FINAL ENVIRONMENTAL IMPACT STATEMENT
AND FINAL SECTION 4(f) AND 6(f) EVALUATIONS
SR 520 BRIDGE REPLACEMENT AND HOV PROGRAM

MAY 2011

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

Construction Techniques and Activities Discipline Report Addendum and Errata

Washington State Department of Transportation

U.S. Department of Transportation Federal Highway Administration

SR 520, I-5 to Medina:
Bridge Replacement and HOV Project
Final Environmental Impact Statement
and Final Section 4(f) and 6(f) Evaluations

Construction Techniques and Activities Discipline Report Addendum and Errata

Prepared for

Washington State Department of Transportation
Federal Highway Administration

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Acronyms and Abbreviations

BMPs	best management practices
CTC	Concrete Technology Corporation
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
SDEIS	Supplemental Draft Environmental Impact Statement
SR	State Route
UW	University of Washington
WSDOT	Washington State Department of Transportation

Introduction

What is the purpose of this addendum?

This addendum to the Construction Techniques and Activities Discipline Report (WSDOT 2009) prepared for the SR 520**,** I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft Environmental Impact Statement and Section 4(f)/6(f) Evaluation (SDEIS; Washington State Department of Transportation [WSDOT] 2010a) presents the construction activities, schedule, sequence, and durations for the Preferred Alternative and, where appropriate, compares these elements to the design Options A, K, and L. This addendum also provides a summary of information about pontoon construction activities and associated effects anticipated for the SR 520, I-5 to Medina: Bridge Replacement and HOV project.

The information contained in the 2009 Construction Techniques and Activities Discipline Report is still pertinent to the Preferred Alternative, except where this addendum specifically updates it. The discussion below supplements the discipline report and provides comparisons using new text and new or updated exhibits, where appropriate. Text updated to reflect the Preferred Alternative has been cross-referenced by page numbers to related text in the 2009 discipline report. Where an addendum exhibit updates or adds new data and/or potential effects of the Preferred Alternative to an exhibit contained in the discipline report, the exhibit name is followed by “Update to Exhibit # of the 2009 Discipline Report."

New information contained within this addendum includes an updated section entitled Pontoon Production and Transport, which includes a discussion about how, when, and where pontoons will be built; how they will be launched into water; and what construction effects are anticipated from these activities. New information used in the analysis of potential effects is included in the Description of Alternatives Discipline Report Addendum (2011a).

An errata sheet is attached to this addendum (Attachment 1) to show revisions and clarifications to the 2009 Construction Techniques and Activities Discipline Report that do not constitute new findings or analysis.

What is the SR 520, I-5 to Medina: Bridge Replacement and HOV Project?

The SR 520, I-5 to Medina: Bridge Replacement and HOV Project would widen the SR 520 corridor to six lanes from I-5 in Seattle to Evergreen Point Road in Medina, and would restripe and reconfigure the lanes in the corridor from Evergreen Point Road to 92nd Avenue Northeast in Yarrow Point. It would replace the vulnerable Evergreen Point Bridge (including the west and east approach structures) and Portage Bay Bridge, as well as the existing local street bridges across SR 520. The project would complete the regional HOV lane system across SR 520, as called for in regional and local transportation plans.

What is the Preferred Alternative?

The new SR 520 corridor would be six lanes wide (two 11-foot-wide outer general-purpose lanes and one 12-foot-wide inside HOV lane in each direction), with 4-foot-wide inside shoulders and 10-foot-wide outside shoulders across the floating bridge. The typical roadway cross-section across the floating bridge would be approximately 116 feet wide, compared to the existing width of 60 feet. In response to community interests expressed during public review of the January 2010 SDEIS, the SR 520 corridor between I-5 and the Montlake interchange would operate as a boulevard or parkway with a posted speed limit of 45 miles per hour and median planting across the Portage Bay Bridge. To support the boulevard concept, the width of the inside shoulders in this section of SR 520 would be narrowed from 4 feet to 2 feet, and the width of the outside shoulders would be reduced from 10 feet to 8 feet. Exhibit 1 highlights the major components of the Preferred Alternative.

The Preferred Alternative would include the following elements:

- An enhanced bicycle/pedestrian crossing adjacent to the East Roanoke Street bridge over I-5
- Reversible transit/HOV ramp to the I-5 express lanes, southbound in the morning and northbound in the evening
- New overcrossings and an integrated lid at 10th Avenue East and Delmar Drive East
- A six-lane Portage Bay Bridge with a 14-foot-wide westbound managed shoulder that would be used as an auxiliary lane during peak commute hours
- An improved urban interchange at Montlake Boulevard integrated with a 1,400-foot-long lid configured for transit, pedestrian, and community connectivity
- A new bascule bridge across the Montlake Cut that provides additional capacity for transit/HOV, bicycles, and pedestrians
- Improved bridge clearance over Foster Island and the Arboretum Waterfront Trail
- A new west approach bridge configured to be compatible with future high-capacity transit (including light rail)
- A new floating bridge with two general purpose lanes, and one HOV lane in each direction
- A new 14-foot-wide bicycle/pedestrian path with scenic pull-outs along the north side of the new Evergreen Point Bridge (west approach, floating span, and east approach), connecting regional trails on both sides of Lake Washington
- A new bridge maintenance facility and dock located underneath the east approach of the Evergreen Point Bridge

