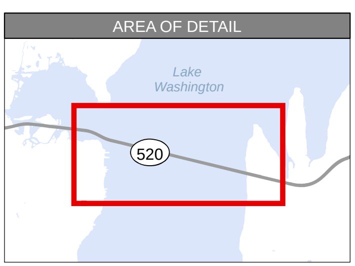
The floating span would be located approximately 190 feet north of the existing bridge at the west end and 160 feet north at the east end (Exhibit 5). Rows of three 10-foot-tall concrete columns would support the roadway above the pontoons, and the new spans would be approximately 22 feet higher than the existing bridge. A 14-foot-wide bicycle/pedestrian path would be located on the north side of the bridge.

The design for the new 6-lane floating bridge includes 21 longitudinal pontoons, two cross pontoons, and 54 supplemental stability pontoons. A single row of 75-foot-wide by 360-foot-long longitudinal pontoons would support the new floating bridge. One 240-foot-long by 75-foot-wide cross-pontoon at each end of the bridge would be set perpendicularly to the longitudinal pontoons. The longitudinal pontoons would be bolstered by the smaller supplemental stability pontoons on each side for stability and buoyancy. The longitudinal pontoons would not be sized to carry future high-capacity transit (HCT), but would be equipped with connections for additional supplemental stability pontoons to support HCT in the future. As with the existing floating bridge, the floating pontoons for the new bridge would be anchored to the lake bottom to hold the bridge in place.

Near the east approach bridge, the roadway would be widened to accommodate transit ramps to the Evergreen Point Road transit stop. Exhibit 5 shows the alignment of the floating bridge, the west and east approaches, and the connection to the east shore of Lake Washington.







- Anchor and Cable
- Pontoons
- Limits of Construction
- Proposed Bicycle/Pedestrian Path
- General-Purpose Lanes
- HOV, Direct Access, and/or Transit-Only Lane
- Park

N

0 250 500 1,000 Feet

Source: King County (2006) Aerial Photo, CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 5. **6-Lane Alternative at the Evergreen Point Bridge (Common to All Options)**

I-5 to Medina: Bridge Replacement and HOV Project

Bridge Maintenance Facility

Routine access, maintenance, monitoring, inspections, and emergency response for the floating bridge would be based out of a new bridge maintenance facility located underneath SR 520 between the east shore of Lake Washington and Evergreen Point Road in Medina. This bridge maintenance facility would include a working dock, an approximately 7,200-square-foot maintenance building, and a parking area.

Eastside Transition Area

The I-5 to Medina project and the Medina to SR 202 project overlap between Evergreen Point Road and 92nd Avenue NE in Yarrow Point. Work planned as part of the I-5 to Medina project between Evergreen Point Road and 92nd Avenue NE would include moving the Evergreen Point Road transit stop west to the lid (part of the Medina to SR 202 project) at Evergreen Point Road, adding new lane and ramp striping from the Evergreen Point lid to 92nd Avenue NE, and moving and realigning traffic barriers as a result of the new lane striping. The restriping would transition the I-5 to Medina project improvements into the improvements to be completed as part of the Medina to SR 202 project.

Pontoon Construction and Transport

If the floating portion of the Evergreen Point Bridge does not fail before its planned replacement, WSDOT would use the pontoons constructed and stored as part of the Pontoon Construction Project in the I-5 to Medina project. Up to 11 longitudinal pontoons built and stored in Grays Harbor as part of the Pontoon Construction Project would be towed from a moorage location in Grays Harbor to Puget Sound for outfitting (see the sidebar to the right for an explanation of pontoon *outfitting*). All outfitted pontoons, as well as the remaining pontoons stored at Grays Harbor would be towed to Lake Washington for incorporation into the floating bridge. Towing would occur as weather permits during the months of March through October. Exhibit 6 illustrates the general towing route from Grays Harbor to Lake Washington, and identifies potential outfitting locations.

> **What is Outfitting?**
>
> Pontoon outfitting is a process by which the columns and elevated roadway of the bridge are built directly on the surface of the pontoon.

The I-5 to Medina project would build an additional 44 pontoons needed to complete the new 6-lane floating bridge. The additional pontoons could be constructed at the existing Concrete Technology Corporation facility in Tacoma, and/or at a new facility in Grays

Harbor that is also being developed as part of the Pontoon Construction Project. The new supplemental stability pontoons would be towed from the construction location to Lake Washington for incorporation into the floating bridge. For additional information about pontoon construction, please see the Construction Techniques Discipline Report (WSDOT 2009d).

Exhibit 6. Possible Towing Route and Pontoon Outfitting Locations

Would the project be built all at once or in phases?

Revenue sources for the I-5 to Medina project would include allocations from various state and federal sources and from future tolling, but there remains a gap between the estimated cost of the project and the revenue available to build it. Because of these funding limitations, there is a strong possibility that WSDOT would construct the project in phases over time.

If the project is phased, WSDOT would first complete one or more of those project components that are vulnerable to earthquakes and windstorms; these components include the following:

- The floating portion of the Evergreen Point Bridge, which is vulnerable to windstorms. This is the highest priority in the corridor because of the frequency of severe storms and the high associated risk of catastrophic failure.
- The Portage Bay Bridge, which is vulnerable to earthquakes. This is a slightly lower priority than the floating bridge because the frequency of severe earthquakes is significantly less than that of severe storms.
- The west approach of the Evergreen Point Bridge, which is vulnerable to earthquakes (see comments above for the Portage Bay Bridge).

Exhibit 7 shows the vulnerable portions of the project that would be prioritized, as well as the portions that would be constructed later. The vulnerable structures are collectively referred to in the SDEIS as the Phased Implementation scenario. It is important to note that, while the new bridge(s) might be the only part of the project in place for a certain period of time, WSDOT's intent is to build a complete project that meets all aspects of the purpose and need.

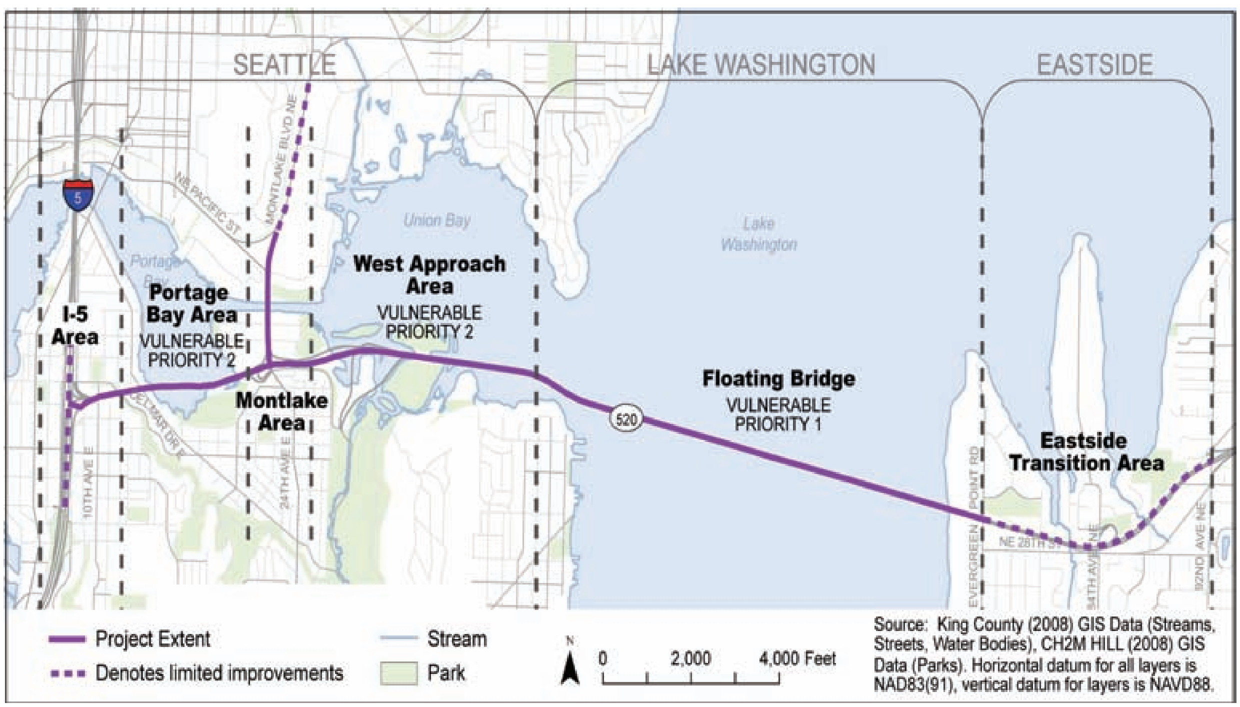


Exhibit 7. Geographic Areas along SR 520 and Project Phasing

The Phased Implementation scenario would provide new structures to replace the vulnerable bridges in the SR 520 corridor, as well as limited transitional sections to connect the new bridges to existing facilities. This scenario would include stormwater facilities, noise mitigation, and the regional bicycle/pedestrian path, but lids would be deferred until a subsequent phase. WSDOT would develop and implement all mitigation needed to satisfy regulatory requirements.

To address the potential for phased project implementation, the SDEIS evaluates the Phased Implementation scenario separately as a subset of the "full build" analysis. The evaluation focuses on how the effects of phased implementation would differ from those of full build and on how constructing the project in phases might have different effects from constructing it all at one time. Impact calculations for the physical effects of phased implementation (for example, acres of wetlands and parks affected) are presented alongside those for full build where applicable.

Construction Techniques

This section summarizes the major construction methods that would be employed during construction of the 6-Lane Alternative and options. Information from this section is based primarily on the SR 520 Westside Construction Techniques and Activities Technical Memorandum (WSDOT 2008b), and on the Description of Alternatives Discipline Report (WSDOT 2009a). Information in this section is presented at a level of detail that is intended to promote an understanding of methods that would be used to construct the SR 520 roadway. The descriptions below do not replace design guidelines and construction standards that are included in WSDOT's manuals and specifications. Construction effects on the built and natural environment are also described in the SDEIS and all of its accompanying discipline reports.

Roadway Construction

Elements of roadway construction required for the 6-Lane Alternative would include roadway excavation, roadway embankments, retaining walls, and paving the new roadway surface. Construction of temporary roadways during construction activities would also be required. These elements are described below.

Roadway Excavation

Roadway excavation involves removing ground surface or other material to the depth and width necessary to achieve a desired grade and slope for a roadway or structure. Material that is removed during excavation could be used as fill at other locations along the project if the materials meet standards.

Roadway Embankments

A roadway embankment is a raised area of fill often used in roadway approaches. Roadway embankment construction consists of building up soil or rock to create a new ground surface at the elevation needed for the new roadway or structure. Roadway embankments slope outward; therefore, the higher the embankment, the wider the surface area needed at the base. To avoid later settlement, rollers and hauling equipment thoroughly compact each layer of soil or rock. Retaining walls are used to support the embankment fill area where other constraints may exist along the alignment.

Retaining Walls

Retaining walls are used to minimize the footprint width of the roadway cut or fill. Since retaining walls can be virtually vertical, they create a much smaller footprint than an earth slope. They can be used to support the roadway when the roadway is higher than the surrounding ground. When a retaining wall supports a roadway, this is called a “fill” situation. Retaining walls can also be used in situations where the road is lower than the surrounding ground. In this case, the retaining wall supports the adjacent soils and prevents them from slumping onto the roadway. Retaining walls are also used in areas where there is a high possibility of erosion, such as near a bridge abutment or water.

Retaining walls are designed to support the soil loads only. The walls must have an area of free drainage between the retained soil and the back of the retaining wall to prevent water pressure from developing and adding to the soil loads. The drainage is usually provided by placing a layer of clean gravel and drainage pipes against the back of the retaining wall.

There are a variety of wall types; the type used depends on the structure it supports, the ground slope being retained, and available area. Cast-in-place and mechanically stabilized earth (MSE) wall types are two that would be used most often in constructing the SR 520 roadway. A third type, secant pile walls, would be needed under Option K to construct the depressed SPUI. A description follows of the major features of each wall type.

Cast-in-Place Walls

Cast-in-place walls are concrete and used to address the need for roadway cut or fill (Exhibit 8). Cast-in-place walls typically have a large foundation footing for wall stability, from which a narrower vertical wall rises to retain the soil. Typically the footing is buried and not visible. Drainage is typically achieved through weepholes in the face of the wall or an underdrain system at the footing.

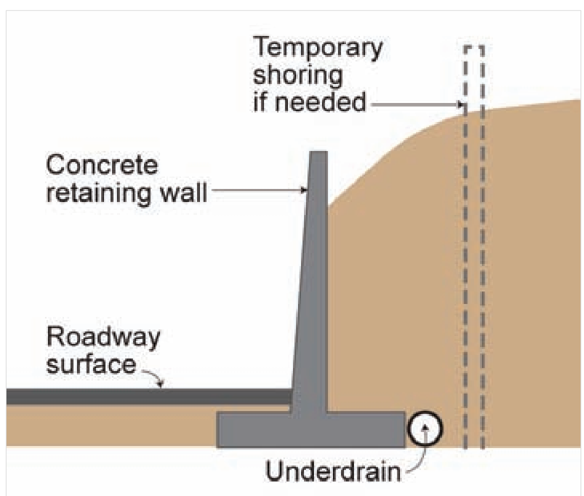


Exhibit 8. Typical Cast-in-Place Wall

Mechanically Stabilized Earth Walls

Mechanically stabilized earth (MSE) walls are typically used only in embankment construction for fill walls. The soil fill behind the wall is reinforced to stabilize the soil layers. MSE walls are constructed in layers approximately 1 to 3 feet deep; reinforcing material, such as geosynthetic fabric, is placed in between layers of soil and attached to the wall face, which retains the soil (Exhibit 9). The earth in each layer is compacted, and the process is repeated until the necessary wall height is reached.

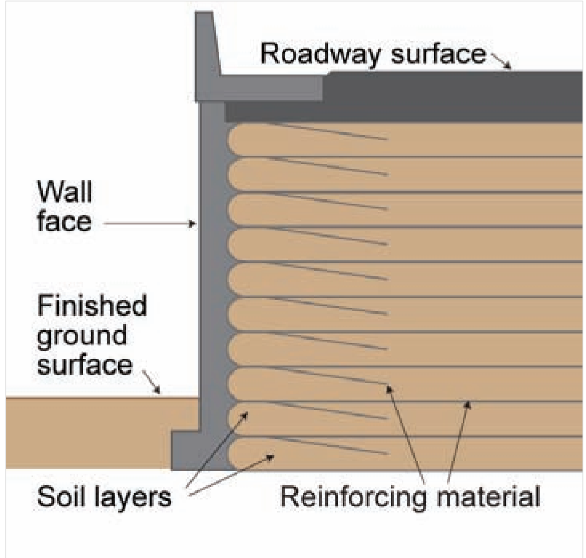


Exhibit 9. Typical MSE Wall

Secant Pile Walls

Secant pile walls are used when wall construction is restricted by tight right-of-way requirements or a watertight barrier is needed. This wall type would be used to construct the new depressed SPUI under Option K. Secant pile walls are constructed with overlapping drilled shafts that are filled with concrete to form the watertight barrier. Exhibit 10 shows the construction sequence for a secant pile wall.

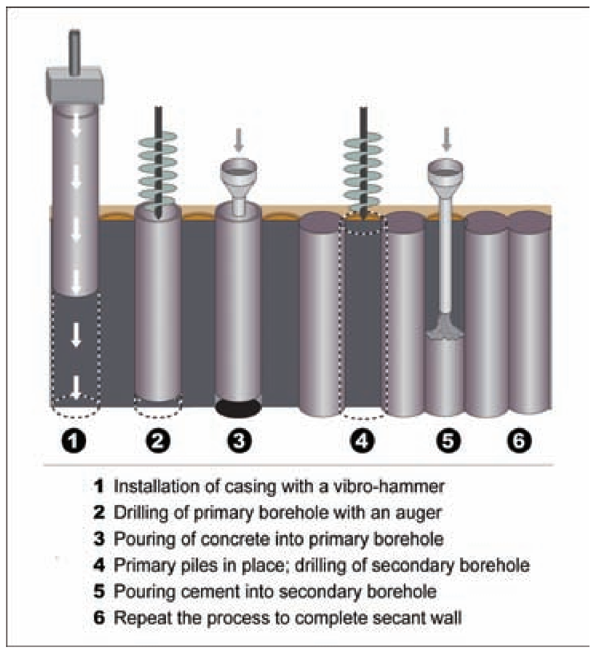


Exhibit 10. Secant Pile Wall Construction Sequence

Roadway Paving

Two types of paving would be used for roadway construction: hot mix asphalt and concrete.

Hot Mix Asphalt Pavement

Hot mix asphalt pavement is a surfacing material made of asphalt oil mixed with specially graded crushed rock. Asphalt is a relatively flexible pavement and cannot support heavy traffic loads by itself; therefore, the asphalt is placed on a base of compacted crushed rock. Because of its lower cost and faster installation time, for the proposed project asphalt paving would be used for temporary roads, temporary lane widening, and permanent surfacing on side streets and arterials where there would fewer vehicles traveling at lower speeds.

Concrete Pavement

Concrete is a more rigid material than asphalt and is strong enough to support heavy loads of traffic. A concrete mix designed for paving, such as Portland cement concrete, would be used on permanent ramps and for the SR 520 mainline. Similar to asphalt, the cement would be placed on a thin layer of crushed rock base material. After the concrete pavement hardens sufficiently, lane striping can be applied and the roadway opened to traffic.

Temporary Roadways

Project construction would require the closure and demolition of some roadways, bridges, and ramps along the SR 520 corridor. Temporary roadways would be constructed to replace lost traffic functions, using techniques similar to those described above. Stormwater systems and safety elements, such as traffic barriers, would also be installed. Once temporary roadways were in place, traffic would be routed to the temporary facility. Following construction of the permanent structures, temporary roadways would be deconstructed. Locations of temporary roadways that would be constructed along the corridor are identified in the section Construction Activities.

Sound Walls

Sound walls that would be used along the SR 520 corridor to reduce the effects from highway noise would typically be precast panels or cast-in-place walls. These sound walls can be cast in a wide variety of patterns to improve their aesthetics. On bridges, sound walls would be cast into the traffic barrier. Sound walls are constructed to withstand the forces of wind and seismic loads.

Sound wall along Harvard Avenue East in Seattle. Bracing equipment is used to keep the wall properly supported during installation.

Bridge Construction

Bridge construction associated with the 6-Lane Alternative would take place on land, on work bridges, and from barges floating on the lake and outfitted with cranes.

A bridge structure consists of two major parts: a substructure and a superstructure (Exhibit 11). The lower portion of a bridge is termed substructure and includes the bridge foundation and support structures, including columns and a cross beam or pier cap. The superstructure is the part of the bridge above the columns and consists of girders and the roadway slab.

This section describes elements of bridge substructure and superstructure.

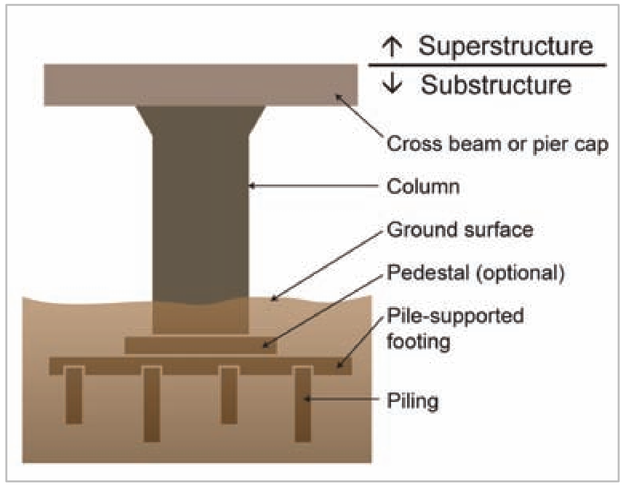


Exhibit 11. Bridge Superstructure and Substructure

Bridge Substructure

The type of substructure selected for each bridge for the I-5 to Medina: Bridge Replacement and HOV Project would be based on soil conditions, groundwater depth, water depth (if the structure is placed in water), and weight of the superstructure and the load it would carry. Substructure foundation types anticipated for this project are described below and include spread footings, drilled shafts and waterline footings, pile-supported footings, and concrete columns.

Spread Footing

Spread footings are reinforced concrete pads constructed on land. They provide a large area to distribute the weight of the bridge into the soil. This type of footing is a shallow foundation type, requiring dense soils that can support the weight of a bridge.

Drilled Shaft and Waterline Footings

Drilled shafts are used to support bridge loads in deep layers of less dense materials. Drilled shafts can be constructed in the ground or lakebed, with bridge columns constructed on top of the shafts. Drilled shafts are commonly used for WSDOT bridges.

Construction of a drilled shaft begins with a steel casing or large hollow pipe vibrated or oscillated into the ground. A crane lowers an auger into the casing to drill the shaft. After excavation to the proper depth, concrete is pumped into the casing. The accumulating concrete displaces any water in the casing, and the displaced water is collected and treated.

When longer bridge spans are used, it may be necessary for a foundation to have more than one drilled shaft. This requires a shaft cap, which ties the individual drilled shafts together so that they act as a single foundation. The column is constructed on top of the shaft cap.

Waterline footings are used in deeper water areas that require footings but are too deep to efficiently use cofferdams (described in the section In-Water Construction). A precast concrete form is floated into position and secured in place with piles. Shafts are drilled through the precast form. A waterline shaft cap may be placed at the top of the drilled shafts at about the water level.

Piling

Piling, or piles, are used to connect a structure to the deep soils. Piles or other types of deep foundations are required where shallow foundations (such as spread footings) are inadequate or impractical due to the presence of surface water or shallow groundwater, low soil-bearing resistance, soil liquefaction potential, or stability considerations.

Piles differ from columns in that they penetrate deep into the ground and are often used in groups connected together by a beam or cap. Piles would be needed to support the over-water work bridges and falsework associated with SR 520 construction (see the section Work Bridges). The piling for work bridges and falsework would likely be 18- to 30-inch-diameter steel pipe piles. The use of precast concrete piling would not be preferred because precast piles cannot be economically pulled out and re-used. Cast-in-place piling alternatives also would not likely be used because of the long construction time involved in their use and the inability to re-use or remove them.

Pile installation methods being considered include impact driving and vibrating. Impact driving involves hitting the top of the pile with a large hammer until the pile is deep enough to develop the desired load-bearing strength. Impact driving is the most common and versatile type of pile installation and can be performed on a wide variety of pile types and sizes in almost any soil type.

Vibrating involves using a pile driver to create a rapid succession of impacts that liquefy and loosen the soils. The vibratory driver is designed with heavy steel weights that help push it into the ground. This method is best suited for sandy or gravelly soils that contain water, but it can be used with some success in a variety of mixed soils.