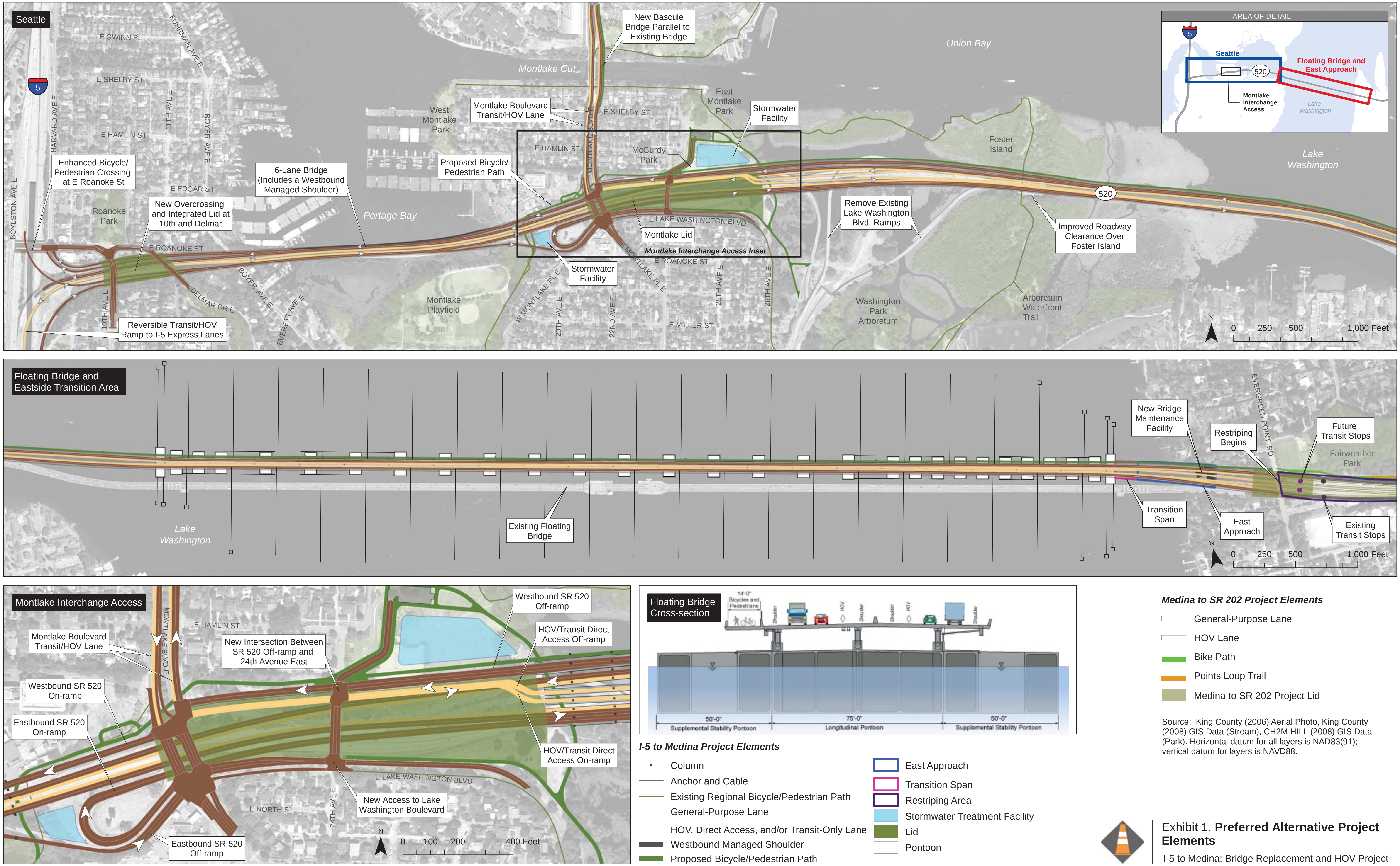


Exhibit 1. **Preferred Alternative Project Elements**

I-5 to Medina: Bridge Replacement and HOV Project

Exhibit 2 summarizes the Preferred Alternative design compared to the existing corridors elements, and compares the Preferred Alternative to design options A, K, and L as described in the SDEIS. For a more detailed description of the Preferred Alternative, see the Description of Alternatives Discipline Report Addendum (WSDOT 2011a).

Exhibit 2. Preferred Alternative and Comparison to SDEIS Options

Geographic Area	Preferred Alternative	Comparison to SDEIS Options A, K, and L
I-5/Roanoke Area	The SR 520 and I-5 interchange ramps would be reconstructed with generally the same ramp configuration as the ramps for the existing interchange. A new reversible transit/HOV ramp would connect with the I-5 express lanes.	Similar to all options presented in the SDEIS. Instead of a lid over I-5 at Roanoke Street, the Preferred Alternative would include an enhanced bicycle/pedestrian path adjacent to the existing Roanoke Street Bridge.
Portage Bay Area	The Portage Bay Bridge would be replaced with a wider and, in some locations, higher structure with six travel lanes and a 14-foot-wide westbound managed shoulder.	Similar in width to Options K and L, similar in operation to Option A. Shoulders are narrower than described in SDEIS (2-foot-wide inside shoulders, 8-foot-wide outside shoulder on eastbound lanes), posted speed would be reduced to 45 mph, and median plantings would be provided to create a boulevard-like design.
Montlake Area	The Montlake interchange would remain in a similar location as today. A new bascule bridge would be constructed over the Montlake Cut. A 1,400-foot-long lid would be constructed between Montlake Boulevard and the Lake Washington shoreline, and would include direct-access ramps to and from the Eastside. Access would be provided to Lake Washington Boulevard via a new intersection at 24th Avenue East.	Interchange location similar to Option A. Lid would be approximately 75 feet longer than previously described for Option A, and would be a complete lid over top of the SR 520 mainline, which would require ventilation and other fire, life, and safety systems. Transit connections would be provided on the lid to facilitate access between neighborhoods and the Eastside. Montlake Boulevard would be restriped for two general purpose lanes and one HOV lane in each direction between SR 520 and the Montlake Cut.
West Approach Area	The west approach bridge would be replaced with wider and higher structures, maintaining a constant profile rising from the shoreline at Montlake out to the west transition span. Bridge structures would be compatible with potential future light rail through the corridor.	Bridge profile most similar to Option L, and slightly steeper; structure types similar to Options A and L. The gap between the eastbound and westbound structures would be wider than previously described to accommodate light rail in the future.
Floating Bridge Area	A new floating span would be located approximately 190 feet north of the existing bridge at the west end and 160 feet north of the existing bridge at the east end. The floating bridge would be approximately 20 feet above the water surface at the midspan (about 10 to 12 feet higher than the existing bridge deck).	Similar to design described in the SDEIS. The bridge would be approximately 10 feet lower than described in the SDEIS, and most of the roadway deck support would be constructed of steel trusses instead of concrete columns.

Exhibit 2. Preferred Alternative and Comparison to SDEIS Options

Geographic Area	Preferred Alternative	Comparison to SDEIS Options A, K, and L
Eastside Transition Area	A new east approach to the floating bridge, and a new SR 520 roadway would be constructed between the floating bridge and Evergreen Point Road.	Same as described in the SDEIS.

When will the project be built?

Construction for the SR 520, I-5 to Medina project is planned to begin in 2012, after project permits and approvals are received. To maintain traffic flow in the corridor, the project would be built in stages. Major construction in the corridor is expected to be complete in 2018. The most vulnerable structures (the Evergreen Point Bridge including the west and east approaches, and Portage Bay Bridge) would be built in the first stages of construction, followed by the less vulnerable components (Montlake and I-5 interchanges). Exhibit 3 provides an overview of the anticipated construction stages and durations identified for the SR 520, I-5 to Medina project.

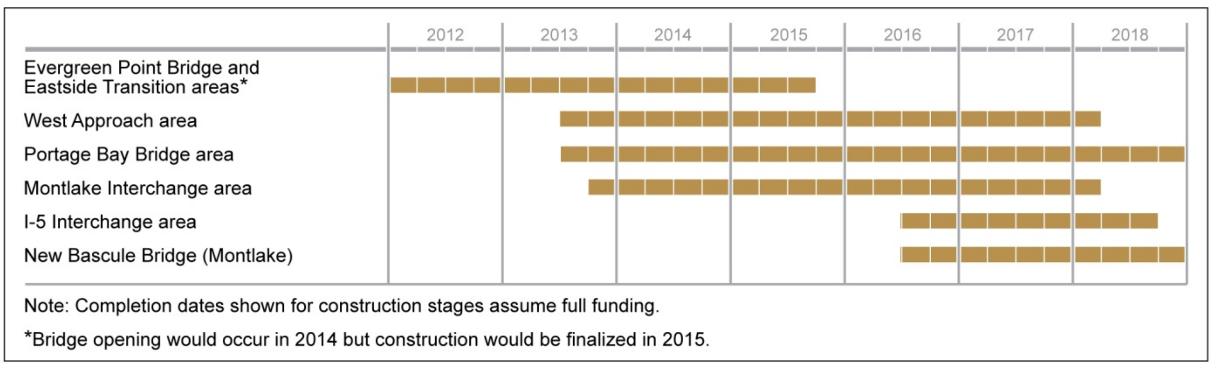


Exhibit 3. Preferred Alternative Construction Stages and Durations

A Phased Implementation scenario was discussed in the SDEIS as a possible delivery strategy to complete the SR 520, I-5 to Medina project in phases over an extended period of time. FHWA and WSDOT continue to evaluate the possibility of phased construction of the corridor should full project funding not be available by 2012. Current committed funding is sufficient to construct the floating portion of the Evergreen Point Bridge, as well as the new east approach and a connection to the existing west approach. The Final EIS discusses the potential for the floating bridge and these east and west “landings” to be built as the first phase of the SR 520, I-5 to Medina project. This differs from the SDEIS Phased Implementation scenario, which included the west approach and the Portage Bay Bridge in the first construction phase. Chapters 5.15 and 6.16 of the Final EIS summarize the effects for this construction phase. Therefore, this discipline report addendum addresses only the effects anticipated as a result of the updated construction schedule.

Are pontoons being constructed as part of this project?

WSDOT has completed planning and permitting for a new facility that will build and store the 33 pontoons needed to replace the existing capacity of the floating portion of the Evergreen Point Bridge in the event of a catastrophic failure. If the bridge does not fail before its planned replacement, WSDOT would use the 33 pontoons constructed and stored as part of the SR 520 Pontoon Construction Project in the SR 520, I-5 to Medina project. An additional 44 pontoons would be needed to complete the new 6-lane floating bridge planned for the SR 520, I-5 to Medina project. The additional pontoons would be constructed at Concrete Technology Corporation in the Port of Tacoma, and if available, at the new pontoon construction facility located on the shores of Grays Harbor in Aberdeen, Washington. Final construction locations will be identified at the discretion of the contractor. For additional information about project construction schedules and pontoon construction, launch, and transport, please see the Construction Techniques and Activities Discipline Report Addendum and Errata (WSDOT 2011b).

Construction Techniques

What were the updates to the construction techniques?

This section provides new information about the major construction methods that would be employed during construction of the Preferred Alternative. Information in this section is presented at a level of detail intended to promote an understanding of methods that would be used to construct the new SR 520 corridor from I-5 to Medina. The following descriptions do not replace design guidelines and construction standards outlined and prescribed in WSDOT's manuals and specifications. Construction effects on the built and natural environment resulting from these techniques and activities to construct the new SR 520 corridor are described in the SR 520, I-5 to Medina project Final EIS and all of its accompanying discipline reports and addenda. Construction effects on the built and natural environment resulting from pontoon construction activities at locations outside the SR 520 corridor are described in Chapter 6.15 of the Final EIS entitled "*Pontoon Production and Transport*."

Roadway Construction

Elements of roadway construction required for the Preferred 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 on pages 15 through 18 of the SDEIS discipline report. The following text provides updated information about roadway construction activities.

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 layer of compacted crushed rock. Because of its lower cost and faster installation time, the Preferred Alternative would include asphalt paving for temporary roads, temporary lane widening, and permanent surfacing on side streets and arterials where there would be fewer vehicles and 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 the SR 520 main line, on bridge decks, and for some on- and off-ramps. During installation, the surface of concrete pavement is treated to provide texture for traction, wear, and performance. For new pavement, this surface texturing typically occurs while the pavement is still wet. Some types of surface textures (longitudinal tining and carpet drag textures) are undergoing study to determine if those textures effectively produce quieter concrete pavements. These types of surface treatments would be used in the SR 520 corridor as part of the noise management strategy for the Preferred Alternative. After the textured concrete pavement hardens sufficiently, lane striping would be applied and the roadway opened to traffic.

Traffic Barriers and Noise Walls

Traffic barriers are typically installed along highways and bridges as a safety measure that reduces the number of head-on, deadly and disabling collisions because fewer vehicles can cross the median. Barriers are also provided along bridges to prevent vehicle accidents. The Preferred Alternative includes 4-foot-high concrete traffic barriers treated with noise-absorptive material for the Portage Bay Bridge and for the west approach structures of the Evergreen Point Bridge. Traffic barriers across the floating bridge would be standard height, and would not include the noise absorptive material.

Concrete traffic barriers are cast directly onto the bridge deck, and are reinforced with steel rebar. A noise-absorptive surface treatment would be applied to the roadway-side of the barrier to attenuate traffic noise. The 4-foot height of the traffic barriers, combined with the noise-absorptive material, is anticipated to provide some noise reduction benefits. Please see the Noise Discipline Report Addendum and Errata (WSDOT 2011b) for further discussion about noise reduction and mitigation.

As indicated in the section *"What is the Preferred Alternative?,"* if noise studies indicate that noise walls are warranted, WSDOT would work with affected property owners to determine community interest in noise walls, and work with the communities to identify which recommended noise walls would be constructed. The type of noise walls that would be used along the SR 520 corridor would typically be precast panels or cast-in-place walls. Noise walls can be cast in a wide variety of patterns to improve their aesthetics. On bridges, noise walls would be cast into the traffic barrier. Noise walls are constructed to withstand the forces of wind and seismic loads.

Bridge Construction

Bridge construction associated with the Preferred Alternative would take place on land, on work bridges, and from barges floating on the lake and outfitted with cranes. Pages 18 through 24 of the 2009 discipline report describe bridge structure type and construction in detail. The following text provides an update to that discussion.

Bridge Substructure

The type of substructure selected for each bridge for the Preferred Alternative is 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 the Preferred Alternative are described on page 19 of the discipline report, and include spread footings, drilled shafts, mudline footings, and concrete columns.

Drilled Shaft and Mudline 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. In-water drilled shaft construction activities would be staged from land, work bridges, or barges. Drilled shafts are commonly used for WSDOT bridges.

When longer bridge spans are used, it may be necessary for a foundation to incorporate more than one drilled shaft for each column. This requires constructing a shaft cap, which is a large concrete slab that ties the individual drilled shafts together so that they act as a single foundation. The column is constructed on top of the shaft cap. When constructed in water at the mudline, a shaft cap is called a mudline footing. The Preferred Alternative includes mudline footings in the design for the Portage Bay Bridge and for the east approach of the Evergreen Point Bridge.

Construction Staging Areas and Haul Routes

As described on pages 31 and 32 of the 2009 Construction Techniques and Activities Discipline Report, construction along SR 520 would be staged from both land and water (WSDOT 2009). The 2009 discipline report describes typical construction activities taking place at staging areas, and the text remains relevant to construction anticipated for the Preferred Alternative.

Since publication of the SDEIS, construction staging plans have been revised to account for the design of the Preferred Alternative, to improve traffic management, to respond to community comments received on the SDEIS and during public meetings, and to accommodate changes in the construction schedule. The following text is additive to the staging area and haul route discussions provided in the 2009 discipline report.

Staging Areas

Typical activities and general layout for construction staging areas is described on pages 31 through 32 of the 2009 Construction Techniques and Activities Discipline Report (WSDOT 2009). Final staging areas will be determined by the contractor prior to construction. Exhibit 4 shows the general locations of possible staging areas identified to support construction of the SR 520, I-5 to Medina project. Staging areas would vary in size and function, though all staging areas could support construction activities 24 hours per day, 7 days per week. The construction staging areas outlined below would be prepared prior to major construction activities along the corridor (mobilization), and would be the last elements to be removed once construction is complete (demobilization).

The construction staging area located beneath I-5 north of SR 520 would be developed to support construction of a stormwater facility at that location. While some materials and equipment would be stored at this location, major construction activities along the SR 520 corridor would not be based out of this location.