The vibrating method cannot be used to penetrate into hard and/or dense soils and does not allow for accurate estimation of bearing capacity when driving is complete. Because of these issues, vibrating cannot be used as the sole installation method. However, vibratory driving can potentially be used for the initial stages of pile driving, which would be completed with impact driving to set the pile.

Concrete Columns

Concrete columns support the superstructure (for example, road and bridge deck). In-water columns can be constructed within cofferdams or installed from barges or work bridges. Columns are constructed by setting reinforcing steel into footings connected to a wire cage. Forms for the concrete columns are constructed around the wire cage, and concrete is poured into the form. A cast-in-place cap beam, or cross beam, is constructed on top of the columns before placement of the superstructure (Exhibit 11).

Bridge Superstructure

There are two main parts of a bridge superstructure: girders and the roadway slab, or deck. A girder is the term for the main horizontal support beam of a structure that supports a bridge deck. Girders can have an I-beam cross section, a box shape, or U-shaped tub form.

Precast Concrete Segmental Box Girder

A variety of girder types could be used in construction of the superstructure on SR 520. These include cast-in-place, post-tensioned concrete box girders; precast, prestressed box girders; precast, prestressed tub girders; or steel plate girders. Factors that are considered in designing a bridge deck include the distance between columns and the clearance needed.

What is a girder?

A girder is the term for the main horizontal support beam of a structure that supports a bridge deck.

The type of bridge decks constructed for the SR 520 project would be, in part, a function of where the bridge is located (for example, along the corridor or across the Montlake Cut). A bascule bridge deck system is proposed with Options A and L for the Montlake Cut crossing. Lids would be incorporated at two locations along the SR 520 mainline and one location on I-5. Following are descriptions of what lid structures are and how a bascule bridge deck system works.

Lids

The term “lid” is short for “lidded highway”; lids are simply wide bridges that cover a length of highway. Because lids provide extensive surface area, they can carry paths and trails, landscaping, and small structures.

Lids are bridge structures proposed as part of the 6-Lane Alternative that would be located at existing over-crossing bridges in the I-5 and Montlake areas and would connect the communities on either side of SR 520. In most cases, lids would be constructed in three sections across the width of SR 520 and I-5. The lids would be supported by walls, and drainage would be installed during lid construction. The drainage conveyance system would be installed concurrently with the roadway.

Lid support walls would be constructed in medians, at existing retaining wall locations, and at the limits of the lid. Walls would be cast in place on spread footings. Wall thickness would vary at each location depending on wall height, supported span lengths, and details of the span configuration. The walls would provide continuous support for the superstructure elements spanning SR 520.

Bascule Bridge

A "two leaf" bascule bridge is a movable bridge with counterweights on either end that balance the leaves (or spans) throughout their upward swing. Hydraulic or gear mechanical systems are used to operate the bridge. When open, the bridge provides unlimited vertical clearance for boat traffic. The existing Montlake and University bridges are examples of bascule bridges.

Two deck systems would be considered for the Montlake Cut bridge crossing (Options A and L): an open steel grid deck and a "closed" deck system. An open steel grid deck reduces bridge and counterweight loads. The existing Montlake Bridge has an open steel deck. A closed deck system fills in the "grid lines" with concrete, which eliminates the "bumpiness" experienced when crossing the steel grid deck.

Work Bridges

Work bridges are temporary structures. Work bridges are built to allow equipment access over the water for construction and are required when water depth is too shallow to allow barge-mounted cranes to be used. Portage Bay, Union Bay, and the west approach are areas where work bridges would be used. The accompanying photo shows a work bridge adjacent to a permanent bridge structure.

A temporary work bridge being used to support a crane for bridge construction.

The typical layout of a temporary work bridge is a 30-foot-wide structure with heavy timber decking supported by steel beams. Pile bents are spaced at 25-foot to 40-foot intervals, with three to four steel piles per bent. A vibratory hammer can be used to initially set the piles; however, a pneumatic impact hammer must be used to confirm the load-bearing capacity of each pile at the end of the driving process.

What is a pile bent?

A pile bent is an engineering term that refers to a row of piles that are fastened together. The row of piles together provides a framework for carrying lateral and vertical loads.

Construction of work bridges is accomplished from a crane on land on a pad prepared at the edge of the water behind a temporary wall. The crane swings out and begins driving piles in the water for the first pile bent. After the piles are driven, they are cut off at the same elevation. Steel capbeams are set on top of the piles, and support beams are welded to the capbeams. Timber deck panels are then bolted to the support beams. After the deck span is in place, the crane is advanced out onto the span and the operation continues until all the bents and work bridge spans are in place.

Work bridge removal is accomplished by reversing the construction process. The timber deck panels are unbolted and removed. The steel beams and steel cap beam are cut and removed. The piles bents are pulled, and the crane is backed off the span while demolition work continues.

Falsework

Falsework is a temporary structure that supports a permanent structure during construction. It carries the weight of the permanent structure until the permanent structure is capable of supporting its own weight. For example, falsework often supports cast-in-place concrete formwork that holds the freshly placed concrete of a bridge. After the concrete of the major structural elements has hardened and attained sufficient strength for the bridge to support its own weight, the formwork and falsework can be removed. Falsework generally consists of steel pipe and/or timber columns, piles, beams, and bracing elements, as well as scaffolding and connecting hardware.

The cast-in-place construction method would be used at multiple locations along the SR 520 roadway, depending on the option selected and the spans between bridge columns that are needed to achieve the designed profile. In general, low profiles require shorter spans. Where longer spans are possible (300 to 350 feet), such as Portage Bay or the

Falsework for a cast-in-place bridge.

west approach to the floating bridge under Option L, precast segmental box construction (described above) may be considered.

Falsework construction techniques are similar to work bridge construction techniques, with the exception that construction does not need to progress from the shoreline out over the water. Falsework would be built from the work bridge and would be removed before removal of the work bridge.

Detour Bridges

Detour bridges are temporary bridges used during construction to provide temporary traffic functions. Detour bridges are constructed similarly to work bridges; however, instead of timber deck panels, pre-cast concrete deck panels are installed to provide a roadway surface for vehicles. A mainline detour bridge would be constructed to accommodate construction associated with Option K. Refer to the Construction Activities discussion below for a description of where the bridge would be located and how the bridge would maintain mobility throughout the corridor during construction.

In-water Construction

In-water work requires specific permits and must follow certain guidelines to minimize its effects on the natural environment. Design considerations for in-water construction techniques include the location and configuration of permanent in-water structures, the timing of construction (that is, appropriate work windows), and measures to protect water quality.

In-water construction activities would occur at various points along the SR 520 corridor, including the Portage Bay Bridge, Montlake Cut crossing, east and west approaches to the Evergreen Point Bridge, the floating portion of the bridge, and the bridge maintenance facility dock underneath the east approach.

Examples of in-water construction activities include the following:

- Pontoon towing/assembly
- Floating bridge superstructure/pontoon outfitting
- Anchor system installation
- Workbridge construction and removal
- Cofferdam construction and removal (discussed below)
- Drilled shafts and bridge footings
- Existing bridge demolition

Exhibit 12 summarizes types of in-water construction activities that may occur along the SR 520 corridor. The activities identified reflect current design possibilities for the bridges and roadway segments along the corridor under Options A, K, and L; these will be refined as design progresses.

In-water construction would be limited by permit conditions to approved time periods (that is, work windows) to minimize effects on fisheries and other natural resources. Exhibit 13 identifies published in-water work windows for the Lake Washington Ship Canal and for Lake Washington.

WSDOT is working with resource agencies to develop project-specific work windows that would be applied to construction. A pile vibration test program is planned for fall 2009. This test program involves collecting underwater and in-air sound data during test pile driving using three sound attenuation methods in order to evaluate the sound propagation characteristics in the project area. Best management practices (BMPs) for maintaining water quality and noise attenuation would be used to meet permit obligations and achieve regulatory compliance.

Exhibit 12. Types of In-water Construction Activities by Area

Construction Activity and Method[a]	Geographic Area				
	Portage Bay	Montlake Cut	West Approach	Lake Washington	East Approach
Pontoon towing	●	●	●	●	
Anchor installation				●	
Pontoon assembly and disassembly				●	
Bridge superstructure outfitting				●	
Work bridge construction and removal	●		●		●
Cofferdam or sheetpile installation and removal	●		●		●
Drilled shafts	●		●		●
Mudline footings	●				
Waterline footings	●		●		●
Column/pier construction on waterline footing	●		●		●
Cast-in-place or precast girder superstructure	●		●		●
Existing bridge removal	●		●	●	●
Tunneling (Option K)		●			
Bascule bridge (Options A and L)		●			

[a] Construction methods identified for substructure and superstructure types at the Portage Bay, west approach, and east approach locations indicate a range of methods that could be used in the construction design for Options A, K, and L.

Exhibit 13. Published In-water Work Windows

Area	Work Window
Lake Washington Ship Canal (from the Chittenden (Ballard) Locks to the east end of the Montlake Cut)	October 1 – April 15
Lake Washington South of I-90	
Within 1 mile of Mercer Slough or Cedar River	July 16 – July 31 and November 6 – December 31
Farther than 1 mile from Mercer Slough or Cedar River	July 16 – December 31
Lake Washington Between I-90 and SR 520	July 16 – April 30
North of SR 520	
Between SR 520 and a line drawn due west from Arrowhead Point	July 16 – March 15
North of a line drawn due west from Arrowhead Point	July 16 – July 31 and November 16 – February 1

Sheet Pile Walls

Sheet pile walls are temporary walls typically used in areas with high groundwater or in underwater situations. Long, slender interlocking steel sheets 2 to 4 feet wide and up to 50 feet long are driven or vibrated into place one at a time. The piling is driven deeper than the wall in order to provide the necessary resistance to hold the soil. After the sheet pile wall is completed, the area inside is dewatered and construction can commence.

Cofferdams

A cofferdam is a temporary, water-tight enclosure built in the water and pumped dry to create a work environment for construction below the water surface. Cofferdams can be used to allow pile driving and the construction of footings in the water or on the shore.

Example of a cofferdam, where workers in the enclosure are working below the level of the surrounding water surface.

Cofferdams are installed from a temporary work bridge, from barges, or from the shore. The cofferdam is typically constructed of steel sheet piling. Once the cofferdam is in place, pumps are used to remove water from the work area and bridge structure construction can proceed. There are currently no restrictions for work performed inside of a functioning cofferdam. Cofferdams would be used on the Portage Bay structure and possibly on the west and east approaches to the floating bridge.

Tunnel Construction

Tunnel construction under the Montlake Cut would be required under Option K of the 6-Lane Alternative. Two tunnel construction methods would be used: 1) the sequential excavation method (SEM) with ground freezing (to tunnel under the Montlake Cut), and 2) cut-and-cover tunnel construction north and south of the freeze pits to bring the roadway up to grade and connect the tunnel to the NE Pacific Street/Montlake Boulevard intersection and the interchange with SR 520.

Tunnel construction details are unique to Option K and are therefore described below under the heading Construction Activities.

Stormwater Treatment Facilities

Construction of the I-5 to Medina: Bridge Replacement and HOV Project would include the installation of stormwater facilities to collect and treat stormwater runoff from impervious surfaces such as roads, bridges, and other hard surfaces. The type of facility constructed would depend on topography, profile of the road or bridge segment, available land for a facility, and availability and proximity of an outlet or outfall for collected and treated water.

Three facility types incorporating approved stormwater BMPs have been identified for use for the project: biofiltration swales, constructed stormwater wetlands, and media filter vaults.

Stormwater runoff would be directed from the impervious surfaces through a treatment and conveyance system to the proposed outfall location. (An outfall is the point where the stormwater enters a water body.) Elements of the treatment and conveyance system include storm drainage pipes; stormwater retention and treatment facilities; catch basins; manholes; and outfalls.

Excavation for the conveyance system typically begins at the proposed outfall location and continues upgradient. Conveyance elements are constructed by trenching, laying the pipe in the trench, and backfilling.

Pump stations and sump pumps are needed when gravity is insufficient to move the water through the pipes to storage, treatment, and outfall. Pump stations and sump pump facilities are small, aboveground structures that contain temporary water storage vaults and electric panels and controls.

The sections below describe three different types of stormwater treatment facilities: treatment wetlands, media vaults, and bioswales.

Stormwater Treatment Wetlands

Wetlands can hold and treat stormwater through settling, filtering, and biological processes associated with wetland vegetation. Constructed stormwater treatment wetlands are considered an enhanced treatment BMP because they remove some of the dissolved metals and total suspended solids from stormwater by using multiple cells and wetland vegetation. Exhibit 14 shows how a stormwater treatment wetland works.

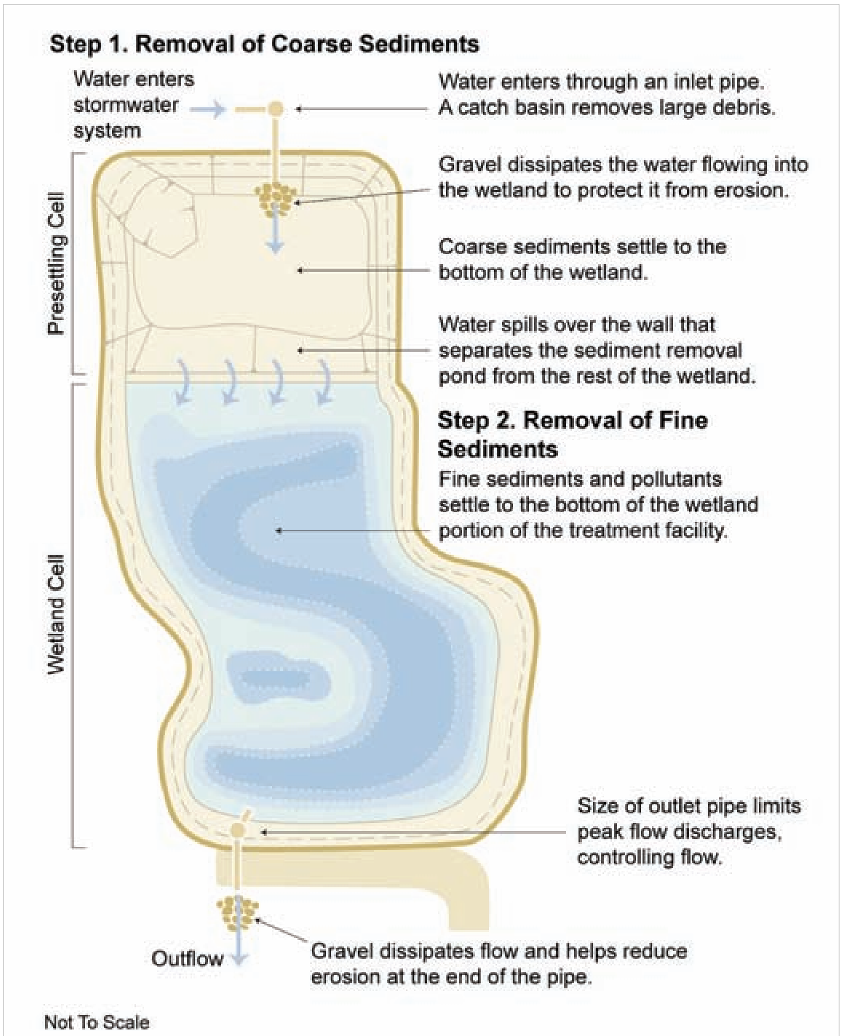


Exhibit 14. Conceptual Stormwater Treatment Wetland

The first cell in the diagram is a presettling cell that collects sediment and pollutants. After treatment in the first cell, water flows into the wetland cell, where additional settling and filtering combine with the biological action of plants and bacteria to provide further treatment for dissolved metals and other pollutants.

The site for a constructed wetland is cleared and excavated to the depth necessary to hold and treat the anticipated flow. Aquatic plants to filter and treat the water are then planted in special soil. A liner may be required to retain water within the wetland cell, depending on the geotechnical and subsurface conditions. If soil permeability allows sufficient water retention, lining is not necessary, but in infiltrative (that is, more permeable) soils, the stormwater wetland must be lined to retain water. Liners may consist of geosynthetic materials or bentonite clay added and compacted with native soils. Gravel or paved access roads to the inlet and outlet areas of the wetland are constructed to provide access for regular maintenance necessary for the wetland to continue to store and treat water.

Stormwater Media Vaults


Constructed stormwater treatment wetland.

A stormwater media filter vault is a proprietary treatment method that provides passive stormwater filtration. The vault houses one or more structures, each containing a rechargeable cartridge. The cartridge is filled with a filtering medium such as dolomite, activated charcoal, or gypsum. The vault functions by conveying stormwater into the structure and through the filtering cartridge. These cartridges trap particulates and dissolved pollutants, including metals, hydrocarbons, and nutrients. The rate at which water flows through the vault can be controlled at each cartridge. Currently, this system is approved by the Washington State Department of Ecology to provide basic water quality treatment for stormwater runoff.


Stormwater vault underneath bridge.

Stormwater media vaults are either constructed on-site or delivered as prefabricated structures and installed on the site. Before installation, the site is cleared and then excavated to create an area underground for the vault. If the vault is to be cast in place, a form is constructed with wood and rebar, and concrete is poured into the form. After the vault is poured and cured (if cast in place) or placed in the excavation by a crane (if prefabricated), the area around the vault is backfilled and compacted. Photo to right shows a stormwater vault underneath a bridge structure.

Bioswales

Bioswales, or biofiltration swales, are vegetation-lined channels designed to remove suspended solids from stormwater. Shallow, concentrated stormwater flow within these swales allows plant stems and leaves to provide filtration. Swales can be easily incorporated into the right-of-way where space allows. Currently, biofiltration swales offer basic water quality treatment. The swales are constructed by clearing an area, grading the area to a defined slope, compacting the soil, and vegetating the area.

Construction Staging Areas and Haul Routes

Staging Areas

Construction along SR 520 would be staged from both land and water. Land-based construction staging areas would be used for delivery and storage of construction materials and equipment, contractor office and storage trailers, and employee parking. These areas would be fenced and located adjacent to areas where project construction is occurring. Construction staging areas vary in size and may require grading or excavation to level the site and install drainage improvements, depending on site conditions. Locations of potential staging areas for construction along the SR 520 corridor are shown in Attachment 1, Exhibits 1-2 through 1-6.

Bridge construction staging and construction activities from barges.

Temporary driveways would be established to allow site access. Points of access for vehicles that intersect with the roadway network would be monitored by flaggers, construction workers, and possibly law enforcement, depending on the location of the access point.

Temporary erosion and sediment control measures would be used to prevent runoff of untreated stormwater and sediment into city stormwater or sewer facilities, nearby water bodies, or adjacent properties. A spill prevention control and countermeasures (SPCC) plan would be required to prevent and minimize the potential for spills of hazardous materials and pollutants.

Office trailers, placed on a temporary foundation, would be connected to available utilities, including power, telephone, water, and sewer as needed. Connecting to these utilities may include pole installation and trench excavation to place water and sewer pipelines.

After construction is complete, staging areas would be restored and the area would be disconnected from any utilities.

Barges would provide access from the water to staging areas and work sites. Barges could be used to transport materials and employees, serve as a construction work platform, or be docked to serve as over-water staging areas.

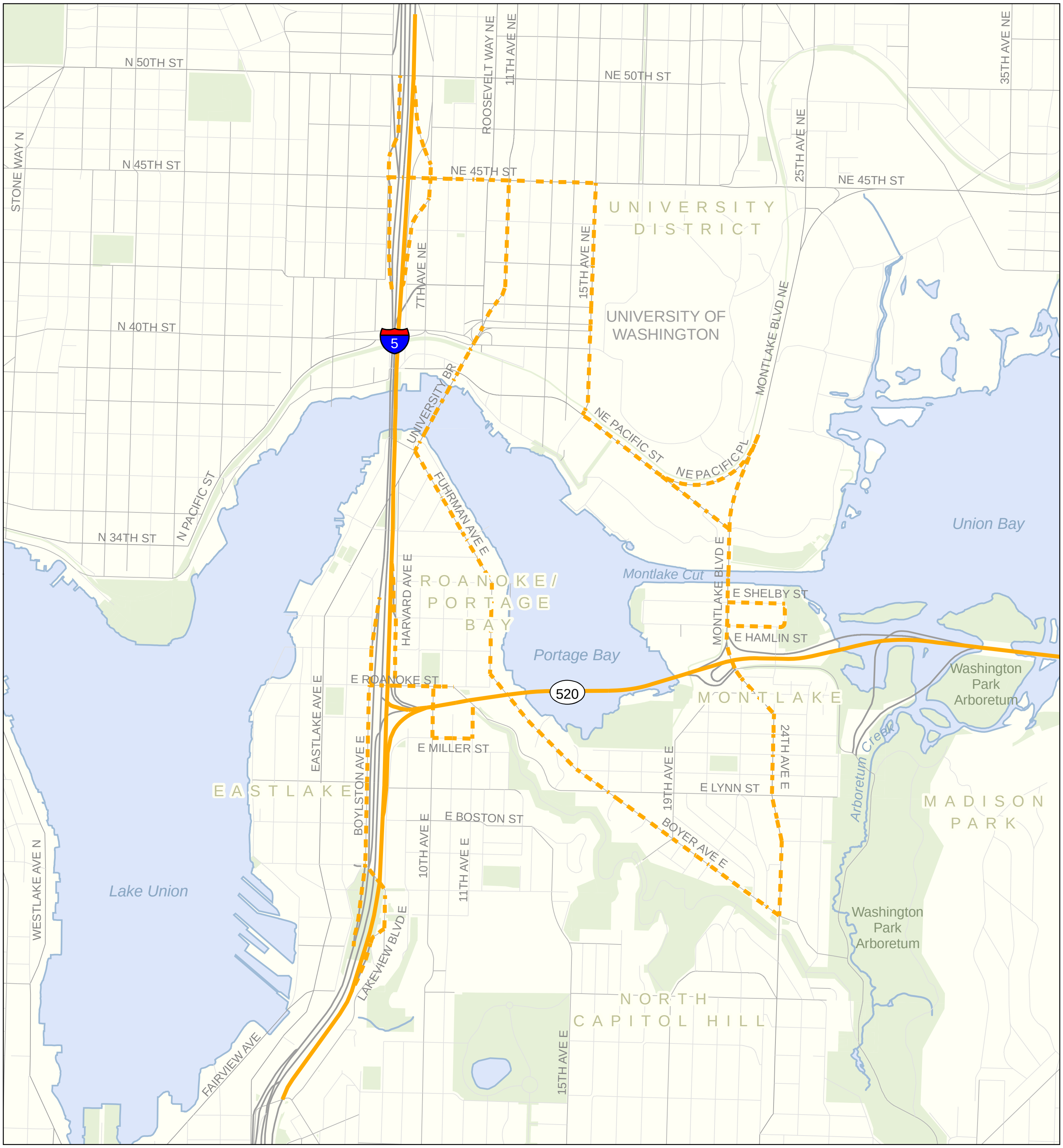
Haul Routes

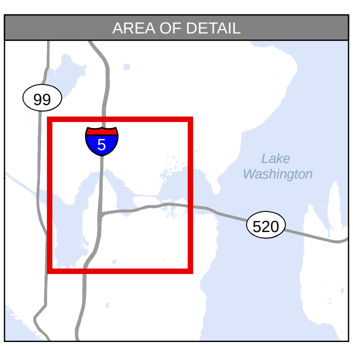
Materials would be transported to and from the construction work areas by trucks and barges. Barges would provide access to offshore work areas. Trucks would travel over designated haul routes through Seattle to SR 520, I-5, and I-405. Exhibit 15 shows the potential truck haul routes that would be used to transport materials.