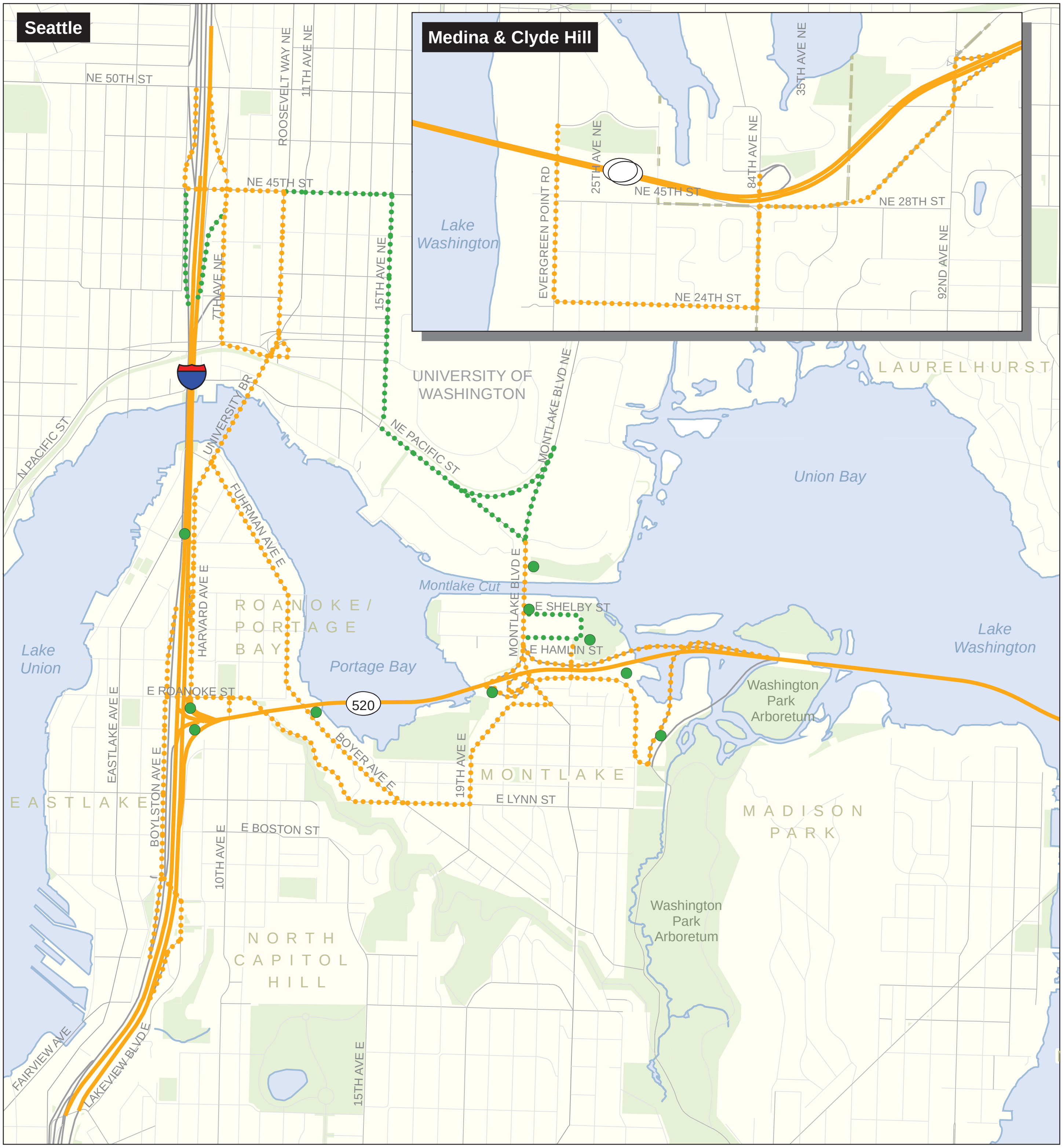
Construction staging areas would be located in WSDOT right-of-way at the I-5/SR 520 interchange. This area would support construction activities along the SR 520 corridor, the 10th and Delmar lid/intersection reconfiguration, and the new bicycle/pedestrian overcrossing adjacent to the Roanoke Street bridge.

Construction staging identified along Boyer Avenue on the west end of Portage Bay would be configured primarily to provide access to the work bridges in Portage Bay. If space allows, construction equipment and materials may also be staged in this location.

Construction staging located under the east end of Portage Bay would provide access to the work bridges located in this area, and would also provide access to the north side of SR 520 for construction along the south edge of the National Oceanic and Atmospheric Administration property. This staging area would support construction activities for the SR 520 on- and off-ramps at Montlake Boulevard. Access to this staging area would be directly from the westbound on-ramp at Montlake Boulevard and from East Roanoke Street.

A small construction staging area would be located east of the existing Montlake Bridge to support construction of the new bascule bridge over the Montlake Cut. Another staging area located north of the cut in the University of Washington (UW) Open Space and the UW stadium parking lot would also support bascule bridge construction activities and the improvements made along Montlake Boulevard north and south of the cut.

The existing MOHAI location would also be used as a staging area during construction of the new west approach and the new Montlake interchange, and prior to installing the new stormwater facility. This area would be used to store materials and heavy construction equipment, and would also be used to provide access to the construction work bridges in Union Bay as well as to the SR 520 corridor.



- Potential Staging Area
- Potential Primary Haul Route (Preferred Alternative and Options A, K, and L)
- Potential Secondary Haul Route (Preferred Alternative and Options A, K, and L)
- Potential Secondary Haul Route (Options K and L)

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 4. **Proposed Haul Routes and Construction Staging Areas**

I-5 to Medina: Bridge Replacement and HOV Project

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The construction staging area identified in Exhibit 4, located south of SR 520 near the Lake Washington shoreline, would be used primarily to access the work bridges constructed along the south side of SR 520.

A construction staging area would be located on WSDOT right-of-way near the Arboretum, just south of the existing Union Bay Bridge along SR 520. This staging area would be adjacent to Lake Washington Boulevard and would be used for materials and heavy equipment storage as well as for contractor offices and other field support. This staging area would likely be the largest staging area along the corridor and would support both construction and demolition activities and provide access to work bridges in Union Bay.

Haul Routes

As described on page 32 of the SDEIS discipline report, materials would be transported to and from the construction work areas by trucks and barges. Barges would provide access to offshore work areas, and could be used to deliver materials to the construction site at Portage Bay and in the west approach area, where practicable. Barges would also be used to transport demolition materials away from the corridor. Trucks would travel over designated haul routes through Seattle to SR 520, I-5, and I-405. Exhibit 4 shows the potential haul routes that would be used to transport materials. Construction assumptions developed for the project are intended to keep the majority of haul route traffic along major freeways. Therefore, primary haul routes would be located along SR 520, I-5, and I-405. However, there will be times when city streets will need to be used as secondary haul routes. Secondary haul routes were identified based on criteria such as the shortest off-highway mileage, access to locations needed for construction where direct highway access in unavailable, and the ability to accommodate truck traffic.

Potential construction haul routes described here include both local and regional roadways. Since publication of the SDEIS, WSDOT has refined potential haul routes to avoid identifying non-arterial neighborhood streets. Local jurisdictions can limit the use of non-arterial streets for truck traffic; therefore, efforts were made to identify designated arterial streets for potential use as haul routes. Local jurisdictions will determine final haul routes for those actions and activities that require a street use or other jurisdictional permit. The permit process typically takes place during the final design phase and prior to construction. Construction haul routes can temporarily increase truck traffic volumes, with accompanying potential for increases in fugitive dust, vehicle emissions, and noise. Haul truck volumes estimated for each potential haul route are intended to characterize truck activity anticipated during a typical average day of construction for the duration of use as a haul route. For potential routes where haul truck volumes may vary substantially over the construction period, peak daily volumes are also estimated.

It is important to note that the estimated truck peaks and averages discussed below represent a worst-case condition for each study location. To generate these estimates, program analysts assumed that all truck trips servicing each work site would need to use more than one haul route. Work sites could be accessed by more than one potential route, which could result in lower actual truck volumes during construction at some locations than presented below. To best represent how truck traffic would be experienced by a single observer, the number of trucks per day reported for this analysis is equal to twice the number of loads delivered. For example, the delivery of one load of concrete is estimated as two trucks per day because the truck is counted both when arriving and when leaving the construction site.

In general, the estimated number of truck trips along arterials would be relatively low compared to overall arterial volumes. The Final Transportation Discipline Report (WSDOT 2011c) includes more specific discussion about haul routes, effects to traffic volumes, and scheduling.

The most likely travel route to access the 10th Avenue East/Delmar Drive East lid construction area would be from I-5 to East Roanoke Street. Delmar Drive East is likely to experience truck traffic as a secondary travel route, mostly for egress from the lid construction area to eastbound SR 520. This potential haul route would use Delmar Drive south from SR 520 and continue east onto East Lynn Street, then north on 19th Avenue East. A haul route along Delmar Drive East as it nears 14th Avenue East could average 20 haul trucks per day during active construction. Estimated peak volume of 160 haul trucks per day could occur for as many as 30 non-consecutive days over a period of roughly 21 months.

A potential haul route along Fuhrman Avenue East could be used throughout the construction period. This route may average 20 trucks per day when in use, and may experience peak volumes up to 230 trucks per day, intermittently throughout construction. To provide some context for this volume of truck traffic, more than 170 trucks and buses per day pass along Fuhrman Avenue East at Eastlake Avenue East. A potential haul route along Boyer Avenue East at East Shelby Street could also have the same typical average volume from construction truck hauling as the route along Fuhrman Avenue East.

The Boylston Avenue East haul route would likely be used intermittently for the duration of construction, and could average approximately 25 trucks per day.

During construction, East Roanoke Street would experience lane closures and detours while the realignment work for the 10th Avenue East and Delmar Drive East intersection occurs. These could include short-term closures during off-peak times, which might require brief detours over an approximately 15-month period. This could result in temporarily restricted access along East Roanoke Street. However, at least one lane would be open at all times to allow local traffic access on East Roanoke Street. During construction, Fire Station #22, located on East Roanoke Street and immediately adjacent to the Roanoke Park Historic District, would be fully operational, and access for emergency response would not be affected.

Harvard Avenue East and East Roanoke Street could provide the most direct access to portions of the project, and are likely to experience truck traffic as potential haul routes. As previously noted, the main travel route to access the 10th Avenue East/Delmar Drive East lid construction area would likely be from I-5 to East Roanoke Street, and Delmar Drive East could operate as a secondary route for egress from the lid to eastbound SR 520. Most trucks coming from westbound SR 520 would likely use the Harvard/Roanoke exit. On East Roanoke Street at Delmar Drive East, the potential route could average as many as 30 trucks per day intermittently for approximately 21 months. Worst-case peak levels could reach as many as 170 trucks per day, which could occur periodically over 21 months.

On Harvard Avenue East, north of East Roanoke Street, haul route volumes could average 15 trucks per day for the duration of construction (approximately 66 months). The existing truck and bus count at this location is more than 690 per day, so an additional 15 trucks per day would not be a substantial change. Worst-case peak volumes could reach up to 70 trucks per day, occurring for 60 non-consecutive days throughout the active construction period. This means approximately 3 percent of total construction days could experience peak levels. As noted above, average haul truck volumes are estimates meant to approximate construction truck activity during a typical day for the duration of a potential haul route's use; these estimates will be updated as construction planning and scheduling progress.

A potential haul route from Delmar Drive would pass along East Lynn Street, then north on 19th Avenue East to Montlake Place to East Roanoke Street and the northernmost portion of 24th Avenue from East Roanoke Street to SR 520 (see Exhibit 4). Average haul truck volume along East Lynn Street could be 15 trips per day when used, while the peak number of haul trucks could range up to 120 trucks per day. These peak truck trips could occur over a total of approximately 60 non-consecutive days, spread intermittently over the construction duration (70 months). Haul route traffic on East Roanoke Street at Montlake Place East could average up to 20 trucks per day for the duration of construction in the area (66 months). Construction activity would likely peak for 60 non-consecutive days, and could result in peak haul route volumes as high as 290 trucks per day.

Lake Washington Boulevard from the SR 520 exit ramps north and west to the intersection with Montlake Boulevard East could be used as a potential haul route. Construction could also include using portions of Lake Washington Boulevard from 26th Street to Montlake Boulevard East, as a potential haul route and detour route after the Lake Washington Boulevard and R. H. Thomson ramps are closed.

In-water Construction

In-water work requires specific permits and must follow certain requirements to minimize its effects on the natural environment to protect species and their habitats. 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 for the Preferred Alternative would occur in Portage Bay, Union Bay, and Lake Washington.

Examples of in-water construction activities include the following:

- Floating bridge anchor system installation
- Work bridge construction and removal

- Cofferdam construction and removal
- Drilled shafts and bridge foundations construction
- Stormwater outfall construction
- Existing bridge demolition

Exhibit 5 summarizes types of in-water construction activities that would occur along the SR 520 corridor.

Exhibit 5. **Types of In-Water Construction Activities by Area for the Preferred Alternative (Update to Exhibit 12 of the 2009 Discipline Report)**

Construction Activity and Method	Geographic Area			
	Portage Bay	West Approach	Lake Washington	East Approach
Anchor installation			●	
Work bridge construction and removal	●	●		●
Cofferdam or sheetpile installation and removal	●			●
Drilled shafts	●	●		●
Mudline footings	●			●
Cast-in-place superstructure requiring falsework	●			●
Existing bridge removal	●	●	●	●

In-water construction would be limited by permit conditions to approved periods (work windows) to minimize effects on fisheries and other natural resources. WSDOT continues to work with resource agencies to develop project-specific work windows for the Preferred Alternative to accelerate project construction and minimize effects on surrounding natural resources. Exhibit 6 lists Washington State Department of Fish and Wildlife published in-water work windows for water bodies within the project area, as well as potential modified work windows specifically for construction of the Preferred Alternative.

Exhibit 6. **Published and Proposed Project-Specific In-Water Work Windows (Update to Exhibit 13 of the 2009 Discipline Report)**

Area	Work Window[a]	Proposed Work Window
Portage Bay	October 1 to April 15	August 16 to April 30
Union Bay	July 16 to April 30	September 1 to April 30 (impact pile-driving only)
Lake Washington (West Approach Area)	July 16 to March 15 (north of existing bridge) July 16 to April 30 (south of existing bridge)	August 1 to April 30

Exhibit 6. Published and Proposed Project-Specific In-Water Work Windows (Update to Exhibit 13 of the 2009 Discipline Report)

Area	Work Window[a]	Proposed Work Window
Lake Washington (East Approach Area)	July 16 to March 15 (north of existing bridge) July 16 to April 30 (south of existing bridge)	July 1 to May 15

[a]WSDOT is working with resource agencies to define project specific work windows based on construction activities, duration of construction, and schedule. Any deviations from the Washington Department of Fish and Wildlife (WDFW) published work windows will be defined in the project Biological Opinion issued by the United States Fish and Wildlife Service and National Marine Fisheries Service,and in the Hydraulic Project Approval issued by WDFW.

Work Bridges

Work bridge installation for the Preferred Alternative is generally the same as described on pages 22 and 23 of the Construction Techniques and Activities Discipline Report (WSDOT 2009). Work bridges would be constructed in Portage Bay, Union Bay, across Foster Island, and east of Foster Island in Lake Washington. Work bridges would also be used on the eastern shore of Lake Washington to construct the east approach and the maintenance facility dock.

As previously described, both a vibratory hammer and an impact hammer would be used to install temporary piles to support work bridges. Pile-driving activities for the construction of work bridges would be limited to the allowable work timeframes set by local jurisdictions as outlined during the project permit process. Construction schedules for the SR 520, I-5 to Medina project assume that pile-driving could occur Monday through Friday, from 7 a.m. until 10 p.m., and that during these work windows, pile-driving could occur at multiple locations at the same time. Construction schedules also assume that a maximum of 16 piles could be installed at any given pile-driving operation, with a maximum of 56 temporary piles installed project-wide in a single workday.

Work bridges would be used in Portage Bay, Union Bay, across Foster Island, and east of Foster Island in Lake Washington. Work bridges would also be used on the eastern shore of Lake Washington to construct the east approach. Exhibit 7 describes the work bridge elements, including the duration of pile-driving. Durations shown in the table reflect the sum total of all pile-driving activities anticipated for each area. Therefore, the durations shown are non-consecutive months of pile-driving activity.