Potential construction haul routes include both local and regional roadways. Some of the haul routes would use streets the City of Seattle classifies as "major truck streets." Major truck streets proposed to be used as part of this project include Montlake Boulevard between SR 520 and NE Pacific Street and NE Pacific Street between Montlake Boulevard and 15th Avenue NE. A few residential streets would also need to be used for truck haul routes due to the location of proposed construction activities. Residential streets proposed to be used for truck haul routes include 11th Avenue East and East Miller Street. East Shelby Street and East Hamlin street east of Montlake Boulevard may be used intermittently during peak construction periods.

Demolition, Removal, and Disposal

Demolition and removal of structures—whether buildings, roads, bridges, temporary facilities erected for construction, or other





Haul Route

Potential Haul Route

N

0 500 1,000 2,000 Feet

Source: King County (2005) GIS Data (Streams and Streets), King County (2007) GIS Data (Water Bodies), CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 15. **Proposed Haul Routes**

I-5 to Medina: Bridge Replacement and HOV Project

\\SIMBA\PROJ\PARAMETRIX\180171\GIS\MAPFILES\SDEIS\COMMON\SDEIS_PROPOSEDHAULROUTES.MXD 10/15/2009 components—generate materials that need to be disposed of consistent with federal, state, and local laws and ordinances.

Construction of the SR 520 project would require extensive demolition and removal of over-water and in-water structures. Demolition is defined as major breaking, crushing, and cutting of existing structures for eventual disposal; demolition may include salvage of reusable or recyclable materials. In the context of the project, removal is defined as vibrating, pulling, and dismantling existing structures for eventual disposal, reuse, or recycling.

Demolition would be required for the following existing over-water structures:

- Portage Bay Bridge
- Montlake interchange ramps
- Montlake Boulevard eastbound off-ramp
- The west approach structures
- The Evergreen Point Bridge
- The east approach structure

Demolition and/or removal would also be required for temporary structures, including work bridges, cofferdams, and some detour bridges and temporary ramps.

A structure demolished over water would be handled carefully for disposal.

Fixed Structures

Demolition of fixed structures would use impact hammers to demolish traffic barriers and rails, saw-cutting to cut the bridge deck before girder removal, and torch-cutting to cut reinforcing steel. Pieces of the roadway would be loaded by crane onto trucks or barges for disposal or recycling. Columns and piles would be removed by vibratory extraction where possible, or cut 2 feet below the mudline (ground surface).

Over-water demolition requires special precautions and equipment to prevent debris or concrete-laden water from entering the natural water system. Nets, tarps, platforms, scaffolds, blankets, barges, and floats can be used to contain the debris; vacuums, diverters, absorption materials, holding tanks, and drainage systems can be used to contain concrete-contaminated water.

Floating Structures

Demolition of the floating structures would involve the following elements:

- Transition spans
- Elevated superstructure
- Pontoons
- Anchor cables
- Underwater anchors

Transition Span Removal

Two truss structures currently serve as transition spans and link the floating structure to the fixed approach structures on each end of the floating bridge. Demolition would likely be performed by removing each entire truss in one piece, either using floating cranes to lift the truss off its bearings or by positioning a barge under each transition span and using jacks to vertically lift each truss off its bearings.

The Ballard Locks have a width limit of about 79 feet. The availability of floating cranes that would fit through the Ballard Locks and also have the capacity to lift an entire transition span could be limited. Because of this, it may be necessary to remove the roadway deck and barriers to reduce weight before removing the steel truss structure in one piece.

Elevated Superstructure Removal

The extent of elevated superstructure removal would likely be dictated by the destination of individual pontoons after leaving Lake Washington. For pontoons that may be towed in the open ocean, the road deck and columns that rest on some of the pontoons could be removed to maintain pontoon stability while under tow. Demolition of the elevated superstructure and columns would be the same as that described for fixed bridges, except columns would be cut flush with the top of the pontoons. For pontoons that are not towed in the open ocean, much of the elevated superstructure could remain in place until it leaves Lake Washington. Options for pontoon disposal are discussed below.

Pontoon Disassembly and Removal

Pontoon disassembly and removal consists of saw-cutting the pontoon joints, disconnecting pontoons from their anchor cables, and towing them away. Some or all of the roadway that rests on pontoons may need to be removed before the pontoons are transported out of Lake Washington.

Anchor Cable Removal

Typically, anchor cable removal consists of detaching anchor cables at their connection to the pontoons and anchors, then winding the cables onto spools on barges for transport. Floating cranes would be used to wind the cable onto spools. Divers would detach the anchor cable from the anchor.

Underwater Anchor Decommissioning

The existing floating bridge has three types of anchors: concrete fluke anchors, rock-filled concrete gravity anchors, and pile anchors. Underwater anchor decommissioning consists of abandoning all anchors in place with the exception of pile anchors. Pile anchors would be removed to the mudline (ground surface).

Disposal

Trucks, barges, and tugs would be used to transport materials from demolition and construction sites along SR 520. Barges and tugs would transport a large portion of the material through the Montlake Cut and the Ballard Locks to disposal sites or transfer facilities accessible by water. Barges may also travel to temporary transfer facilities at the north and south ends of Lake Washington. Due to the large amount of disposal material and the transport required by land and water, multiple disposal sites would likely be used.

Materials disposal would occur at approved disposal sites. Demolition materials would be disposed of in accordance with federal, state, and local laws and ordinances. Demolished concrete pieces could also be transported to local concrete recycling facilities.

As with past floating bridge projects, all pontoons, including the elevated superstructure in the existing floating bridge, could be made available for purchase. All existing pontoons, including the elevated superstructure, that were removed as part of the recent Hood Canal Bridge Project were sold to private parties. Pontoons could be reused for a wide variety of waterfront functions such as docks, breakwaters, and dolphins. If pontoons are not able to be sold, they would be towed to an approved site, such as a graving dock or floating dry dock, and demolished. Pontoons would not be submerged in any water body.

Typical Construction Equipment

Roadway and bridge construction activities require a variety of construction equipment, as listed in Exhibit 16.

Exhibit 16. Typical Equipment and Use for Roadway and Bridge Construction

Equipment	Typical Use
Air Compressor	Pneumatic tool power and general maintenance
Backhoe	General construction
Concrete Pump	Concrete pumping
Concrete Saw	Concrete removal, utilities access
Crane	Materials handling, removal, and replacement
Excavator	General construction and materials handling
Forklift	Staging area work and hauling materials
Haul Truck	Materials handling, general hauling
Jackhammer	Pavement removal
Loader	General construction and materials handling
Paver	Roadway paving
Pile Driver	Support-installation for structures and hillsides
Pump	General construction use, water removal
Pneumatic Tools	Miscellaneous construction work
Service Truck	Repair and maintenance of equipment
Tractor Trailer	Material removal and delivery
Utility Truck	General project work
Vibratory equipment	Activities to shore up hillside or install piles
Welder	General project work

Construction Activities

This section describes the construction activities that would take place to build Options A, K, or L of the 6-Lane Alternative. Exhibit 17 summarizes major construction components of the 6-Lane Alternative by geographic area.

The description and general sequence of construction activities is presented for each geographic area (that is, Seattle, Lake Washington, and Eastside Transition Area) along the corridor for Options A, K, and L.

Exhibits 1-1 through 1-6 in Attachment 1 show the roadway profiles for the options; locations of construction work bridges, temporary roadways, and detour bridges; construction staging areas; and stormwater facilities.

Exhibits 1-7 through 1-10 in Attachment 1 depict the general sequencing of corridor construction. Attachment 2 provides more detailed information on sequencing of construction activities for each geographic area along the corridor.

Estimated construction durations are discussed at the end this section.

Seattle

I-5 Area (Common to All Options)

Under all 6-Lane Alternative options, the I-5/SR 520 interchange would be rebuilt with a reversible HOV ramp providing access to the I-5 express lanes. The 10th Avenue East and Delmar Drive East bridges would become part of the 10th and Delmar lid.

Construction would begin with the I-5 and 10th and Delmar lids. The I-5 lid would be constructed starting at the north end; retaining walls would be constructed in the I-5 median to support the lid. Boylston Avenue East would be narrowed and shifted to the west to allow for the I-5 lid abutment and wall construction. Following construction of the north portion of the lid, Roanoke Street traffic would be detoured to this northern portion to allow demolition of the existing Roanoke Street bridge across I-5 and completion of the lid.

Exhibit 17. SDEIS 6-Lane Alternative and Options

<table>
<tr><th rowspan="2">Geographic Area</th><th colspan="3">6-Lane Options</th></tr>
<tr><th>Option A</th><th>Option K</th><th>Option L</th></tr>
<tr><td>I-5 Area</td><td colspan="3">• Rebuild I-5/SR 520 interchange; add reversible HOV direct access ramp to I-5 express lanes.
• Rebuild 10th Avenue East and Delmar Drive East bridges and intersection
• Lids at I-5 and East Roanoke Street and 10th Avenue East and Delmar Drive East</td></tr>
<tr><td>Portage Bay Area</td><td>• Rebuild Portage Bay Bridge to a 7-lane bridge (includes westbound auxiliary lane)
• Architectural treatment to be determined</td><td>• Rebuild Portage Bay Bridge to a 6-lane bridge
• Architectural treatment for bridge is a “faux arch”</td><td>• Rebuild Portage Bay to a 6-lane bridge
• Architectural treatment to be determined</td></tr>
<tr><td rowspan="2">Montlake Area</td><td>• Rebuild Montlake interchange at current location
• Relocate functions of Montlake Transit Station
• Westbound to northbound transit-only direct access ramp
• New bascule bridge parallel to existing bridge over Montlake Cut
• Bridge replacements over SR 520 at Montlake Blvd East and 24th Avenue East
• Partial lid from Montlake Blvd East to 24th Avenue East
• Add southbound traffic capacity on Montlake Place East and 24th Avenue East [a]</td><td>• Rebuild Montlake Blvd East bridge over SR 520; replace interchange with new depressed SPUI east of 24th Avenue East
• Relocate functions of Montlake Transit Station
• HOV direct-access ramps (eastbound-to-northbound and southbound-to-eastbound)
• Twin tunnels under Montlake Cut
• Lowered intersection and lid at Montlake Blvd NE and NE Pacific Street
• Additional northbound capacity on Montlake Blvd NE
• Bridge replacements over SR 520 at Montlake Blvd East and 24th Avenue East
• Lid between Montlake Blvd East and 24th Avenue East</td><td>• Rebuild Montlake Blvd East bridge over SR 520; replace interchange with new elevated SPUI* east of 24th Avenue East
• Relocate functions of Montlake Transit Station
• HOV direct-access ramps (eastbound-to-northbound and southbound-to-eastbound)
• New bascule bridge over Montlake Cut
• Lowered intersection and lid at Montlake Blvd NE and NE Pacific Street
• Bridge replacements over SR 520 at Montlake Blvd East and 24th Avenue East
• Lid between Montlake Blvd East and 24th Avenue East</td></tr>
<tr><td>• Suboption to add eastbound HOV direct-access ramp (part of Option A+)</td><td>• Suboption to add eastbound off-ramp to Montlake Blvd (right-turn only)</td><td>• Suboption to add capacity northbound on Montlake Blvd NE to NE 45th Street</td></tr>
</table>

Exhibit 17. SDEIS 6-Lane Alternative and Options

<table>
<tr><th rowspan="2">Geographic Area</th><th colspan="3">6-Lane Options</th></tr>
<tr><th>Option A</th><th>Option K</th><th>Option L</th></tr>
<tr><td rowspan="2">West Approach Area</td><td>• Construct 6-lane bridge width
• Ramps removed, no direct connection to Lake Washington Blvd
• Profile of bridge from 24th Avenue East through Arboretum is a 0.5% slope to just beyond Foster Island, where roadway descends to elevation of existing profile and flattens to 0.0% before a 3.0% incline to west transition span.</td><td>• Construct 6-lane bridge width
• Lake Washington Blvd ramp function combined with SPUI*
• Traffic turnaround at Lake Washington Boulevard East
• Profile of bridge from 24th Avenue East through Arboretum is a 0.5% slope to Foster Island, where roadway dips below the existing profile, and then flattens to 0.0% before a 3.0% incline to west transition span
• Foster Island Land Bridge with lowered roadway</td><td>• Construct 6-lane bridge width
• Lake Washington Blvd ramp function combined with SPUI*
• Profile of bridge from 24th Avenue East through Arboretum is at a constant 0.3% slope until reaching the 3% incline leading to the west transition span.</td></tr>
<tr><td>• Suboption to add eastbound on-ramps and westbound off-ramps to Lake Washington Blvd (part of Option A+)
• Suboption to add Option L profile[b] (part of Option A+)
•</td><td></td><td>Suboption to allow left-turn movement to access SR 520 from Lake Washington Blvd East</td></tr>
<tr><td>Floating Bridge Area</td><td colspan="3">• Replace floating bridge and east approach to 6-lane width
• Build bridge maintenance facility and dock</td></tr>
<tr><td>Eastside Transition Area</td><td colspan="3">• Tie into Medina to SR 202 project improvements at Evergreen Point Road, and restripe to 92nd Avenue NE
• Relocate Evergreen Point transit station</td></tr>
</table>

*SPUI = single point urban interchange
[a]Added capacity only necessary if Lake Washington Blvd ramps are not included in final design.
[b]Suboption not part of original mediation options; added by WSDOT to address stormwater management concerns.

For construction of the 10th and Delmar lid, a detour bridge would be constructed just east of the existing 10th Avenue crossing of SR 520. Traffic would then shift to the temporary 10th Avenue East bridge during construction of the lid. Delmar Drive East would remain closed for 9 months and would then reopen as part of the new lid structure. The existing 10th Avenue East and Delmar Drive East bridges would be demolished.

Construction of the westbound to the northbound I-5 connector ramp, the off-ramp to Harvard Avenue, and the eastbound mainline would occur under the 10th and Delmar lid. Building the new 10th and Delmar lid (including retaining walls, columns, foundations, and girders) would require off-peak lane and freeway closures, depending on the work being done.

A stormwater facility would be constructed along I-5, north of East Roanoke Street (see the Water Resources Discipline Report [WSDOT 2009c] for the dimensions and construction details for stormwater facilities associated with the 6-Lane Alternative.)

Portage Bay Bridge Area

Under Option A, the Portage Bay Bridge would be rebuilt with seven lanes, including two general purpose lanes, one HOV lane in each direction, and a westbound auxiliary lane. Options K and L do not include the westbound auxiliary lane.

Work bridges would be constructed along both the south and north sides of the existing Portage Bay Bridge. Finger piers, constructed perpendicular to the existing bridge, would provide access to the existing and proposed bridge columns.

Initially, the existing bridge would be widened to the south; temporary in-water footings and additional columns and superstructure would be placed in line with the existing bridge. Traffic would be shifted to the south portion in order to allow the north portion of the existing structure to be demolished and the new bridge to be constructed. Four lanes would be open (two in each direction) during construction. Following construction of the north portion of the bridge, traffic would be shifted to the north portion of the bridge to allow demolition of the existing and temporary south bridge lanes and construction of the southern columns and superstructure. The type of permanent bridge structure selected would depend on site conditions, which dictate the distance between columns and clearance needed under the bridge. Option K includes "faux," or false, arches underneath the bridge deck, which would be completed last.

Connections between the new bridge and the exit lanes and ramps to Roanoke Street and northbound I-5 would be configured similarly to the way they are currently.

Exhibit 18 shows estimated dimensions of different construction elements associated with the Portage Bay Bridge.

Exhibit 18. Portage Bay Bridge Construction Elements

	Existing Structure	Option A	Option K	Option L
Bridge width (feet)	61 to75	100 to 165	101 to 144	100 to 146
Estimated height range above water (feet to bottom of structure)	7 to 50	9 to 60	7 to 60	6 to 60
Span Length (feet)	100	115 to 300	115 to 300	115 to 300
Total number of columns	119	66	56	56
Column size (diameter in feet)	4.5	6 to 7	6 to 7	6 to 7
Number of columns in water	89	43	40	40
Number of temporary support piles (includes piles for work bridges and falsework)	-	1,150	1,050	1,250

Montlake Area

Key differences in construction of Options A, K, and L in the Montlake area are related to how traffic would move from the SR 520 roadway north across the Montlake Cut and to the neighborhood areas south of the corridor.

Option A

Under Option A, the Montlake interchange would be rebuilt at its current location. A new bascule bridge would be built parallel to the existing bridge over the Montlake Cut. The clearance above water of the new bridge would range from 43 to 57 feet. New overcrossings (bridges) over SR 520 at Montlake Boulevard and 24th Avenue East would be constructed as part of the lid from Montlake Boulevard East to 24th Avenue East (Attachment 1, Exhibit 1-3).

At the beginning of the construction period, the 24th Avenue East bridge would be closed and demolished. The north half of the Montlake interchange would be reconstructed first. The portion of the Montlake lid east of, and adjacent to, the existing Montlake Boulevard crossing would be built first to allow traffic to be detoured onto the new lid while the 24th Avenue East and Montlake Boulevard bridge structures are replaced. The Montlake Freeway Transit Station would be closed in the first year of reconstructing the interchange. Westbound and eastbound lanes of SR 520 would then be constructed, and traffic would be shifted to the north portion of the Montlake interchange until the south portion is completed.

On- and off-ramps at Montlake Boulevard would remain open to traffic while being reconstructed, with lane shifts using temporary ramp connections as needed.

The new parallel bascule bridge would be constructed across the Montlake Cut. A description of bascule bridge construction is included above, under the heading Bridge Construction.

A constructed stormwater treatment wetland with an outfall to Lake Washington would be built at the current Museum of History and Industry (MOHAI) site. Smaller stormwater treatment facilities would be constructed north of West Montlake Place East and along the northern Montlake Cut shoreline.

Option K

Under Option K, the existing Montlake interchange would be replaced with a depressed SPUI under SR 520. The Montlake Freeway Transit Station would be closed in the first year of constructing the new interchange.

The depressed SPUI would be located at the south entrance to the Montlake Cut tunnel, approximately 50 feet below the existing ground surface. The interchange would be contained within a concrete base slab integrated into the side retaining walls with a watertight connection, essentially forming a watertight bowl, or "boat section," below the water table level. The SPUI would require extensive amounts of excavation. Constant dewatering would be needed to lower the groundwater level during construction because the elevation of the interchange would be below the water table.

To keep the watertight bowl from floating as the water table rises, micropiles would be drilled into the ground and cast into the base slab. The piles would anchor the intersection to the ground. The SR 520 mainline lanes would span the new SPUI interchange.

Work bridges and finger piers would be constructed east of the Montlake shoreline to accommodate construction of the tunnel approach ramps. The ramps would be built below the water table with

What is a SPUI?

Options K and L each include a single-point urban interchange (abbreviated as "SPUI"). The term "single point" refers to the fact that all traffic passing through the interchange can be controlled from a single signal. This allows vehicles to clear the intersection much more quickly than in a diamond interchange, which requires two sets of traffic signals. In addition to moving traffic efficiently, a SPUI is useful in constrained urban areas because it can be designed to take up less space than other types of interchanges.

The conceptual graphics shown in this report depict the general concept proposed for each of the options but do not reflect how the intersection would be signaled.

retaining walls that would permanently hold back the water and earth. Because the SPUI would be located below the lake water level, a pump station would be constructed near the tunnel entrance to pump stormwater out of the depressed SPUI interchange and to the MOHAI stormwater facility.

Exhibit 19 is a conceptual depiction of the completed Option K SPUI. The Lake Washington Boulevard ramp functions would be combined with the SPUI. Twin tunnels under the Montlake Cut would connect the SPUI ramps to a reconstructed Pacific Street/Montlake intersection. Montlake Boulevard and 24th Avenue East would be reconstructed on a lid. The existing Lake Washington Boulevard ramps would be removed.

Exhibit 19. Option K Depressed Single-Point Urban Interchange

Similar to Option A, the 24th Avenue bridge would be closed and demolished as part of the interchange construction. A temporary mainline detour bridge would be constructed from Montlake Boulevard to Foster Island south of the existing roadway to facilitate traffic movement through the area during construction.

As described under Option A, a constructed wetland with an outfall to Lake Washington would be built at the current MOHAI site west of the tunnel alignment. Other stormwater facilities would be built east of the tunnel alignment and north of the Montlake Cut (Exhibit 1-4 in Attachment 1).

A tunnel under the Montlake Cut would connect the ramps from the interchange on SR 520 to a reconstructed Pacific Street/Montlake Boulevard intersection. The tunnel would be completed in two segments—one from the south and one from the north of Montlake Cut—meeting approximately at the middle of the cut.

Two types of tunnel construction would be employed: cut and cover and sequential excavation method (SEM). Exhibit 20 depicts tunnel construction that would occur under the Montlake Cut.

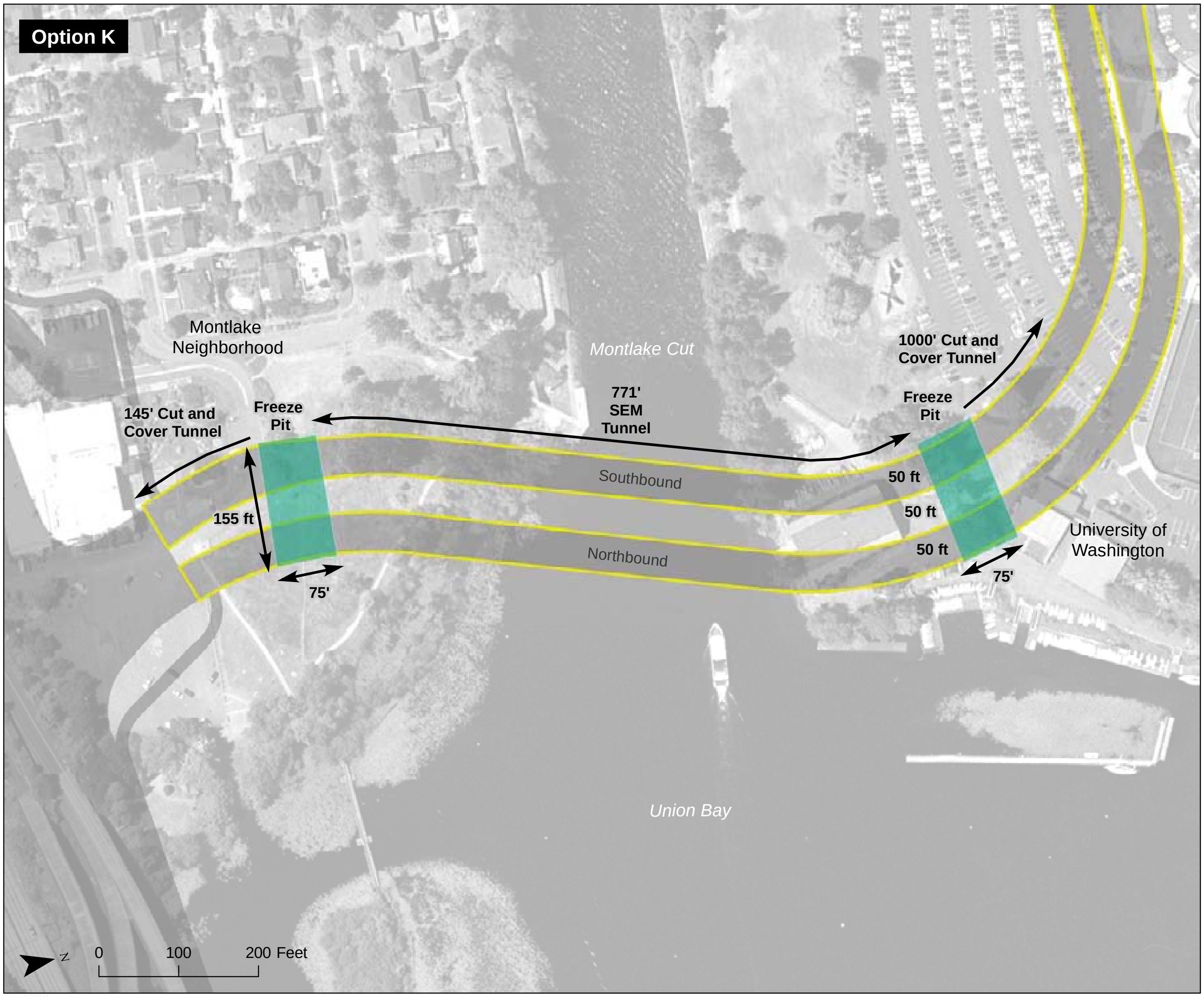
SEM tunnel excavation.

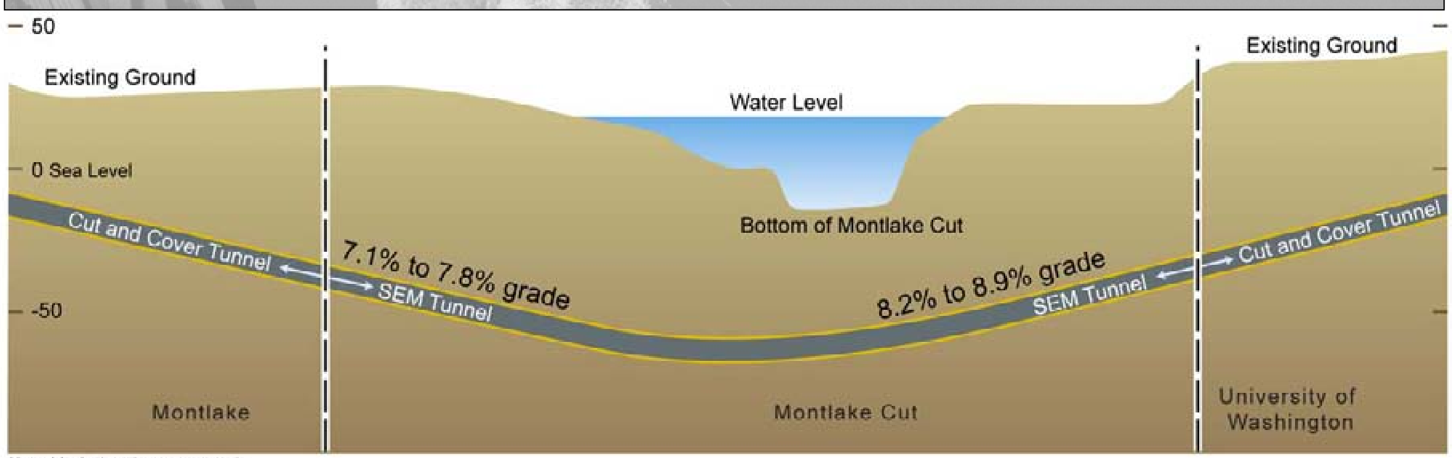
Cut and cover tunnels would be constructed from the SEM tunnel portals to the point where the tunnels connect with the surface roadway. The cut and cover tunnels would be 145 feet long on the south end and 1,000 feet long on the north end. The cut and cover tunnels would have a depth ranging from 100 feet deep adjacent to the SEM tunnel to 60 feet deep at the ends connecting to the surface roadways.

The cut and cover tunnel sections would be constructed by excavating a deep trench and then constructing the tunnel in the trench. A foundation and box tunnel structure would be constructed using cast-in-place methods for the floor, walls, and roof. Once the concrete boxes of the tunnel are completed, soil would be backfilled over the tunnel roof. The roadway surface and tunnel equipment (that is, mechanical, electrical, ventilation, safety) would be installed, as well as the concrete portal where the tunnel would emerge. The area over the cut and cover tunnel section would be restored with vegetation and necessary drainage features.

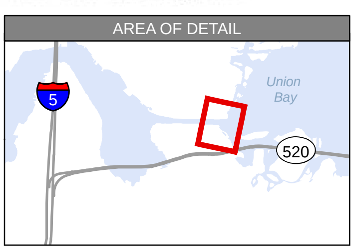
SEM tunnel construction would require freezing the ground to stabilize the soil prior to tunneling. The work would start from “freeze pits” at the portals to the SEM tunnel. Each freeze pit would be approximately 50 feet long and as wide as the face of the tunnel (approximately 155 feet wide).

Pipes to convey a freezing liquid would be inserted around the tunnel circumference at about 5-foot intervals. Drilling for freezing operations would use two drill rigs operating simultaneously, one for each tunnel (northbound and southbound). Once the freezing pipes are in place, soil freezing would take approximately 6 months to complete.





Note: Vertical scale exaggerated.



Source: King County (2006) Aerial Photo. Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Freeze Pit

Tunnel

Exhibit 20. **Tunnel Construction Plan View and Cross Section**

I-5 to Medina: Bridge Replacement and HOV Project

When ground freezing is complete, excavation of the SEM tunnel could begin. SEM tunneling and excavation would occur simultaneously in the northbound and southbound tunnels. The tunnel would advance at an estimated average of 1 foot per day. As excavation advances, the interior walls of the tunnel would be lined with reinforced concrete. A second waterproof liner would be installed after the tunnel is complete. Mechanical, electrical, fire safety, and ventilation systems and utilities would be installed in the tunnel. The roadway would consist of cement concrete with curbing.

At the NE Pacific Street/Montlake Boulevard East intersection, roadway reconstruction would begin by lowering the level of intersection. In order to lower the intersection, retaining walls would be constructed on the east side of Montlake Boulevard and the north and south sides of Pacific Street east of Montlake Boulevard. After completion of the intersection, the Montlake/Pacific lid would be constructed.

Option L

Under Option L, the existing Montlake interchange would be replaced with an elevated SPUI, as depicted conceptually in Exhibit 21.

Exhibit 21. Option L Elevated Single-Point Urban Interchange

Construction would occur from work bridges and finger piers (Exhibit 1-5 in Attachment 1). The Montlake Freeway Transit Station would be closed during the first year of constructing the new interchange. Montlake Boulevard and 24th Avenue East would be reconstructed on a lid, similar to Option A. Also similar to Option A, the 24th Avenue bridge would be closed and demolished as part of the interchange construction.

The elevated SPUI would be a six-span structure consisting of concrete superstructure elements, support walls, and spread footings. The elevated SPUI structure would connect to the north ramps (crossing the new bascule bridge), the west approach, and the south ramps to Lake Washington Boulevard.

The north portion of the elevated SPUI and ramps would be constructed first, after which traffic would be shifted north to allow construction of the south portion of the interchange and the south ramp connection to Lake Washington Boulevard south of SR 520.

Construction of a new bascule bridge across the Montlake Cut and the lowered Pacific Street/Montlake Boulevard intersection would occur, similar to how it is described above for Option A. The clearance above water of the new bridge would range from 43 to 57 feet.

As under Options A and K, a constructed wetland with an outfall to Lake Washington would be built at the current MOHAI site.

West Approach Area

Option A

The northern half of the new west approach bridge would be constructed first, beginning with work bridges north of the existing Union Bay and west approach bridges. Finger piers would allow access from the work bridges to the existing and proposed columns. The northern half of the west approach bridge would be constructed from a work bridge. If possible, barges would be used in certain locations.

Traffic would be moved to the new northern half of the west approach bridge to allow construction of the southern portion. Traffic movement to the northern portion would be contingent on prior completion of the floating bridge to a four-lane configuration. The proposed bicycle/pedestrian path would be temporarily used to provide sufficient road width for the east and west travel lanes.

Following construction of the north portion of the west approach bridge, the existing Union Bay and west approach bridges would be demolished and construction of the southern half of the proposed west approach bridge would occur.

Option K

Construction of the west approach bridge leading up to the depressed SPUI and tunnel construction activities would occur similarly to that described under Option A. Stormwater vaults and a pump station would be constructed at the east and west end of the Foster Island land bridge.

Foster Island Lid

Construction of the Foster Island lid (or land bridge) would require vegetation clearing, substantial excavation and fill, and construction of a 105,000-square-foot structure. The conceptual grading plan for the land bridge identifies the following quantities for fill on Foster Island: 15,320 cubic yards north of the lid and 12,970 cubic yards south of the lid. An additional 17,340 cubic yards of soil would be placed on the lid.

Option L

Construction of new elevated approach structures leading up to the elevated SPUI and Montlake Cut crossing would be required under Option L to connect with the new bascule bridge that is part of this option. Similar to Option A, work would occur from work bridges and possibly barges in certain locations.

Exhibit 22 shows estimated dimensions of different construction elements associated with the west approach bridges.

Lake Washington

Floating Bridge Pontoons

The new floating bridge would consist of a single row of twenty-one 75-foot-wide by 360-foot-long longitudinal pontoons, two 75-foot-wide by 240-foot-long cross pontoons (located at each end of the floating bridge), and fifty-four 50-foot- or 60-foot-wide by 98-foot-long supplemental stability pontoons.

As previously discussed, WSDOT recognized the urgent need to prepare for potential catastrophic failure of the Evergreen Point Bridge and initiated the Pontoon Construction Project under a separate National Environmental Policy Act (NEPA) process. The Pontoon Construction Project evaluates construction of a new casting basin facility in Grays Harbor County; construction of all of the longitudinal and cross pontoons, as well as 10 supplemental stability pontoons that

Exhibit 22. West Approach Construction Elements

Union Bay Bridge Structure[a]	Existing Structure	Option A	Option K	Option L
Bridge width (feet)	60 to 150	147 to 205	192 to 250	199 to 270
Estimated height range above water (feet to bottom of structure)	2 to 7	9 to 25	6 to 10	3 to 10
Span length (feet)	100	112 to 140	20 to 65	63 to 140
Total number of columns	237	98	782	155
Column size (diameter in feet)	4 ft, 6 in.	6	2-6	6
Number of columns in water	176	71	733	117
West Approach Structure		**Option A**	**Option K**	**Option L**
Width (feet)[b]	60	65 (WB) 50 (EB)	65 to 95 (WB) 50 to 67 (EB)	65 to 88 (WB) 50 to 79 (EB)
Estimated height range above water (feet to bottom of structure)	17 to 43	7 to 50	2 to 50	11 to 47
Span length (feet)	100	140	30 to 140	140 to 350
Total number of columns	228	110	211	72
Column size (diameter in feet)	4 ft, 6 in.	6	2 to 7	7 to 9
Number of columns in water	228	110	211	72
Total number of temporary support piles (Union Bay and west approach structures)	-----	1,900 to 2,200	2,950 to 3,000	2,200

[a] The west approach evaluated and referred to in the SDEIS includes both the Union Bay structure (including Arboretum ramps and SPUI) and the west approach to the floating bridge.

[b] Bridge widths for Options A, K, and L are shown for both westbound (WB) and eastbound (EB) structures on the west approach.

would be needed to replace the bridge in the event of catastrophic failure; and moorage of the pontoons until a catastrophic event occurs. If pontoons constructed as part of the Pontoon Construction Project are not used for bridge replacement resulting from catastrophic failure, they would be available for construction of the 6-Lane Alternative for the I-5 to Medina project.

The I-5 to Medina project would construct the additional 44 supplemental stability pontoons needed for stability and buoyancy of a new six-lane floating bridge. The supplemental stability pontoons may be constructed at both the existing Concrete Technology Corporation (CTC) facility and at the new casting basin facility in Grays Harbor. The following discussion describes pontoon construction, transport, and installation.

Existing CTC Casting Basin Facility

The existing CTC casting basin alone is too small to accommodate the timely construction of the 44 supplemental stability pontoons required for the I-5 to Medina project. However, WSDOT could use this facility in conjunction with the larger casting basin in the Grays Harbor area to complete pontoon and anchor construction.

The CTC casting basin is next to an existing concrete batch plant sufficient to serve pontoon building operations at the CTC site. For the Hood Canal Bridge Project, WSDOT leased about 17 additional acres at several nearby properties for construction laydown areas, parking areas, and office space to support activities at the CTC site and would also lease those and/or other nearby properties to support this project.

Grays Harbor Casting Basin Facility

A new casting basin facility located on the shore of Grays Harbor, and developed as part of the Pontoon Construction Project, would be used to construct some of the 44 additional supplemental stability pontoons necessary for the new 6-lane floating bridge. This facility would likely have a concrete batch plant where concrete for the pontoons would be produced, large laydown areas, and stormwater handling and water treatment systems.

The casting basin facility would include stormwater and water treatment systems that would continue to operate during pontoon construction for the I-5 to Medina project. The systems would address stormwater runoff from the facility, casting basin process water, and water from the dewatering systems (described below). For typical stormwater runoff, WSDOT anticipates providing basic water quality treatment best management practices in accordance with WSDOT's *Highway Runoff Manual* (WSDOT 2008c) or the Washington State Department of Ecology *2005 Stormwater Management Manual for Western Washington* (Ecology 2005), as applicable. All process water would be pumped from the casting basin to a collection system where the water would be monitored and treated as appropriate before being discharged to Grays Harbor or an approved offsite facility.

A permanent dewatering system would be in place to maintain the casting basin facility when not in use and to keep the casting basin reasonably dry during pontoon construction. The system would consist of passive (water flow via gravity) and active (water pumping) components. All groundwater leaving the site would be monitored and treated as needed to meet applicable water quality standards before being discharged (pumped) into the harbor or an approved offsite facility.

Pontoon Construction Methods

Pontoon construction would involve the following steps to construct the pontoons at either casting basin facility. Taken all together, these steps make up one full cycle of pontoon construction.

- Deliver materials to the facility
- Form pontoon components
- Prepare reinforcing steel for the pontoons
- Manufacture concrete
- Place concrete in formwork
- Cure concrete
- Perform water quality treatment activities
- Flood casting basin and open gate
- Tow pontoons out of basin to Lake Washington
- Close gate and drain casting basin

Pontoons are reinforced concrete structures. To build them, concrete would be poured around steel rebar cages surrounded by wooden or steel forms. When the concrete is set, the forms would be removed and the pontoons would be cured in the casting basin.

When a cycle of pontoons is complete, the casting basin would be thoroughly cleaned and pressure washed, and the runoff would be treated before discharge to Grays Harbor or the Puget Sound. Then, the basin would be flooded to allow the pontoons to safely float within the casting basin. After the water level inside the basin reaches the water level in Grays Harbor (or the Blair Waterway at the CTC facility), the casting basin access gates would be opened and the pontoons towed out of the basin by a tug boat.

At the Grays Harbor facility, trenches along the perimeter would provide channels for any fish that entered the basin during gate openings to be collected and released back into open water when the gate is closed and the water is pumped from the basin. The casting basin would require a permanent dewatering system to lower the groundwater level, thereby reducing the buoyant uplift pressures that could destabilize the casting basin structure. This system is described in the dewatering discussion under Grays Harbor Casting Basin Facility, above.

Construction Duration

Each cycle (defined above) of pontoon construction would be based on a typical work schedule (8 hours per day, 5 days per week). The first construction cycle at each facility could take as long as 9 months, while subsequent cycles may be 6 months.

The size of the Grays Harbor casting basin facility to be built for the Pontoon Construction Project would determine the exact number of pontoons that could be built in that facility. However, it is anticipated that a maximum of 26 pontoons could be built at the new Grays Harbor facility at one time. A maximum of 5 pontoons could be built at the existing CTC facility at one time. Using these estimates, one cycle of 26 pontoons could be built at the Grays Harbor facility, while 4 cycles of pontoons could be built at the CTC facility. However, more cycles are likely at the CTC facility because it may be available for use earlier than the Grays Harbor facility.

Pontoon Towing

As described above under *What are the Project Alternatives?*, pontoons being towed from Grays Harbor would use the coastal waters of Washington state, the Strait of Juan de Fuca, and Puget Sound as a transport route. Ocean-going tugs moving pontoons from Grays Harbor north to Puget Sound would follow international rules of right-of-way. See Exhibit 6, which illustrates the general towing route from Grays Harbor into Puget Sound and potential locations that could be used for outfitting the pontoons.

All pontoons would be towed into Lake Washington from Puget Sound through the Ballard Locks and the Lake Washington Ship Canal. The Lake Washington Ship Canal includes Salmon Bay, the Fremont Cut, Lake Union, Portage Bay, and the Montlake Cut. Pontoons would be towed by tug boat(s) through Lake Washington Ship Canal to Lake Washington; one pair of longitudinal pontoons could be towed through the Ballard Locks at one time.

The pontoons would be towed from Grays Harbor between the months of March and October. Towing would be limited to times when the ocean has a maximum wave height of 7 feet. Pontoons would be towed at approximately 4 knots and would take approximately 2 days to get from Grays Harbor into the calmer Strait of Juan de Fuca.

Pontoon Outfitting

Pontoons would be outfitted with bridge and roadway structures at available port locations in Puget Sound. Pontoons may be stored in Puget Sound until needed for construction of the Evergreen Point Bridge. These temporary storage sites would be at existing commercial shipping or mooring facilities regularly used by large vessels or barges. Temporary storage of the pontoons would be consistent with typical facility operations.

Construction within Lake Washington

The floating portion of the Evergreen Point Bridge would be built over deep, open water where bridge columns are not feasible. Pontoons would be towed into Lake Washington and temporarily anchored while the roadway is constructed and pontoons placed in the final location. Steel cables would connect the anchors to the floating pontoons.

Floating bridge construction would start from each end of the bridge and move towards the “middle.” One 240-foot-long by 75-foot-wide cross pontoon at each end of the bridge would be set perpendicularly to the longitudinal pontoons; these cross pontoons would be installed first. The longitudinal pontoons would be bolted to these cross pontoons to form the main floating length of the bridge. The supplemental stability pontoons would then be attached to the north and south sides of the longitudinal pontoons to provide stability and buoyancy. Exhibit 23 illustrates how the pontoons would be arranged to replace the floating portion of the Evergreen Point Bridge to a 6-lane capacity.

The new floating bridge would be located 190 feet north of the existing bridge at the west end, and 160 feet north at the east end. The longitudinal pontoons would support the roadway on the floating portion of the bridge. Rows of 10-foot-tall concrete columns would support the roadway above the pontoons, and the new bridge deck would be approximately 22 feet higher than the existing bridge deck. The new bridge deck would also extend out beyond the edges of the longitudinal pontoons (see schematic cross section in Exhibit 5).

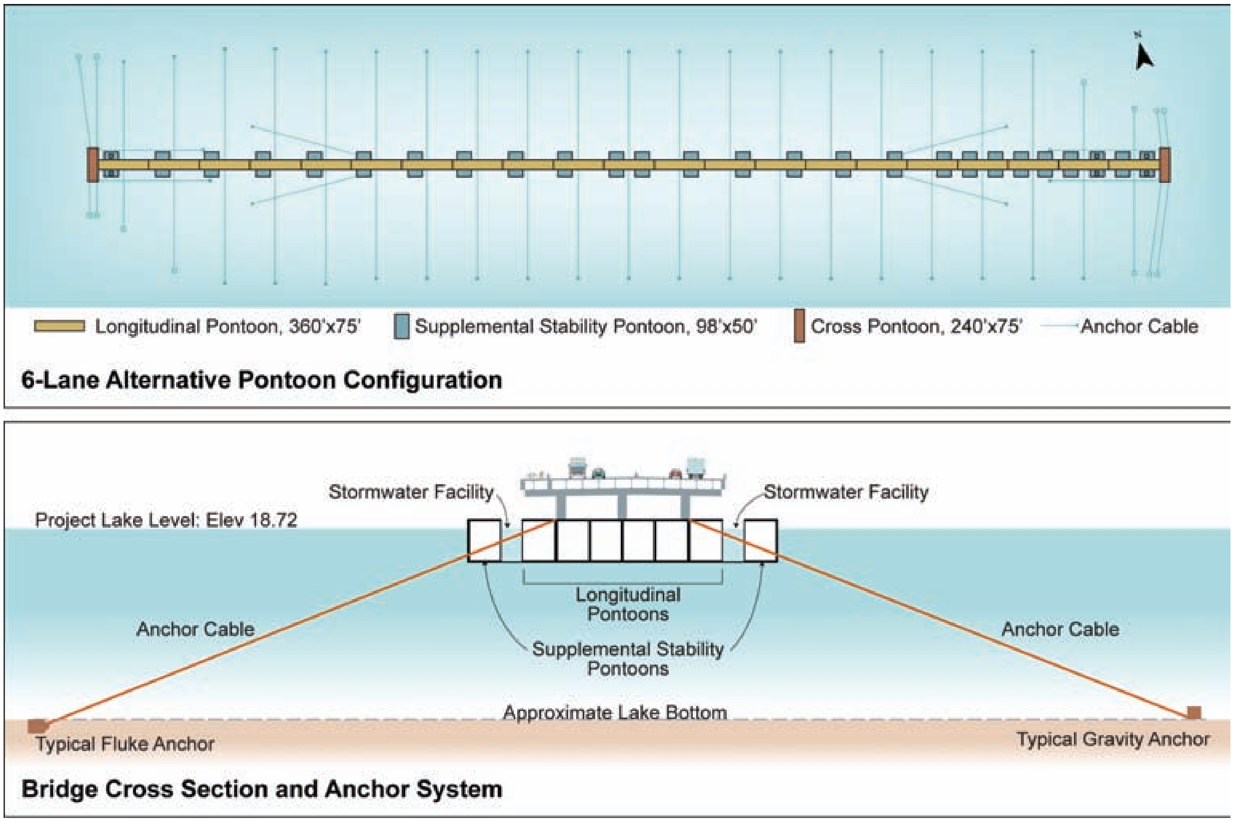


Exhibit 23. Pontoon Arrangement

Once traffic shifts to the new floating bridge, the existing floating bridge would be dismantled and pontoon sections towed away. Pontoons could be sold for use elsewhere, or disposed of or recycled in accordance with all applicable federal, state, and local requirements.