Exhibit 7. Work Bridge Elements by Area

	Portage Bay	West Approach	East Approach
Number of piles	850	2,300	125
Area of work bridge (square feet)	261,900	703,400	42,000
Duration of pile-driving*	14 non-consecutive months	16 non-consecutive months	5 months
Work bridge duration	64 months	58 months	36 months

*Pile-driving duration is the total number of months when pile-driving will occur. However, those months will not be consecutive, as some work bridge elements would be installed at different times during construction than others.

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.

Falsework is expected to be used for construction of the Portage Bay Bridge and the east approach to the new 6-lane Evergreen Point Bridge. Falsework is installed in the same way that work bridges are installed, by pile-driving the support piles into the substrate. Falsework for Portage Bay would be installed after work bridge installation, at the same time as substructure construction, before the bridge deck is put in place. Pile-driving for falsework in the east approach area could take place after work bridges are installed, to support superstructure construction. Exhibit 8 summarizes falsework elements for the project.

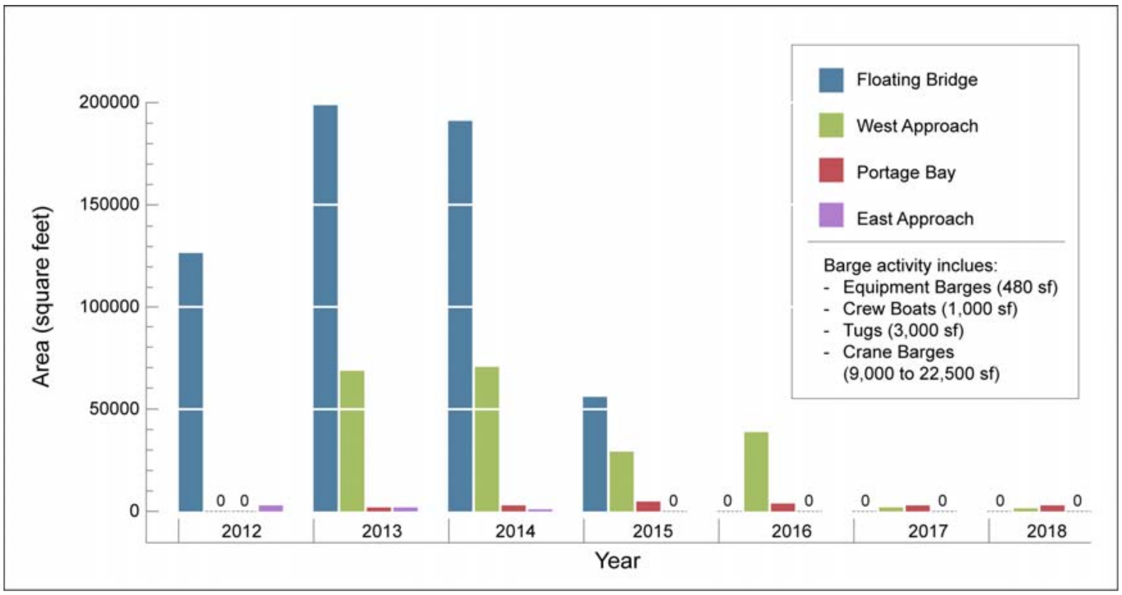
Exhibit 8. Falsework Elements for the Preferred Alternative by Area

	Portage Bay	East Approach
Number of piles	400	40
Duration of pile-driving activity	6 non-consecutive months	4 months

Construction Using Barges and Tug Boats

Barges would be used to stage construction materials, store construction equipment, transport demolition debris, provide a work area for construction personnel, and store water containment systems and water storage tanks. Barges would also be used to catch demolition debris if located below a proposed demolition activity. Construction materials such as anchors, piles, timber decking, and reinforcing cages and bars could be transported to the construction site by way of barges and tug boats. The superstructure for the new bascule bridge would likely be transported to the site by barges and tug boats. Once the tug boats are situated in the Montlake Cut, barge-mounted derricks would lift and hold bridge sections in place during installation. Additionally, barges could be used in place of tugs to transport floating bridge anchors and pontoons from casting sites to Lake Washington.

Barges would range in size from 12 feet by 40 feet for smaller materials vessels, to 75 feet by 300 feet for crane-mounted barges. Tug boats would be used to maneuver barges and pontoons into and around Lake Washington. Tug boats and crew boats can range in size from 20 feet by 50 feet to 30 feet by 100 feet. Peak barge use would occur during the first 3 years of floating bridge assembly on Lake Washington, and as many as 25 barges could be out on the lake at one time. Barges would also be used to support construction activities in Portage Bay and for the west approach to the floating bridge. Exhibit 9 shows the estimated peak barge activity for construction of the SR 520, I-5 to Medina project.



Note: Exhibit does not include estimates for the Montlake Cut.

Exhibit 9. Estimated Peak Barge Activity for Portage Bay and Lake Washington

Construction Sequence and Schedule

This section describes the general construction sequence and schedule developed for the Preferred Alternative, and includes some discussion about the activities (construction and demolition) for each element. Full project construction is expected to last approximately 7 years. Estimated construction durations for each project area and element are discussed at the end of this section.

What is the construction sequence in the Seattle area?

The west approach to the Evergreen Point Bridge would be the first major area of construction in the Seattle area, followed by the Portage Bay Bridge and the Montlake interchange (including the lid over SR 520). Improvements to the I-5/SR 520 interchange as well as constructing the new bascule bridge over the Montlake Cut would be initiated in later stages. Although construction would be completed in stages, construction on several areas would occur at the same time. Exhibits 10a through 10i show the construction sequence by year for the entire project. Exhibit 4 shows the potential staging areas and haul routes identified to support construction of the Preferred Alternative. The following is a description of the construction sequence and activities throughout the corridor for the Preferred Alternative.

I-5 Area

Construction activities and durations in the I-5 area would occur over a 2- to 3-year period. Activities in this area would include roadway reconstruction, excavation and embankment grading, retaining wall and abutment construction, and paving. Potential staging areas would be located within the existing right-of-way. The areas affected by construction and demolition and the duration and sequence of activities are described below. Exhibit 11 shows the estimated construction durations and quantities for the I-5 area.

Exhibit 11. Construction Durations and Quantities for I-5 Area

Construction Duration	26 months
Excavation	54,000 cubic yards
Daily truck trips (average)*	6 to 25
Daily truck trips (peak)	60 to 240

* Truck trips described are for local streets only, and do not include truck trip estimates utilizing major highways only.

I-5/Roanoke Crossing

The new bicycle/pedestrian path located on the south side of the East Roanoke Street overcrossing would be constructed over approximately 9 months. The new crossing would be built as an expansion of the existing overcrossing, and would require some limited demolition of the existing structure to build the new structure onto it. Abutments and support walls for the bicycle/pedestrian overcrossing would be constructed in the median and on both sides of I-5. The support walls would be constructed on footings.

During construction of the support walls, the I-5 northbound and southbound lane widths would be temporarily reduced, and the lanes would be shifted to the center. Boylston Avenue East would be temporarily narrowed and shifted to the west to allow for the new bicycle/pedestrian crossing abutment and wall construction. Once the walls are completed, the new crossing superstructure would be constructed with girders that would span over I-5. For safety reasons, I-5 traffic would be shifted to lanes not under construction when girders are being placed. Any landscaping identified as a component of the new crossing would influence the design of the structure. Landscaping and soil would be added to the new structure at the end of construction.