Pontoon Anchors

Two main anchor types would be used for the new floating bridge: gravity anchors and fluke anchors. Gravity anchors, used in harder lakebed materials and sloped areas (near the shores), consist of large concrete blocks stacked on top of one another to provide the necessary weight to hold the pontoons in place. Fluke anchors, used in soft bottom sediments and flat areas (middle of the lake), use a combination of their own weight and water- or air-jetting to set them below the mud line. Both types of anchors would be connected to the floating pontoons with steel cables.

East Approach

The new east approach of the Evergreen Point Bridge would be located north of the existing east approach. Construction for the new east approach would take place from work bridges and barges. The westbound (north) side of the east approach structure would be constructed first, followed by the eastbound (south) structure. Both the north and south structures would be completed prior to shifting traffic onto the bridge.

Exhibit 24 shows estimated details for different construction elements associated with the east approach.

Bridge Maintenance Facility

The new bridge maintenance facility would be built at the same time as the east approach structure. Permanent and temporary access roads, retaining walls, and the dock substructure would be constructed while the westbound portion of the east approach structure is being built.

The maintenance facility dock would be located under the bridge. Exhibit 25 shows the profile of the bridge maintenance facility and dock relative to the east approach. Exhibit 26 is a conceptual plan view of the dock.

Exhibit 24. East Approach Construction Elements

East Approach	Existing Structures	All Options
Bridge width (feet)[a]	60	85 (WB) 58 (EB)
Estimated height range above water (feet to bottom of structure)	75 to 87	72 to 75
Span length (feet)	100	300+
Total number of columns	24	8
Number of columns in water	12	4
Number of temporary support piles	-	165

[a] Bridge widths are shown for both the westbound (WB) and eastbound (EB) structures.

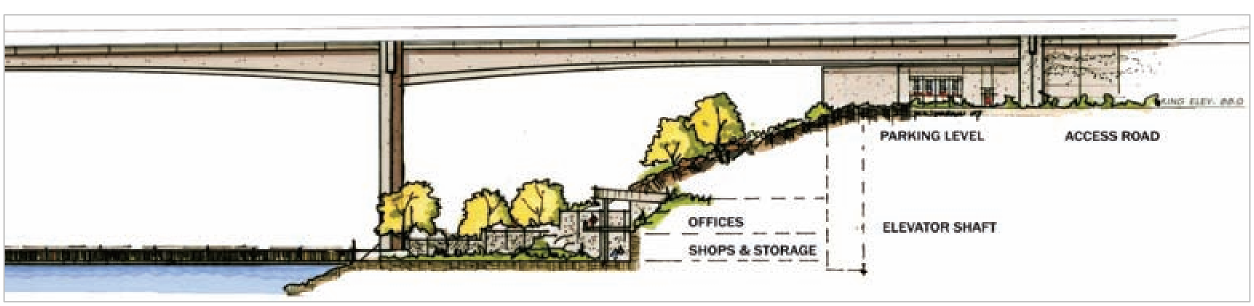


Exhibit 25. Conceptual Sketch of Bridge Maintenance Facility

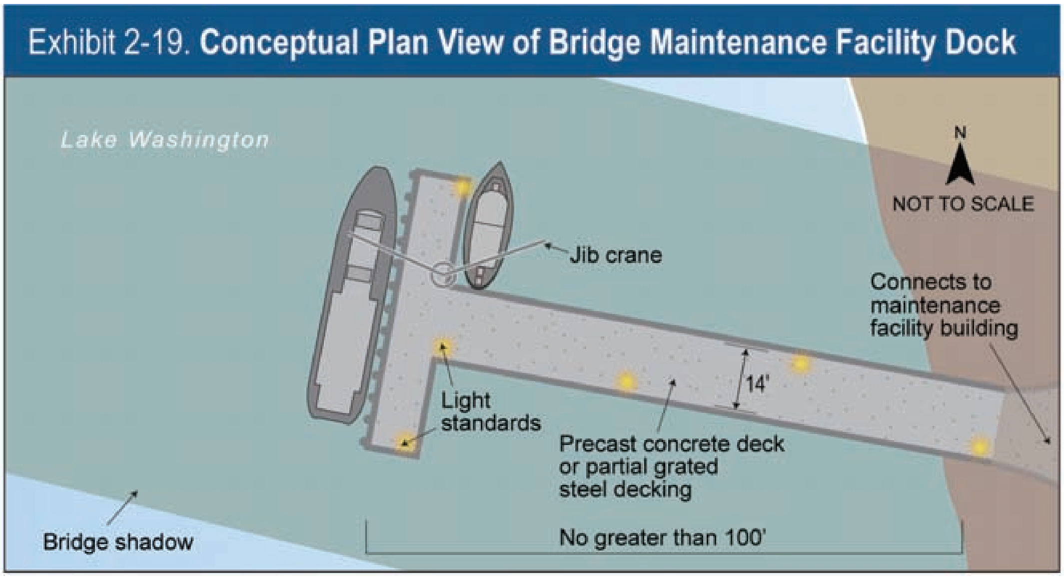


Exhibit 26. Conceptual Plan View of Bridge Maintenance Facility Dock

Eastside Transition Area

Once the east approach and floating portions of the Evergreen Point Bridge have been replaced, a new SR 520 roadway would be constructed between the east approach and Evergreen Point Road area to accommodate the new alignment. These activities would include basic grading and paving operations. Lane channelization between Evergreen Point Road and 92nd Avenue NE would need to be adjusted to tie in to improvements made under the Medina to SR 202: Eastside Transit and HOV Project. The Evergreen Point Road transit station would be relocated to the Evergreen Point lid. In order to make ramps and lanes connect for proper traffic operations, the SR 520 mainline would be restriped beginning at the physical improvements completed near Evergreen Point Road and extending east to 92nd Avenue NE. Restriping efforts may include sand blasting to remove existing paint lines.

Estimated Construction Durations

Construction of the 6-Lane Alternative is projected to begin in 2012. Construction would be completed in 2018 for Options A and L and in 2019 for Option K. Exhibit 27 on the following page provides a summary of the durations for major construction elements.

Exhibit 27. **Estimated Construction Durations for the 6-Lane Alternative, Options A, K, and L[a]**

Element	**Option A** (Montlake interchange with bascule bridge across Montlake Cut)	**Option K** (Depressed SPUI with twin tunnels under Montlake Cut)	**Option L** (Elevated SPUI with bascule bridge across Montlake Cut)
I-5/SR 520 Interchange	21 months	21 months	21 months
10th Avenue and Delmar Lids	27 months	27 months	27 months
Portage Bay Bridge (north half – 4 lanes)	30 months	30 months	30 months
Portage Bay Bridge (south half – widen to 6 lanes, including demolition of existing structure)	42 months	42 months	42 months
Montlake Interchange and Lid	45 months	Not Applicable	Not Applicable
SPUI, Montlake Lid; Lake Washington Boulevard South of SR 520	Not Applicable	78 months	60 months
Pacific Street/Montlake Boulevard Intersection with Lid	Not Applicable	18 months	18 months
New Bascule Bridge	27 months	Not Applicable	30 months
Tunnel from SR 520 to Pacific Avenue/Montlake Boulevard E	Not Applicable	45 months	Not Applicable
West Approach (north half – 4 lanes, includes work in Union Bay)	30 months	54 months (Includes Foster Island lid)	30 months
West Approach (south half – widen to 6 lanes, includes demolition of existing structure)	30 months	30 months	30 months
Floating Bridge and East Approach (includes towing, outfitting, and installing pontoons for a 6-lane bridge)	54 months	54 months	54 months
Bridge Maintenance Facility	24 months	24 months	24 months

[a] Construction durations include testing of new systems and facilities, but do not include mobilization or closeout activities. Mobilization includes material procurement, preparing construction staging areas, and moving equipment to the site. Closeout includes demobilization of staging areas and final roadside planting.

More detailed information on duration and sequencing of construction activities that would occur within each geographic area for Options A, K, and L is included in Attachment 2. This information has been developed to support the effects analyses contained in the SDEIS and represents a logical and sequential approach to constructing the SR 520 roadway, identifies key traffic shifts that would occur, and accommodates certain environmental constraints, such as the current fisheries work windows and pontoon towing weather windows. Specific staging and sequencing of construction activities would ultimately be determined as part of contract packages.

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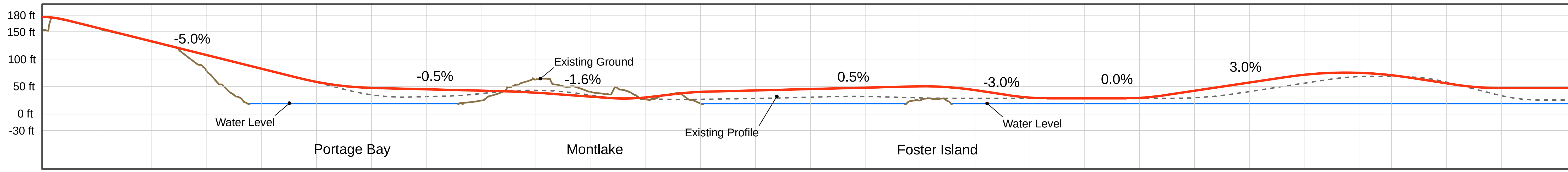
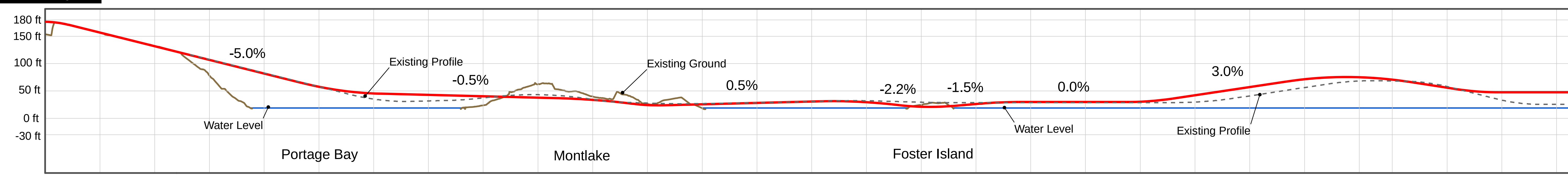
Attachment 1

6-Lane Alternative Maps

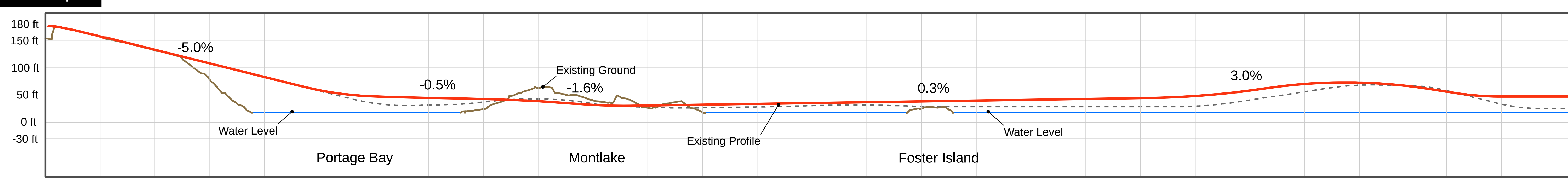
Option A Profile

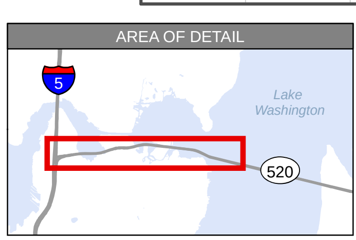


Option K Profile
Option A Suboption



Option L Profile
Option A Suboption





Proposed Mainline Profile
Existing Profile
Park

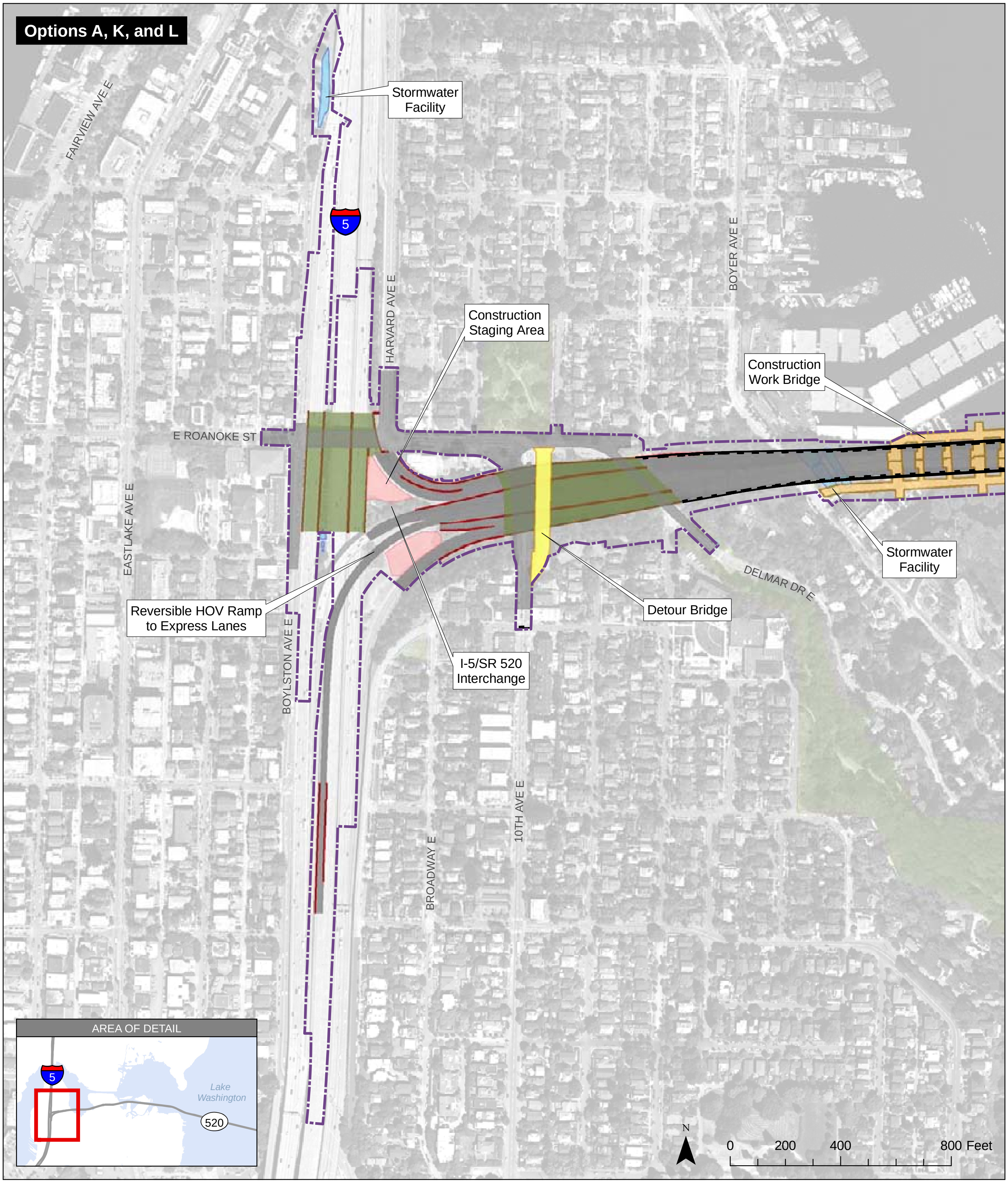
N
0 500 1,000 2,000 Feet

Source: King County (2006) Aerial Photo, CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-1. **6-Lane Option Profiles from I-5 to Lake Washington**

I-5 to Medina: Bridge Replacement and HOV Project

\\SIMBA\PROJ\PARAMETRIX\180171\GIS\MAPFILES\SDEIS\COMMON\SDEIS_PROFILEALLOPTIONS_MONTLAKE.MXD 10/14/2009



Retaining Wall

Potential Sound Wall

Construction Staging Area

Construction Work Bridge

Temporary Roadway or Detour Bridge

Limits of Construction

Stormwater Facility

Lid or Landscape Feature

Park

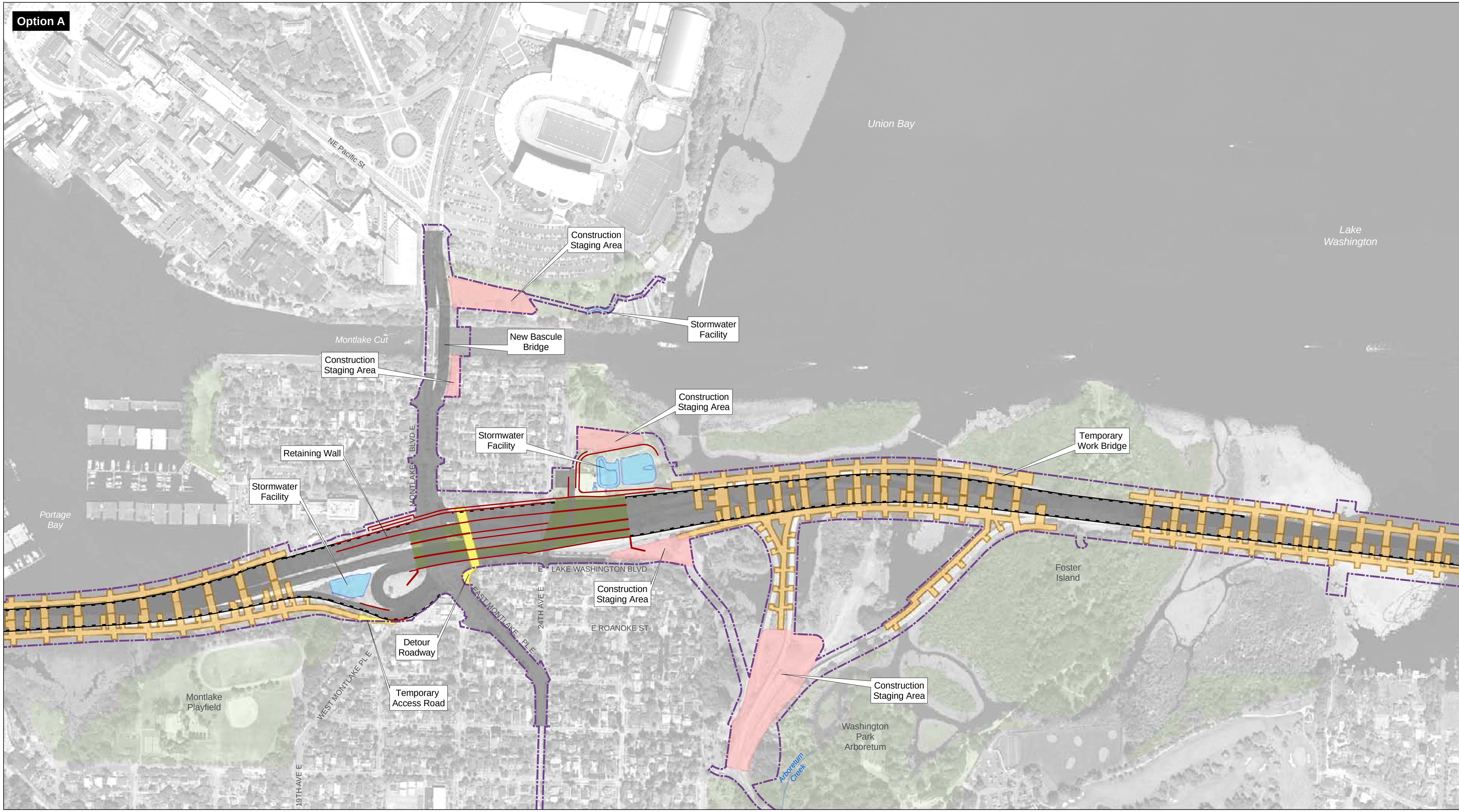
Pavement

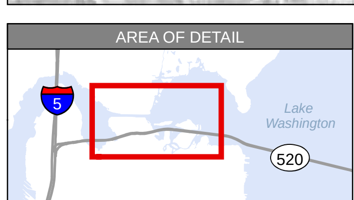
Source: King County (2006) Aerial Photo. CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-2. **Options A, K, and L from I-5 to Portage Bay**

I-5 to Medina: Bridge Replacement and HOV Project

\\SIMBA\PROJ\PARAMETRIX\180171\GIS\MAPFILES\SDEIS\CONSTRUCTIONTECHNIQUES\SDEIS_DR_CT_I5_ALLOPTIONS.MXD 10/14/2009





Retaining Wall
Potential Sound Wall
Limits of Construction
Construction Staging Area
Temporary Detour Road or Bridge
Construction Work Bridge
Stormwater Facility
Lid or Landscape Feature
Park
Pavement

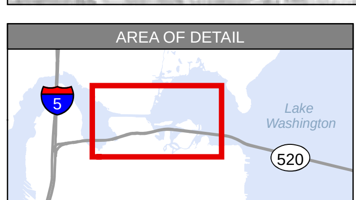
N
0 250 500 1,000 Feet

Source: King County (2006) Aerial Photo, King County (2005) GIS Data (Streams), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-3. **Option A from Portage Bay to Lake Washington**

I-5 to Medina: Bridge Replacement and HOV Project

\\SIMBA\PROJ\PARAMETRIX\180171\GIS\MAPFILES\SDEIS\CONSTRUCTIONTECHNIQUES\SDEIS_DR_CT_OPTIONA.MXD 10/14/2009



Retaining Wall
PotentialSound Wall
Limits of Construction
Tunnel
Construction Staging Area
Temporary Detour Road or Bridge
Construction Work Bridge
Stormwater Facility
Lid or Landscape Feature
Park
Pavement