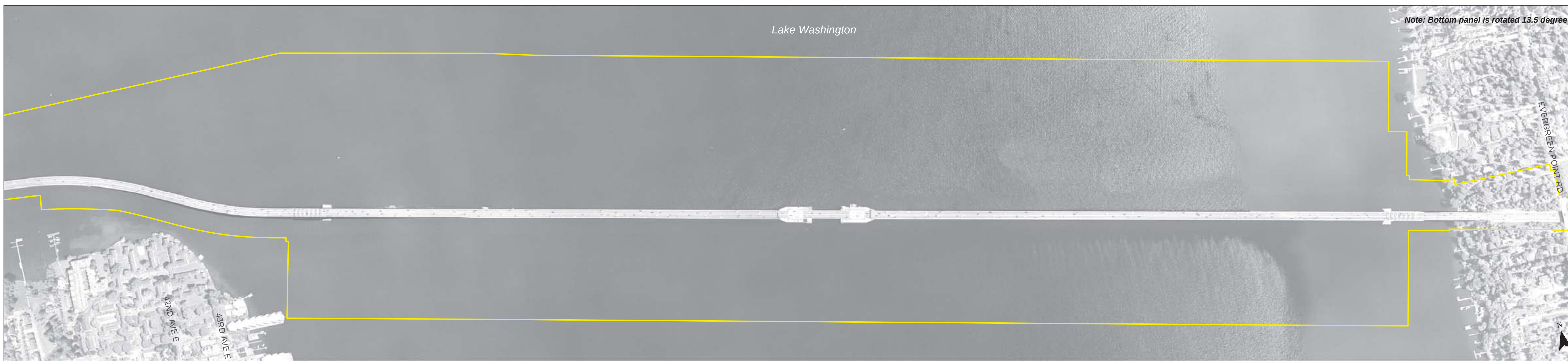
10th Avenue East/Delmar Drive East Lid

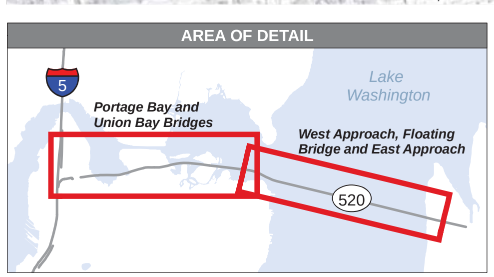
Portions of the 10th Avenue East/Delmar Drive East Lid would be constructed concurrently with I-5 area and Portage Bay area elements. Construction of the 10th Avenue East/Delmar Drive East lid would begin with retaining walls and support walls for the new lid east of Delmar Drive. 10th Avenue East and Delmar Drive East would remain open during construction while the east portion of the new lid is built. Traffic would then be shifted onto the new Delmar Drive detour across the lid while the 10th Avenue East and Delmar Drive East overcrossings are rebuilt to match the final lid configuration. Once traffic is permanently shifted back to 10th Avenue East and Delmar Drive East, landscaping would be completed. This sequence differs from the sequence described in the SDEIS, in that Delmar Drive will not have any long-term closures during construction.

SR 520 Main Line and Ramps

The SR 520 main line and ramps in this area would be reconstructed in generally the same location as today. The lanes would be reconstructed from the I-5 interchange (including ramps) to the 10th Avenue East/Delmar Drive East lid. The Harvard off-ramp retaining walls and westbound lanes would be reconstructed first, followed by the eastbound lanes.

Activities would include roadway excavation, embankment construction, grading, and temporary and permanent paving. Cast-in-place embankment retaining walls would be constructed to support the south end of the reversible HOV ramp and the on- and off-ramps at the I-5 interchange.





Limits of Construction

0 500 1,000 2,000 Feet

Exhibit 10a. **Preferred Alternative Construction Sequence - Existing**

I-5 to Medina: Bridge Replacement and HOV Project

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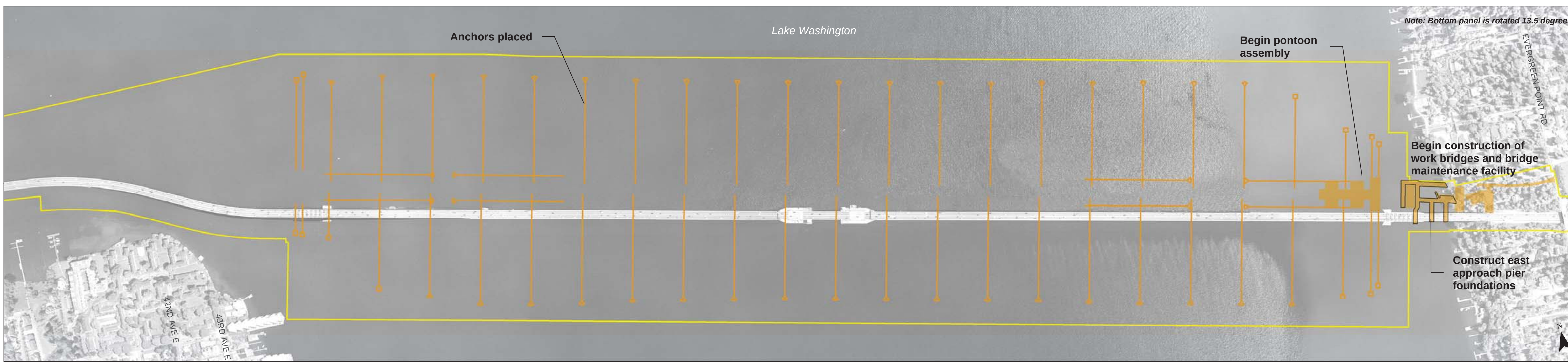

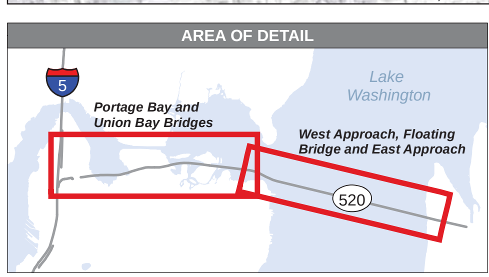

Anchor & Cable (Construction in Progress)
WorkBridge
Limits of Construction
Construction in Progress
Staging Area