N
0 250 500 1,000 Feet

Source: King County (2006) Aerial Photo,King County (2005) GIS Data (Streams), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-4. **Option K from Portage Bay to Lake Washington**

I-5 to Medina: Bridge Replacement and HOV Project

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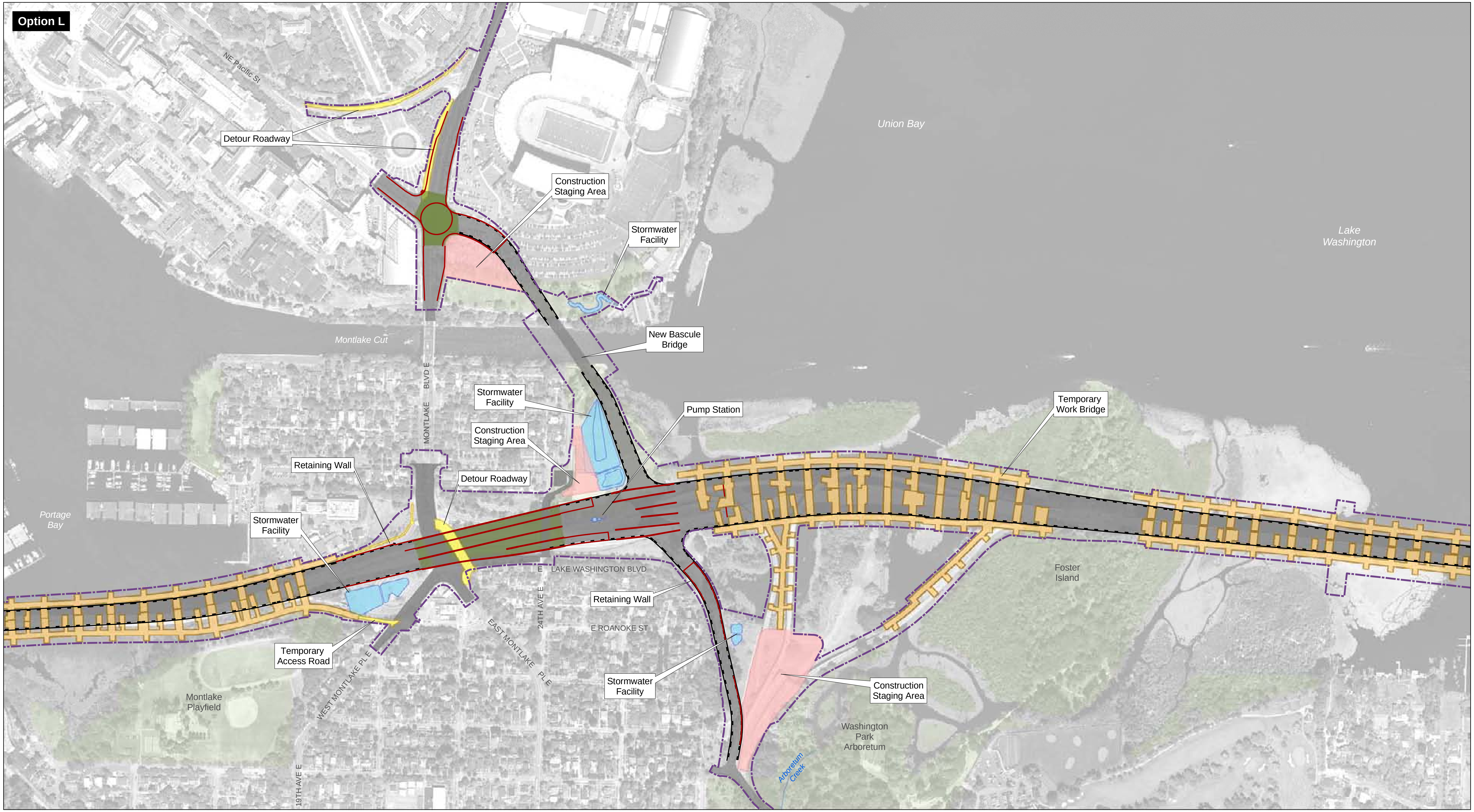

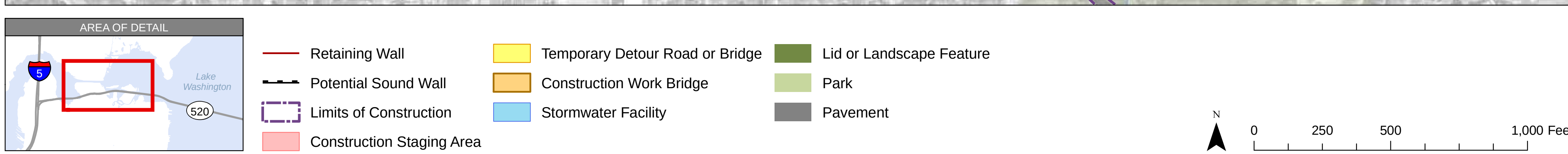

Source: King County (2006) Aerial Photo, King County (2005) GIS Data (Streams), CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-5. **Option L from Portage Bay to Lake Washington**

I-5 to Medina: Bridge Replacement and HOV Project

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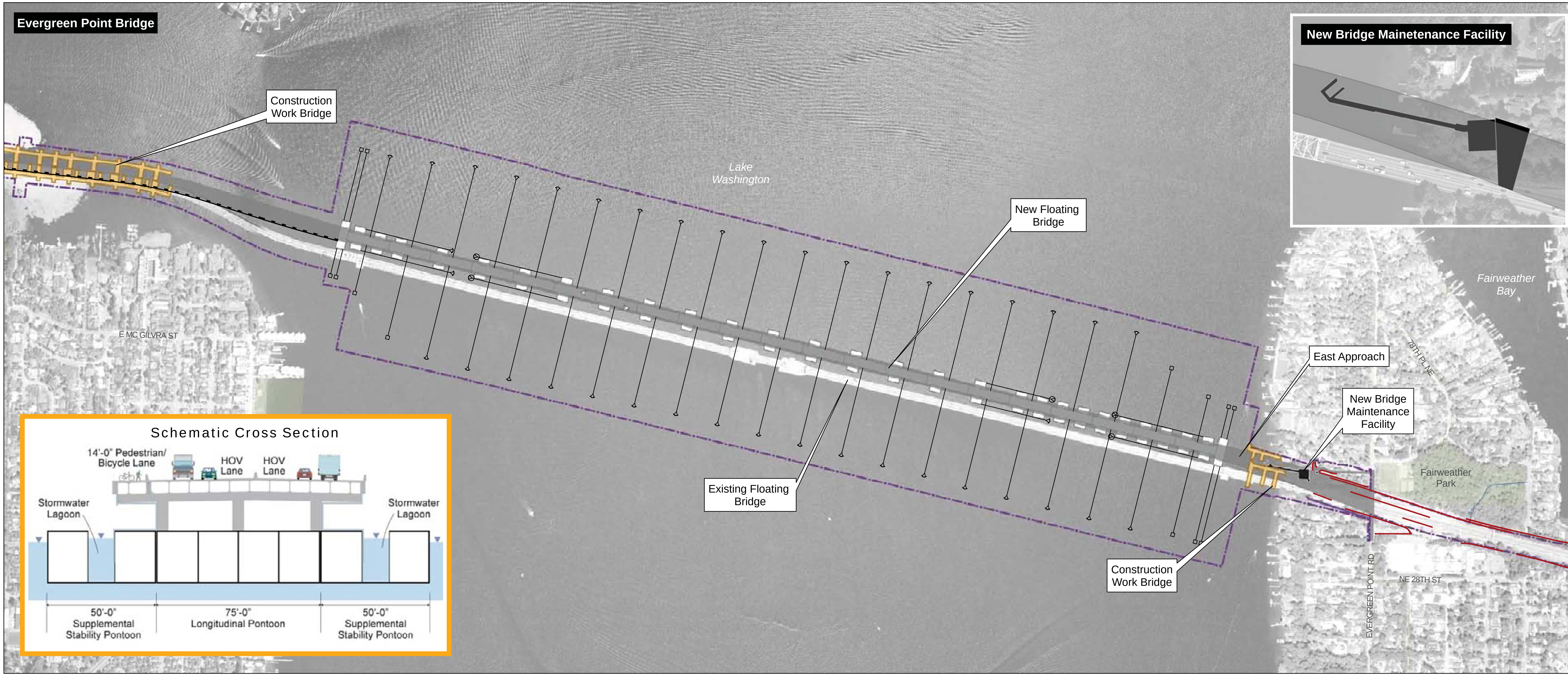
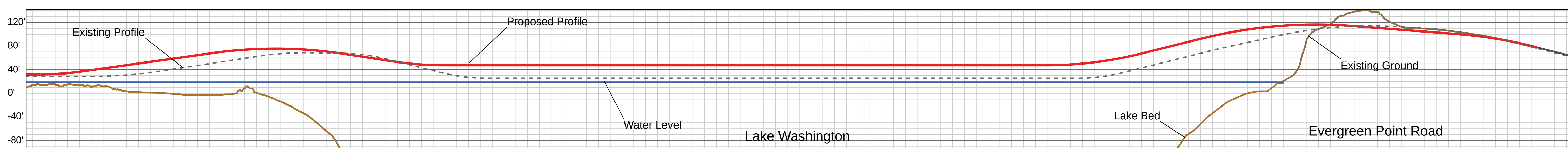
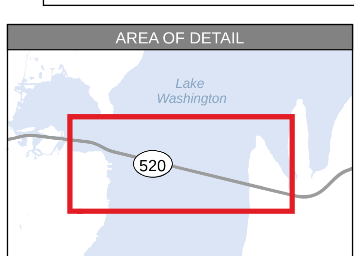






- Anchor and Cable
- Retaining Wall
- Sound Wall
- Temporary Detour Road or Bridge
- Construction Work Bridge
- Limits of Construction
- Pontoon
- Bridge Maintenance Facility
- Park
- Pavement

N

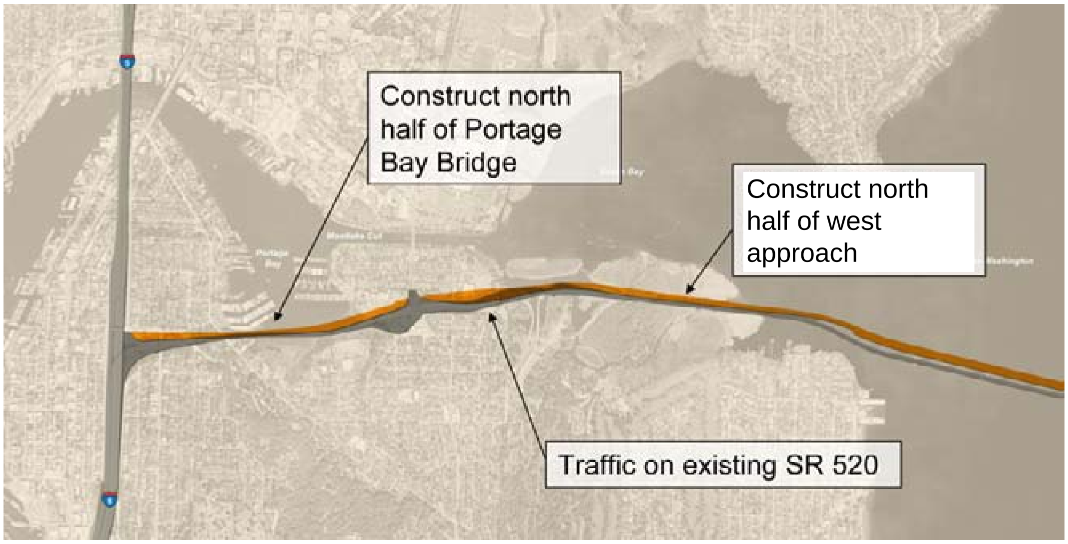
0 500 1,000 2,000 Feet

Source: King County (2006) Aerial Photo, CH2M HILL (2008) GIS Data (Park). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

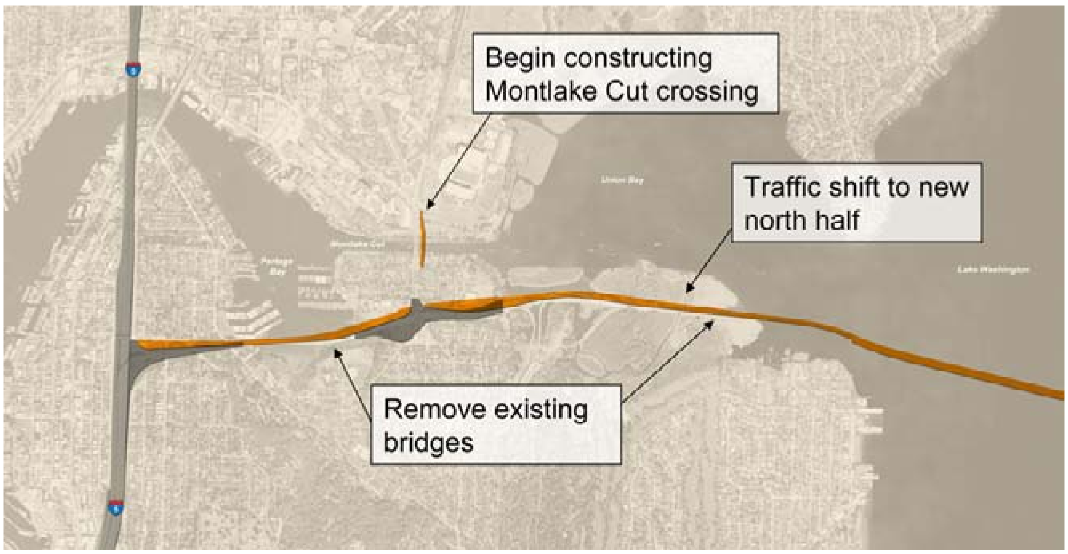
Exhibit 1-6. **Evergreen Point Bridge and East Approach**

I-5 to Medina: Bridge Replacement and HOV Project

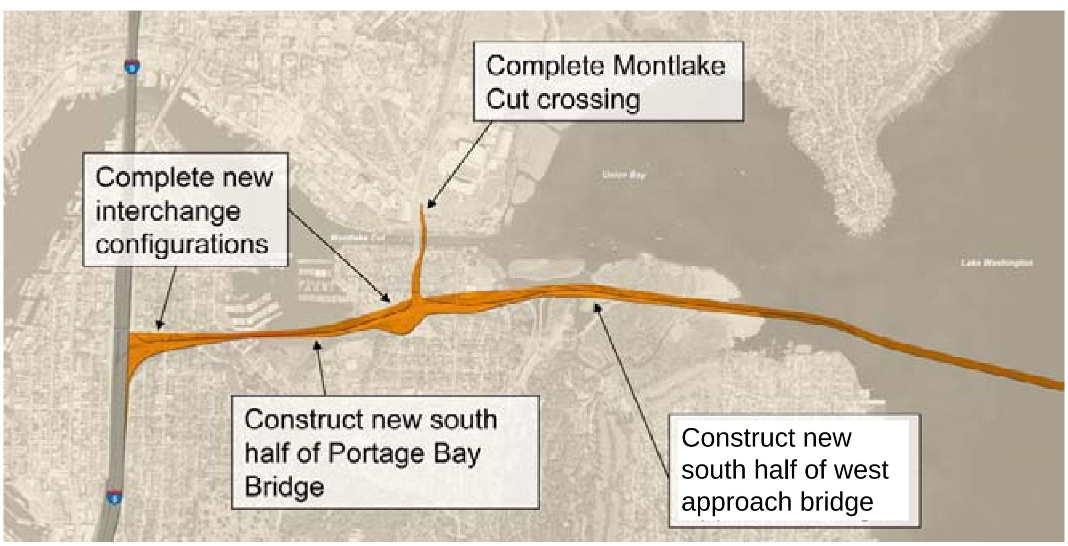
\\SIMBA\PROJ\PARAMETRIX\180171\GIS\MAPFILES\SDEIS\CONSTRUCTIONTECHNIQUES\SDEIS_DR_CT_BRIDGEDESIGN.MXD 10/14/2009



Step 1:
Construct north half

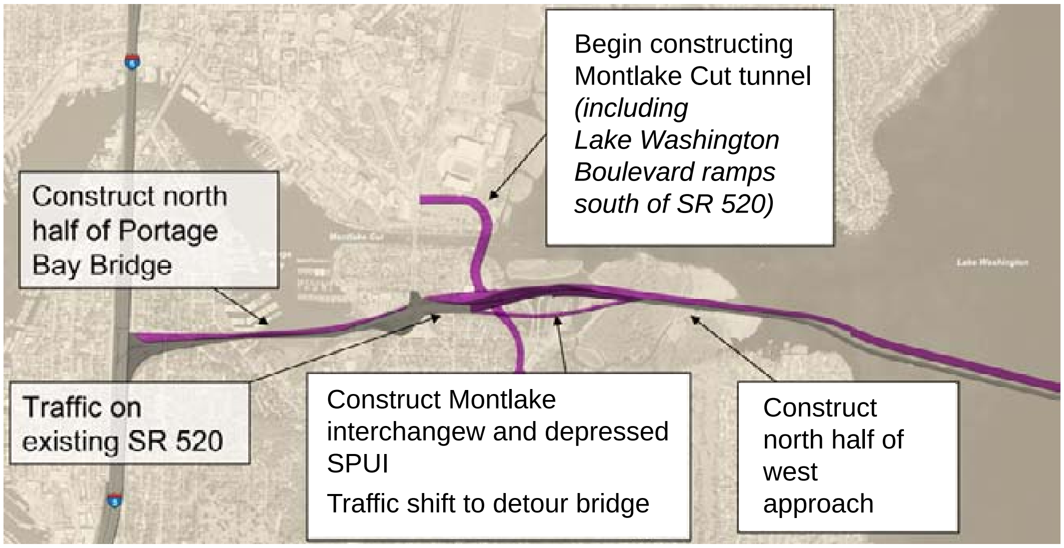


Step 2:
Shift traffic



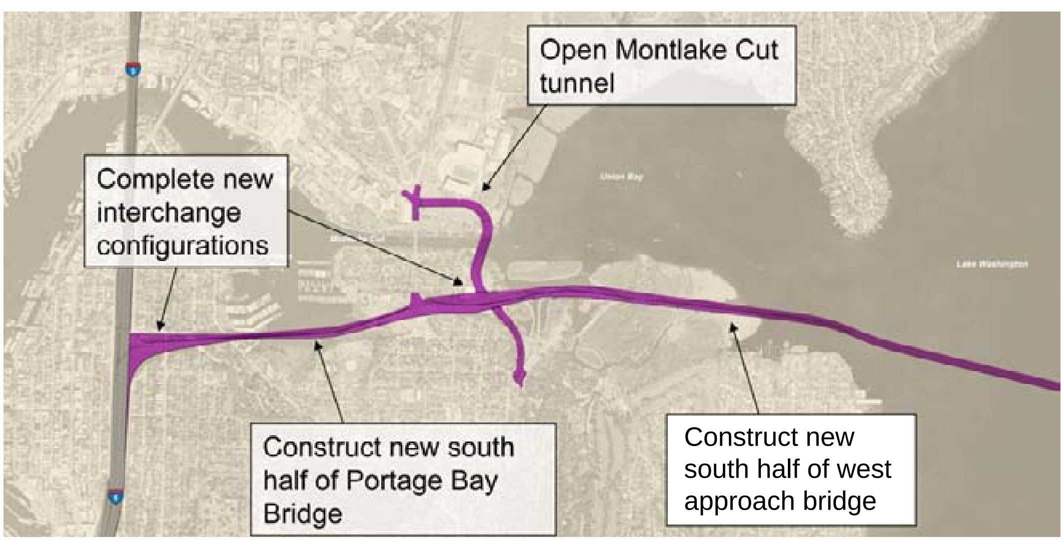
Step 3:
Construct south half

Exhibit 1-7. **Construction Sequencing for 6-Lane Alternative, Option A**
I-5 to Medina: Bridge Replacement and HOV Project



Step 1:
Construct north half and tunnel

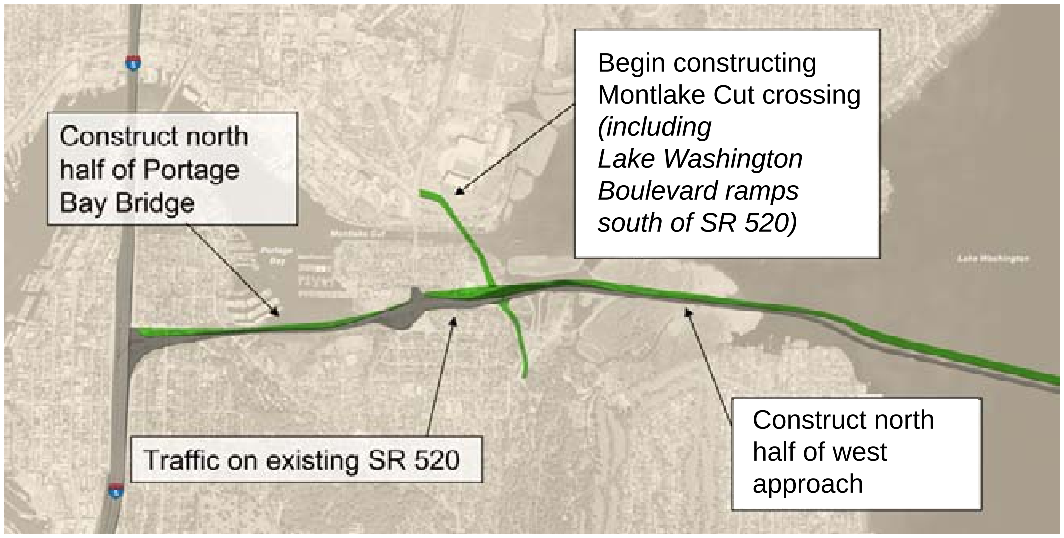
Step 2:
Shift traffic



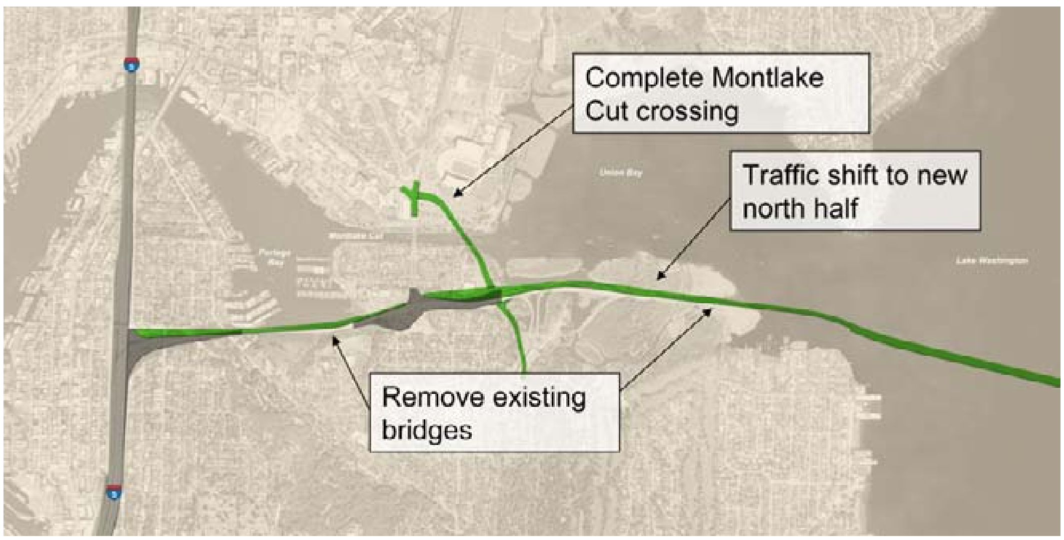
Step 3:
Construct south half

Exhibit 1-8. **Construction Sequencing for 6-Lane Alternative, Option K**

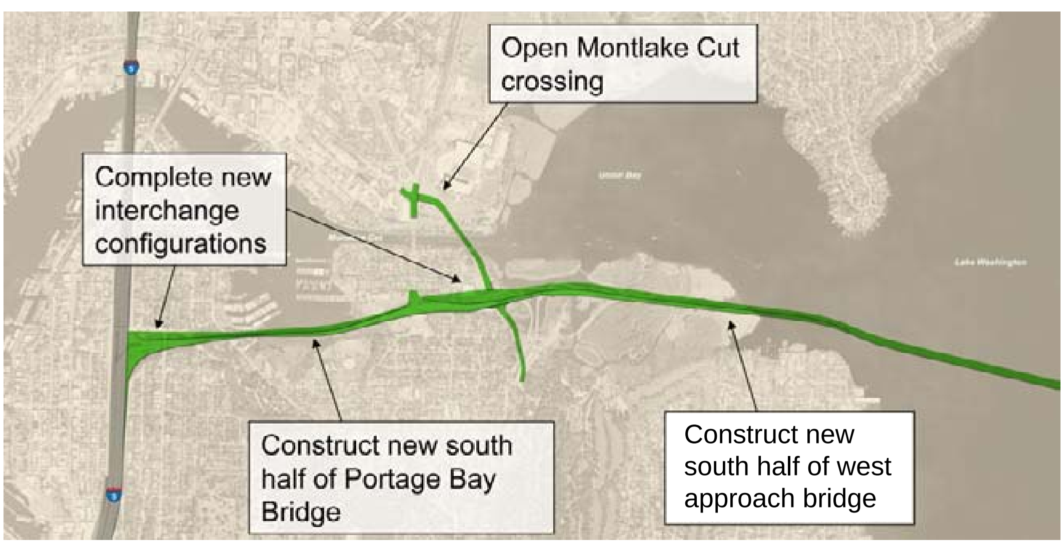
I-5 to Medina: Bridge Replacement and HOV Project



Step 1:
Construct north half



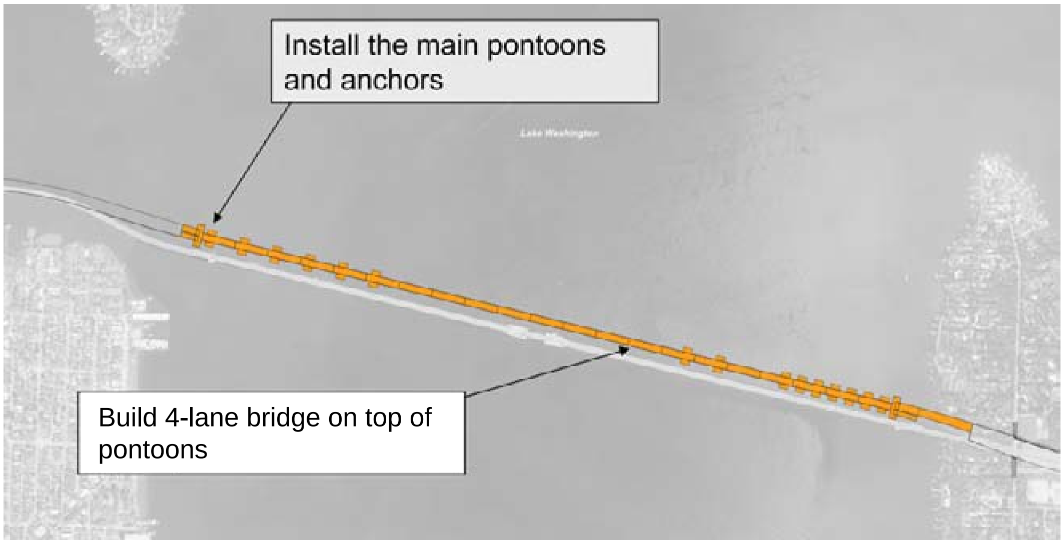
Step 2:
Shift traffic



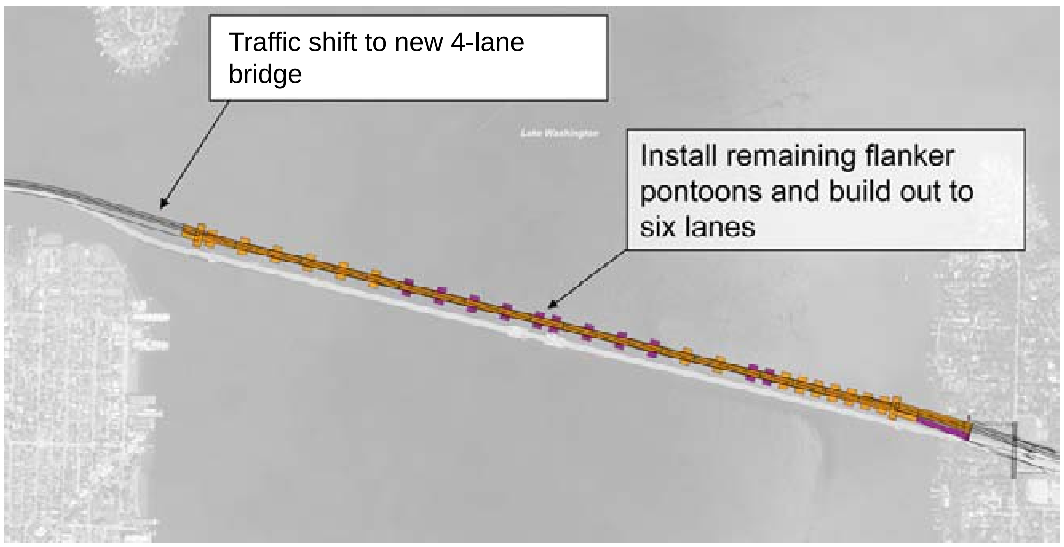
Step 3:
Construct south half

Exhibit 1-9. **Construction Sequencing for 6-Lane Alternative, Option L**

I-5 to Medina: Bridge Replacement and HOV Project



Step 1:
Install pontoons for 4-lane traffic

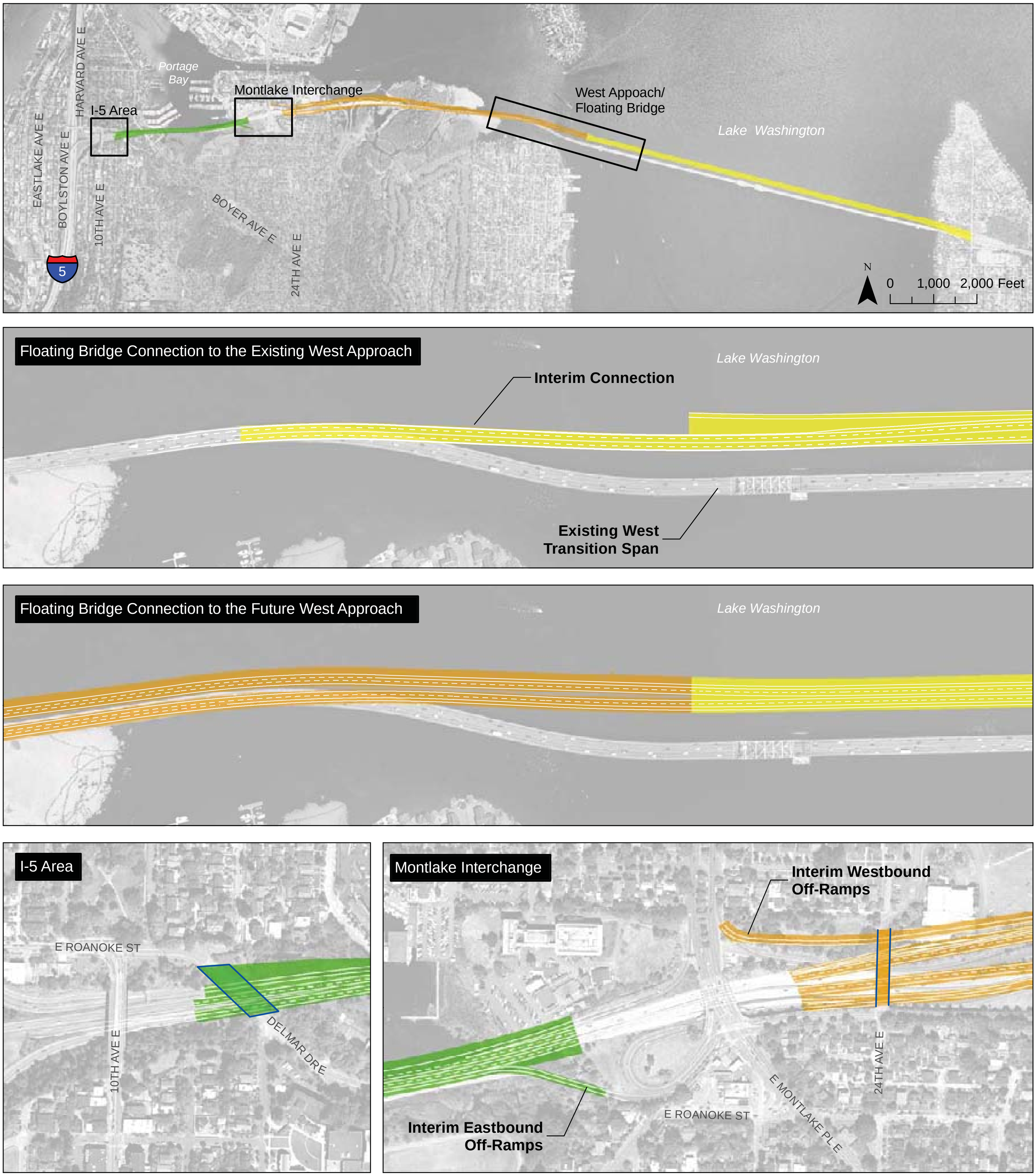


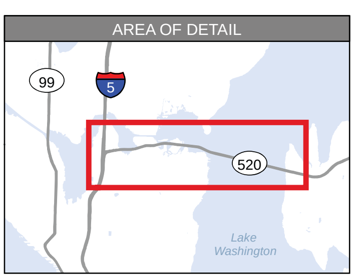
Step 2:
Shift traffic and build out to six lanes

Step 3:
Open six lanes

Exhibit 1-10. **Construction Sequencing for 6-Lane Alternative, Evergreen Point Bridge**

I-5 to Medina: Bridge Replacement and HOV Project





New Overcrossing
Evergreen Point Floating Bridge (Priority 1)
Portage Bay Bridge (Priority 2)
West Approach (Priority 2)

N
0 200 400 Feet

Source: King County (2006) Aerial Photo and CH2M HILL (2008) GIS Data (Parks). Horizontal datum for all layers is NAD83(91); vertical datum for layers is NAVD88.

Exhibit 1-11. **Phased Implementation Transition Areas**

I-5 to Medina: Bridge Replacement and HOV Project

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Attachment 2

Construction Duration and Sequencing Tables

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING

I-5 / SR 520 INTERCHANGE AREA
COMMON TO ALL OPTIONS

Legend
- In-Water Work
- Construction
- In-place
- In Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

To make a clearer presentation of the schedule, some work activites, work titles, and work durations have been adjusted for consistency and reasonableness.
Floating Bridge deep water locations, in-water work year round.
Portage Bay in-water work window from October 1 to April 15.
East and West Approach Bridges in-water work window from July 16 to March 15.
Floating Bridge lake weather work restriction window is November and December.
Pontoon ocean transport restriction window is November 1 to February 28
Updated work schedules based on individual project phases will be prepared as the designs are developed further.

I-5/SR 520 Interchange Area
COMMON TO ALL OPTIONS

	Year				Year				Year				Year				Year				Year				Year				Year			
Activities	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
I-5/SR 520 Area (Option K)										■	■	■	■	■	■	■	■	■	■	■	■											
I-5/SR 520 Interchange										■	■	■	■	■	■	■	■	■														
Mobilization										■	■																					
I-5 Lid & Reversible HOV Ramp to I-5												■	■	■	■	■																
On-grade Westbound Mainline I-5 to PBB															■	■																
Roanoke Lid												■	■	■	■	■																
4 lanes Traffic on New Northbound PBB																♦	Tied to Traffic on North Half of PBB															
Eastbound Mainline & I-5 Ramps																	■	■														
10th Ave & Delmar Lid												■	■	■	■																	
Temporary Bridge at 10th Ave												■	■																			
Demo Existing 10th Ave Bridge														■																		
Close Delmar Traffic												♦																				
Demo Existing Delmar Bridge												■																				
Delmar Lid													■	■	■	■	■	■	■													
Open Delmar Traffic																♦																
10th Ave Lid Bridge Open																			♦													
Demo Temporary 10th Ave Bridge																				■												
6 Lane Ready on I-5																				♦												
I-5 Open to 6 Lanes																								♦	Limited by 6 lanes open on PBB							
Area Closeout																		■	■	■	■											

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING

PORTAGE BAY BRIDGE

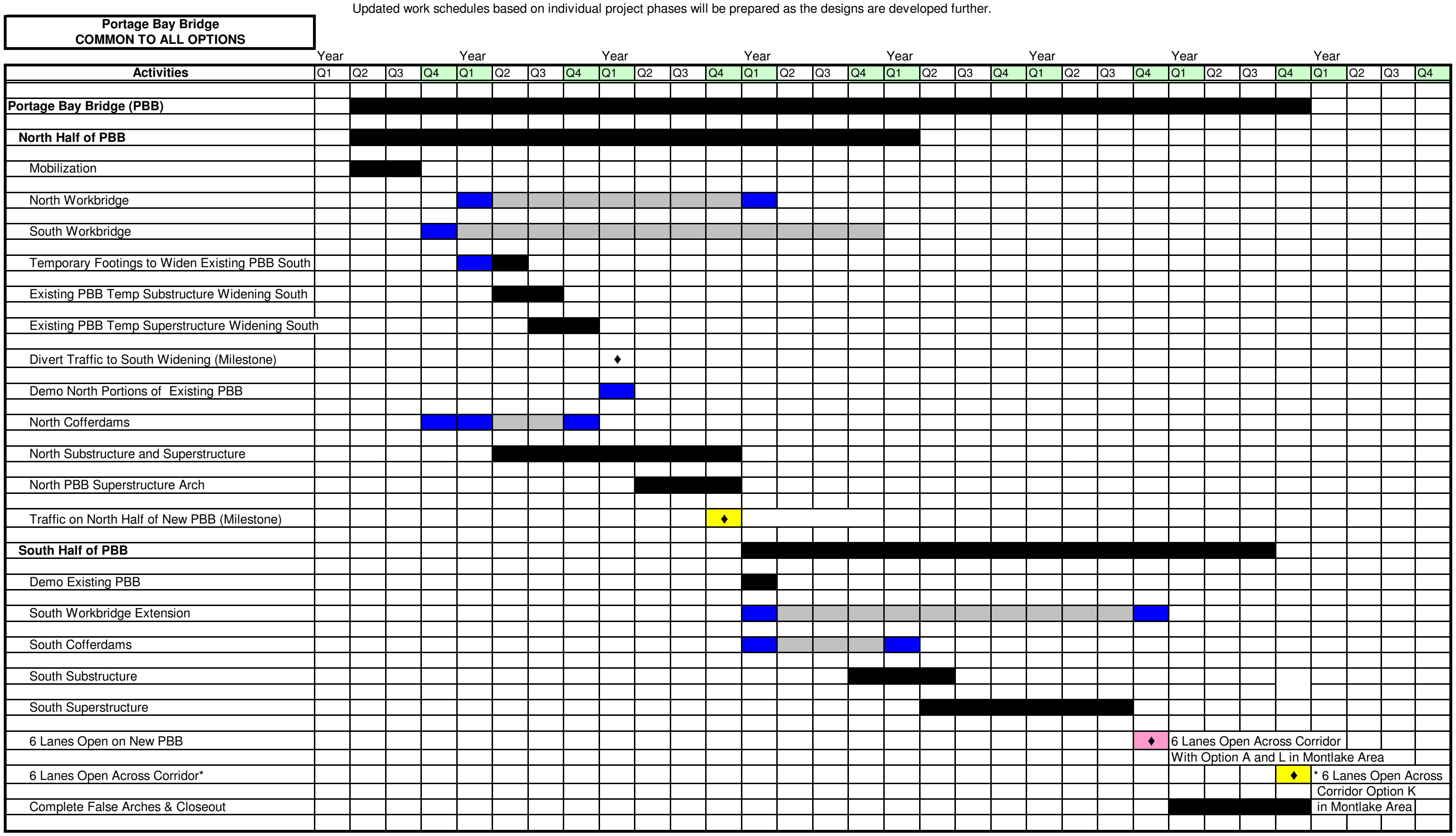
COMMON TO ALL OPTIONS

Legend

- In-Water Work
- Construction
- In-place
- In Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

To make a clearer presentation of the schedule, some work activites, work titles, and work durations have been adjusted for consistency and reasonableness.
Floating Bridge deep water locations, in-water work year round.
Portage Bay in-water work window from October 1 to April 15.
East and West Approach Bridges in-water work window from July 16 to March 15.
Floating Bridge lake weather work restriction window is November and December.
Pontoon ocean transport restriction window is November 1 to February 28
Updated work schedules based on individual project phases will be prepared as the designs are developed further.



6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING

MONTLAKE INTERCHANGE AREA

OPTION A

Legend

- In-Water Work
- Construction
- In-place
- In-Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

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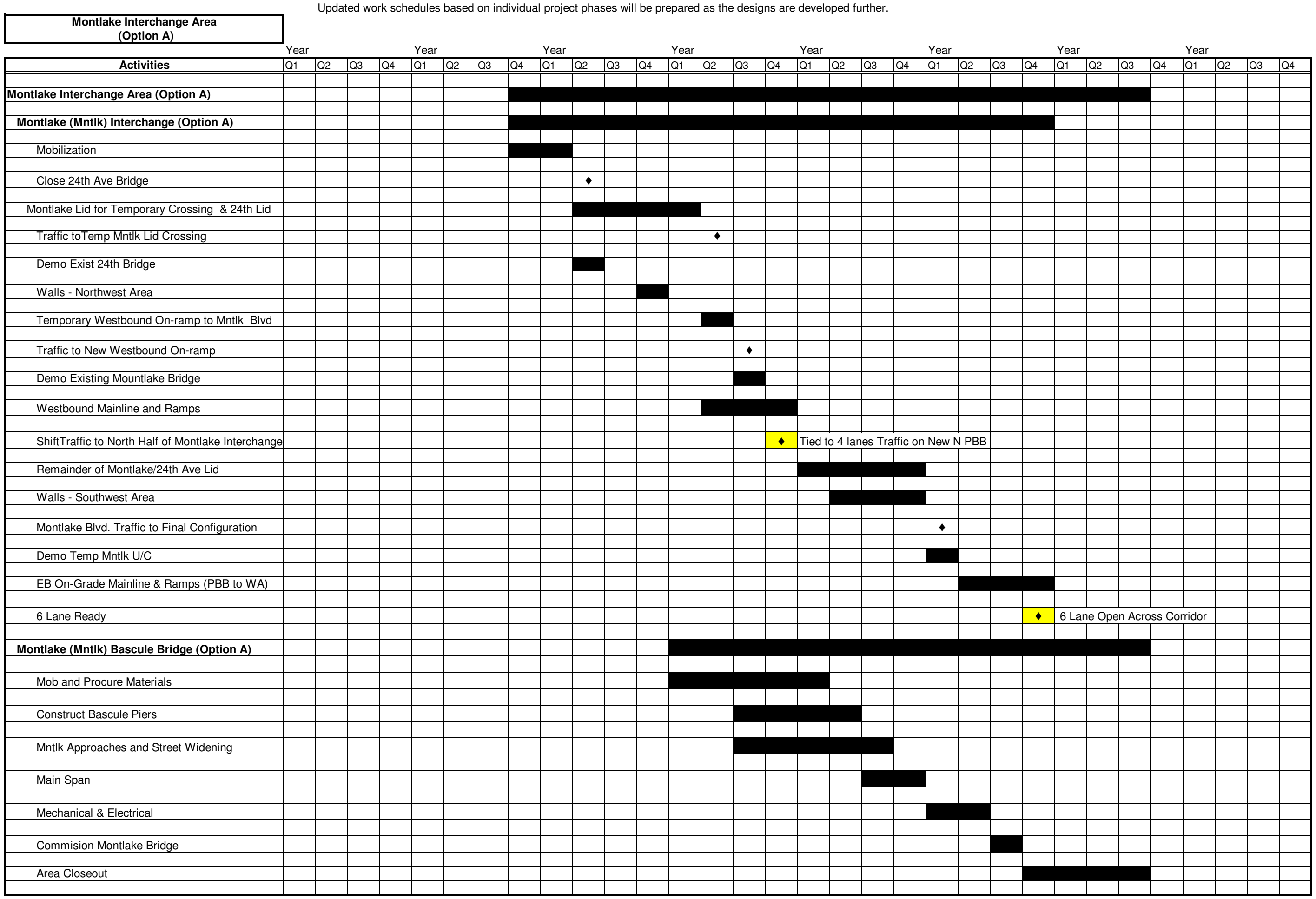

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING

WEST APPROACH AREA

OPTION A

Legend

- In-Water Work
- Construction
- In-place
- In-Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

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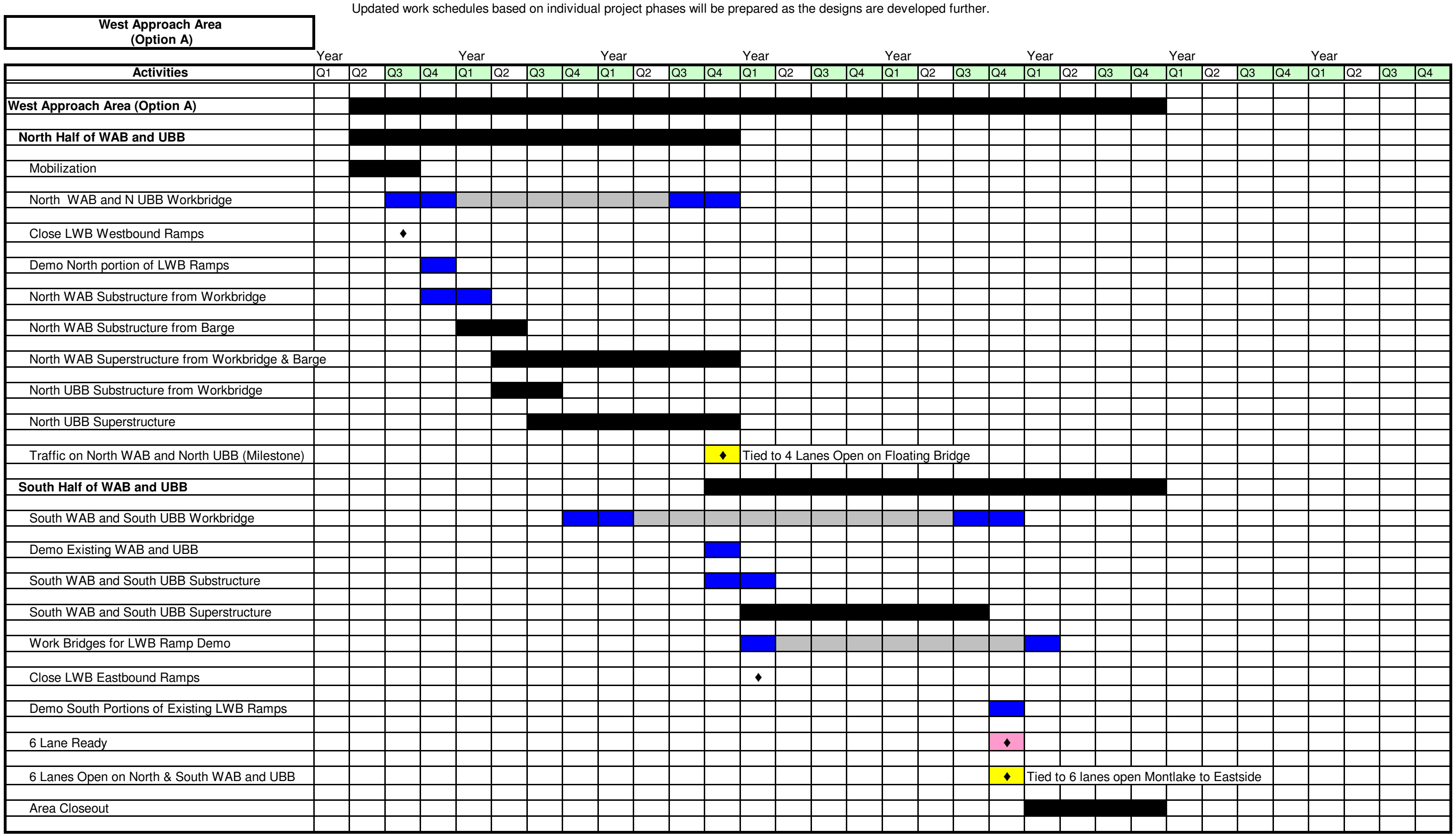

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING
MONTLAKE INTERCHANGE AREA
OPTION K

Legend

- In-Water Work
- Construction
- In-place
- In Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

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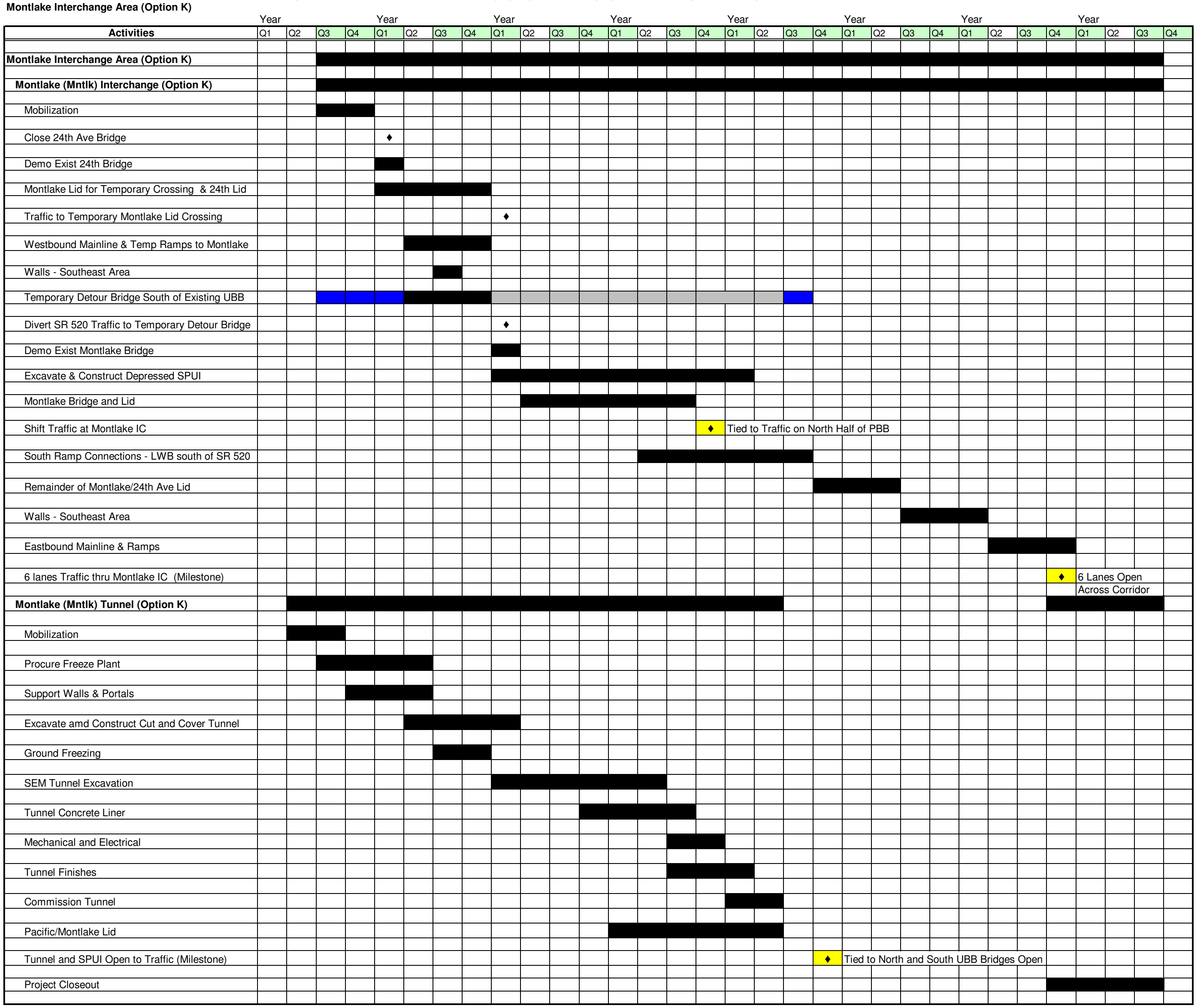
Montlake Interchange Area (Option K)



6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING
WEST APPROACH AREA
OPTION K

Legend
- In-Water Work
- Construction
- In-place
- In Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

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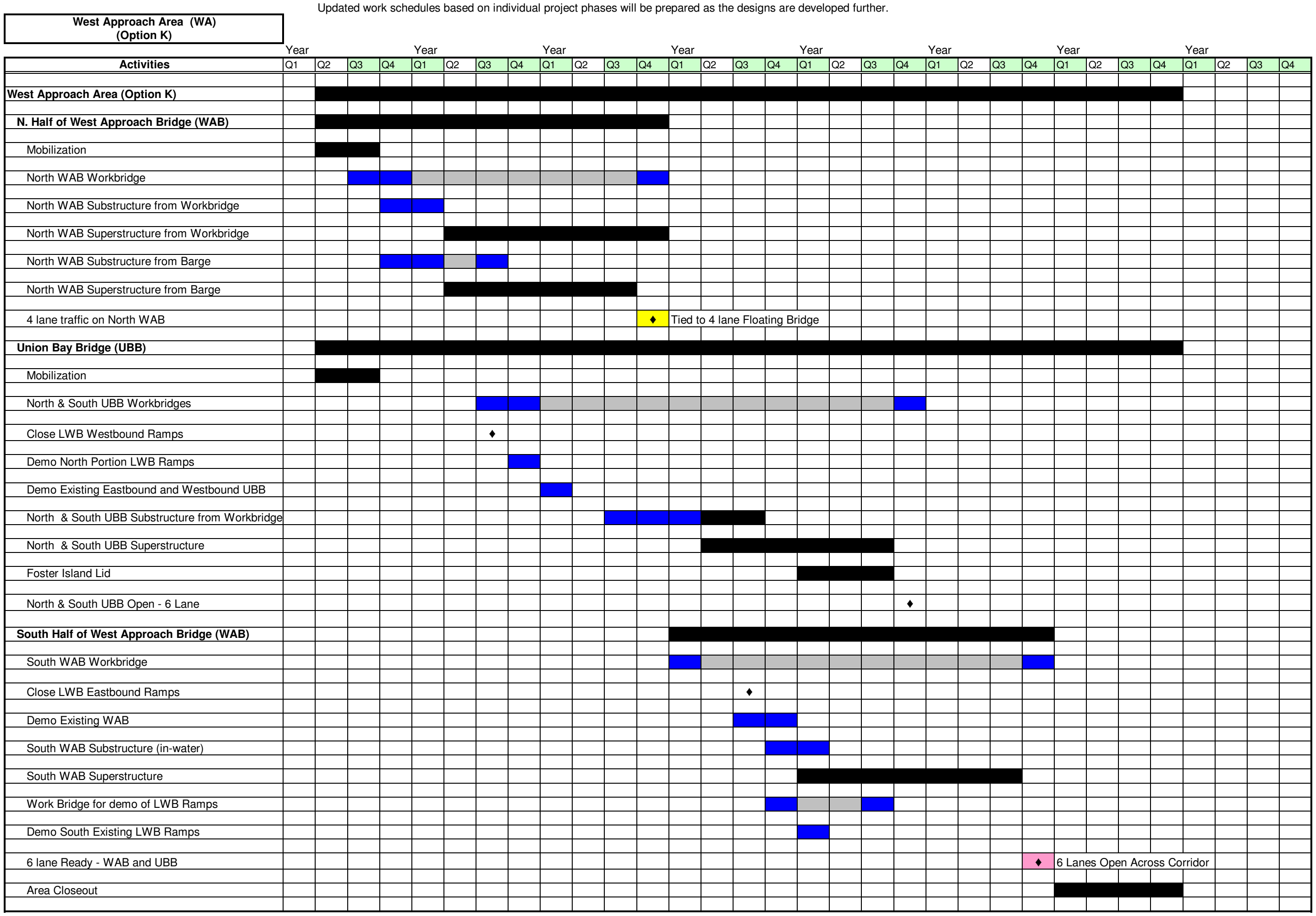

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING

MONTLAKE INTERCHANGE AREA

OPTION L

Legend

- In-Water Wo
- Construction
- In-place
- In Water Wo
- Milestone Tie
- 6 Lane Read

Assumptions:

To make a clearer presentation of the schedule, some work activites, work titles, and work durations have been adjusted for consistency and reasonableness.
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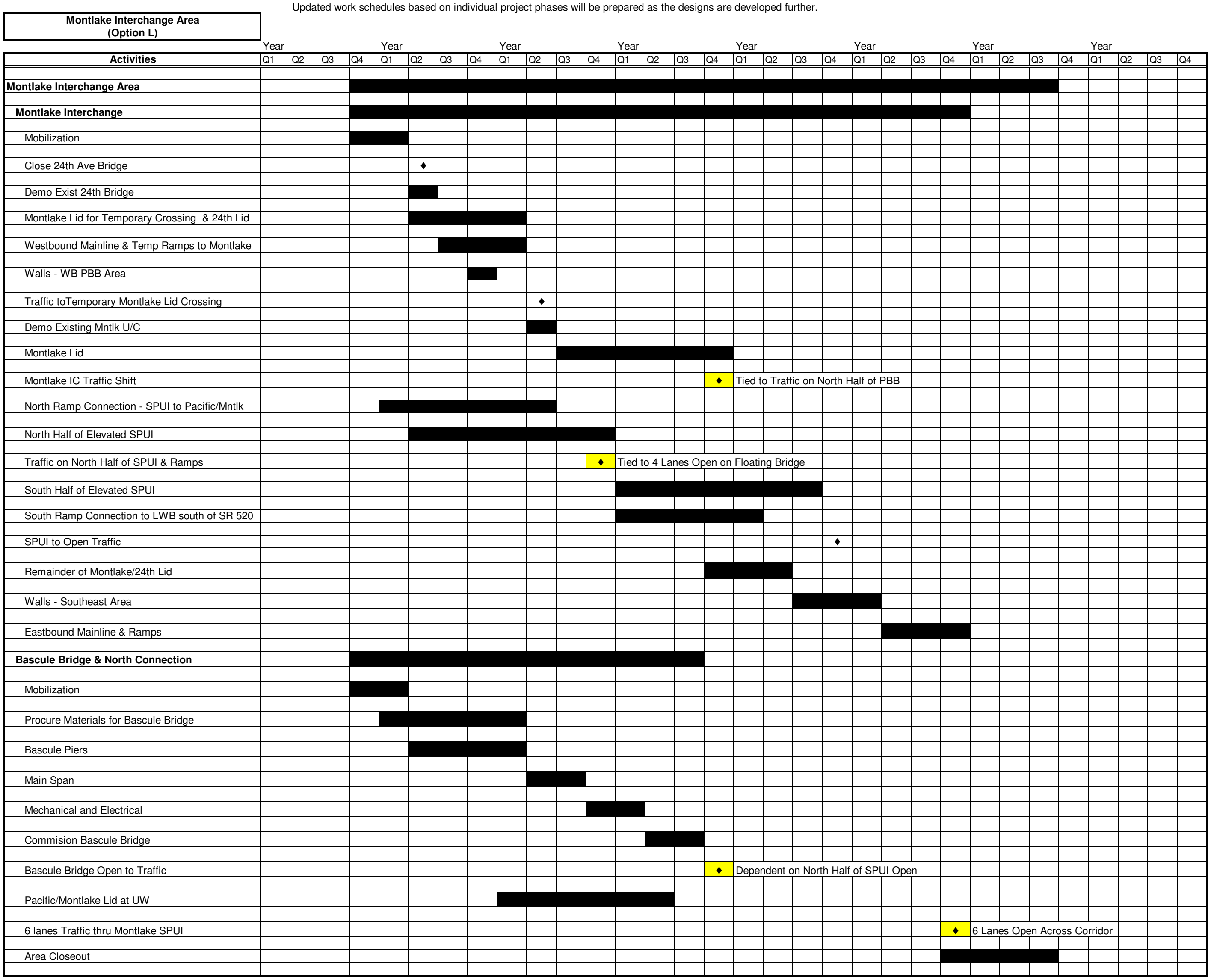

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING

WEST APPROACH AREA

OPTION L

Legend

- In-Water Work
- Construction
- In-place
- In-Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

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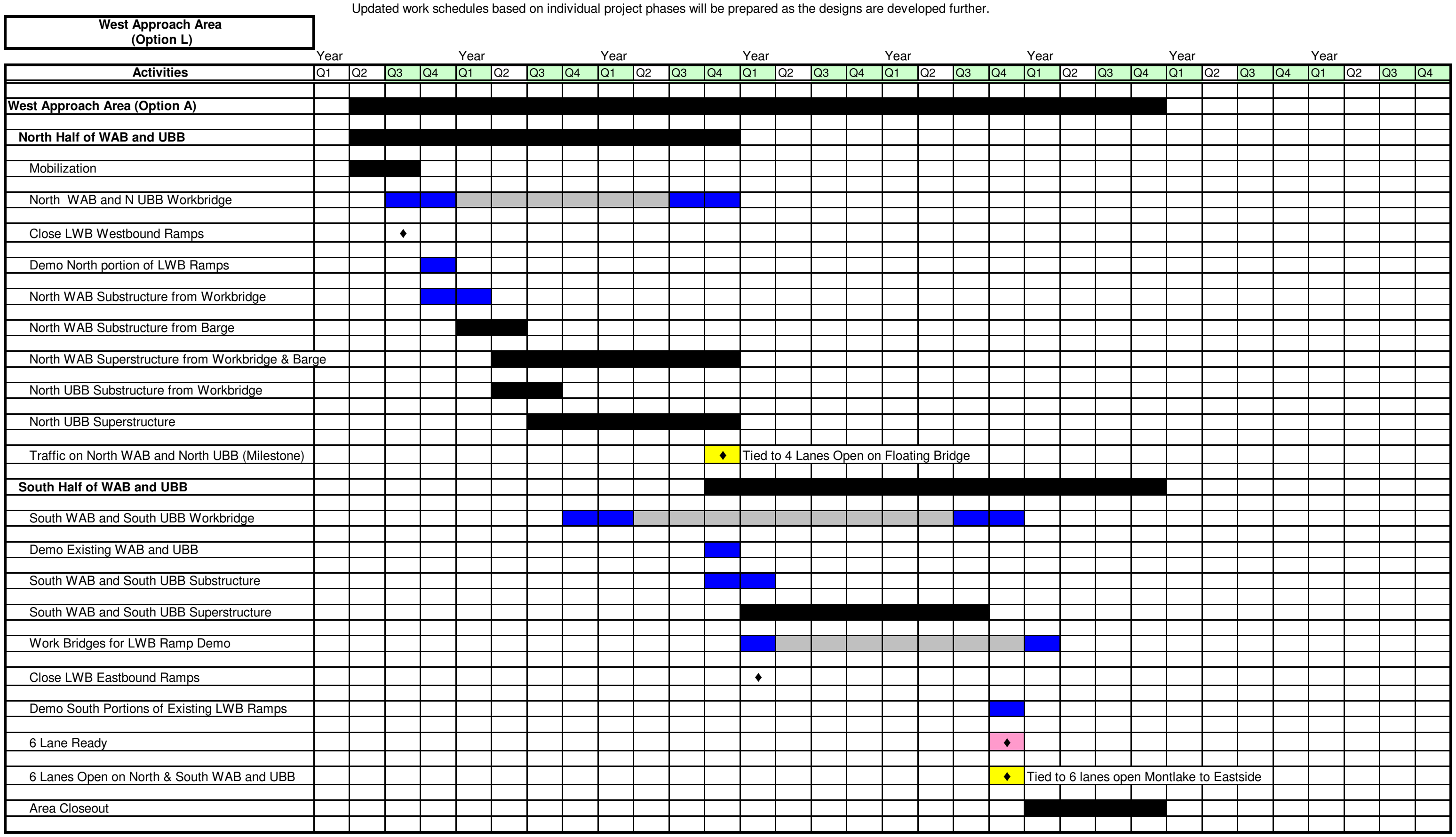

6-LANE ALTERNATIVE - ESTIMATED CONSTRUCTION DURATIONS AND SEQUENCING
EVERGREEN POINT BRIDGE AND EAST APPROACH
COMMON TO ALL OPTIONS

Legend
- In-Water Work
- Construction
- In-place
- In-Water Work Window
- Tied Milestone
- 6 Lane Ready

Assumptions:

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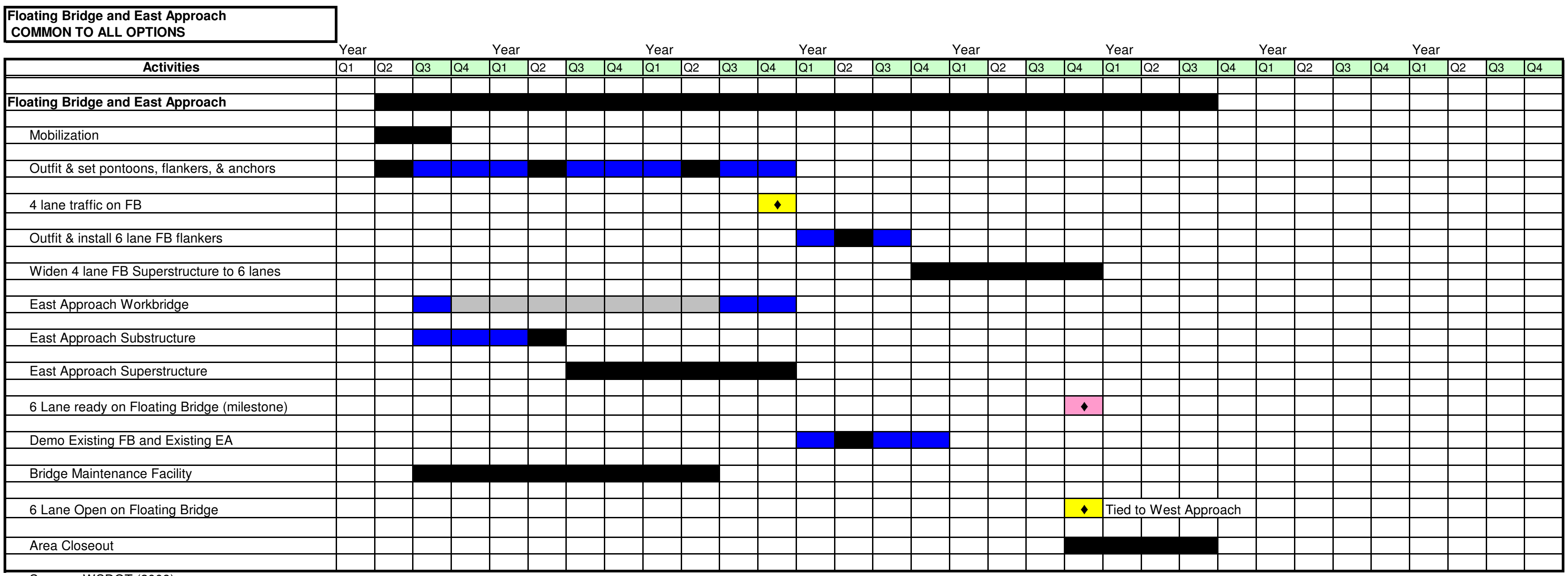

Source: WSDOT (2009)