0 500 1,000 2,000 Feet

Exhibit 10b. **Preferred Alternative Construction Sequence - Year 1**

I-5 to Medina: Bridge Replacement and HOV Project

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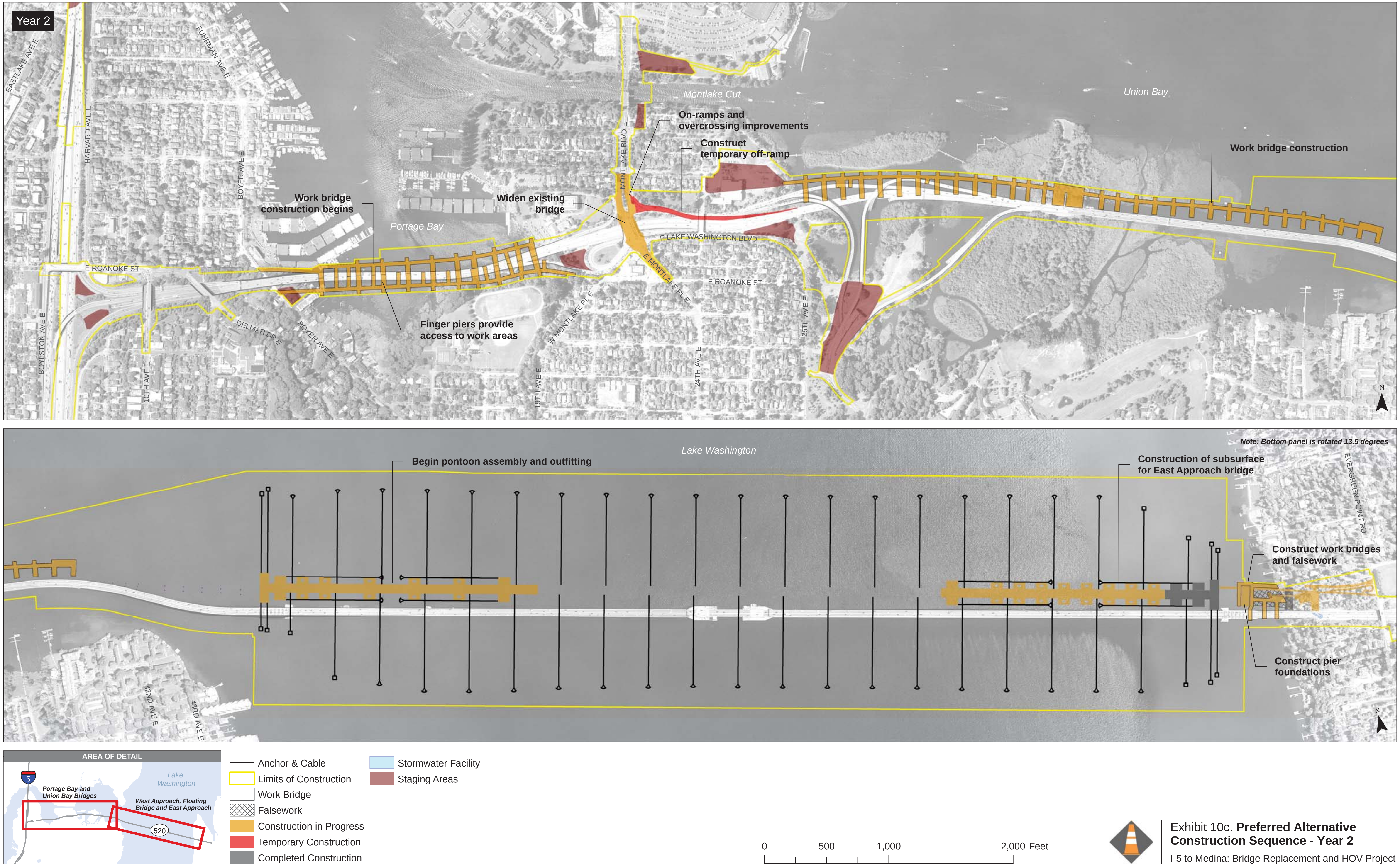
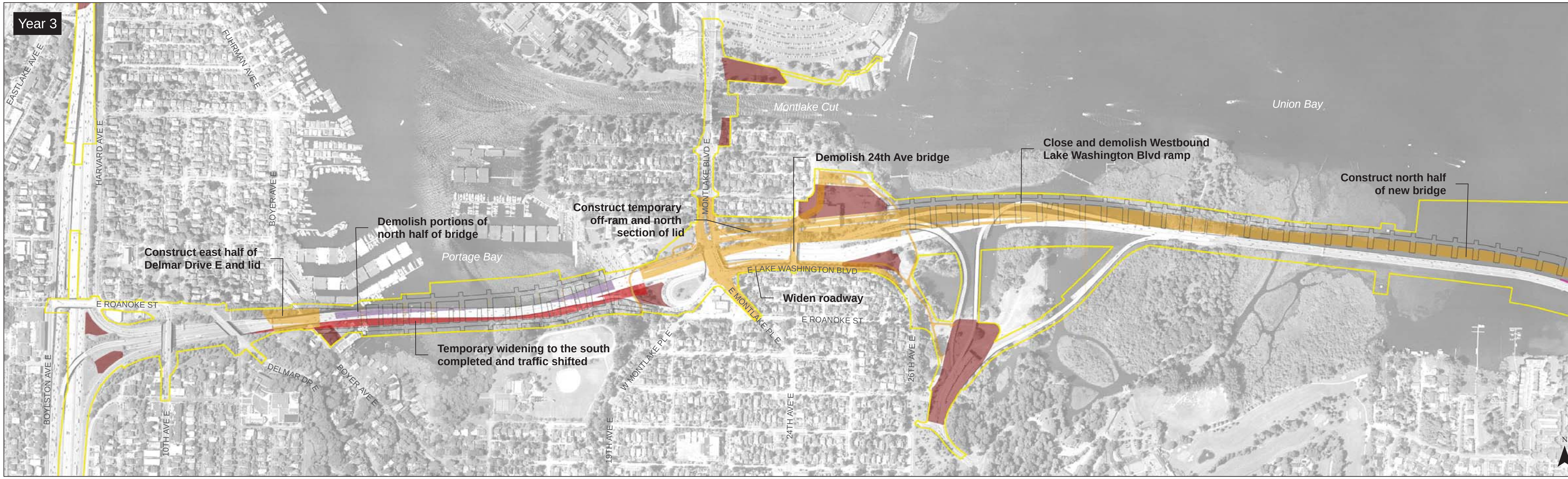
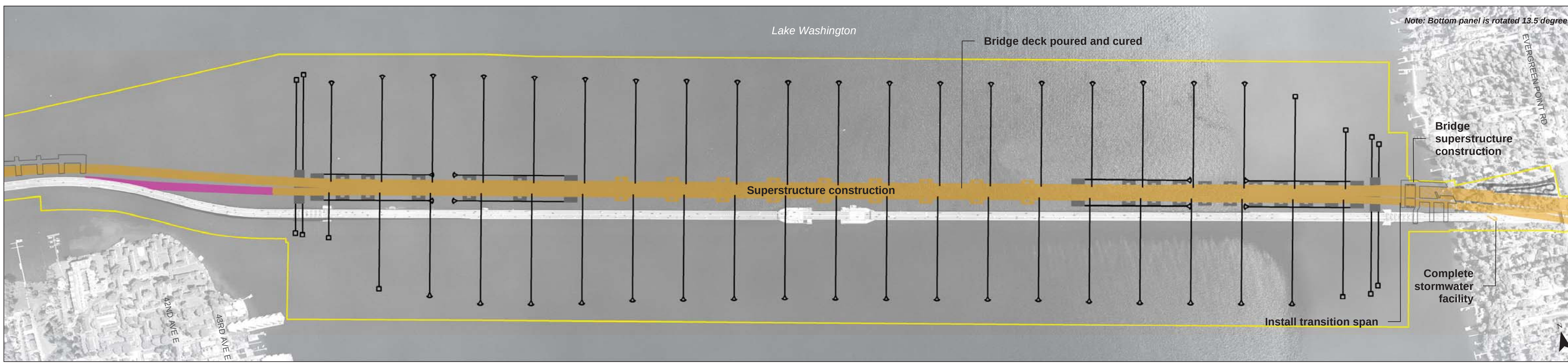
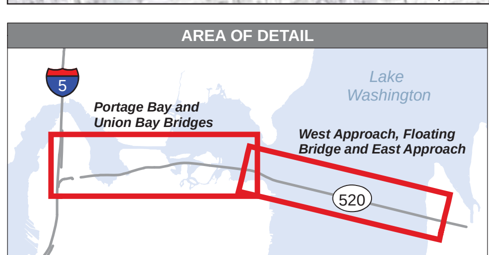


Exhibit 10c. **Preferred Alternative Construction Sequence - Year 2**

I-5 to Medina: Bridge Replacement and HOV Project







- Limits of Construction
- Work Bridge
- Falsework
- Bridge or Roadway Removal
- Temporary Construction
- Interim Connection
- Construction in Progress
- Completed Construction
- Staging Area

0 500 1,000 2,000 Feet

Exhibit 10d. **Preferred Alternative Construction Sequence - Year 3**

I-5 to Medina: Bridge Replacement and HOV Project

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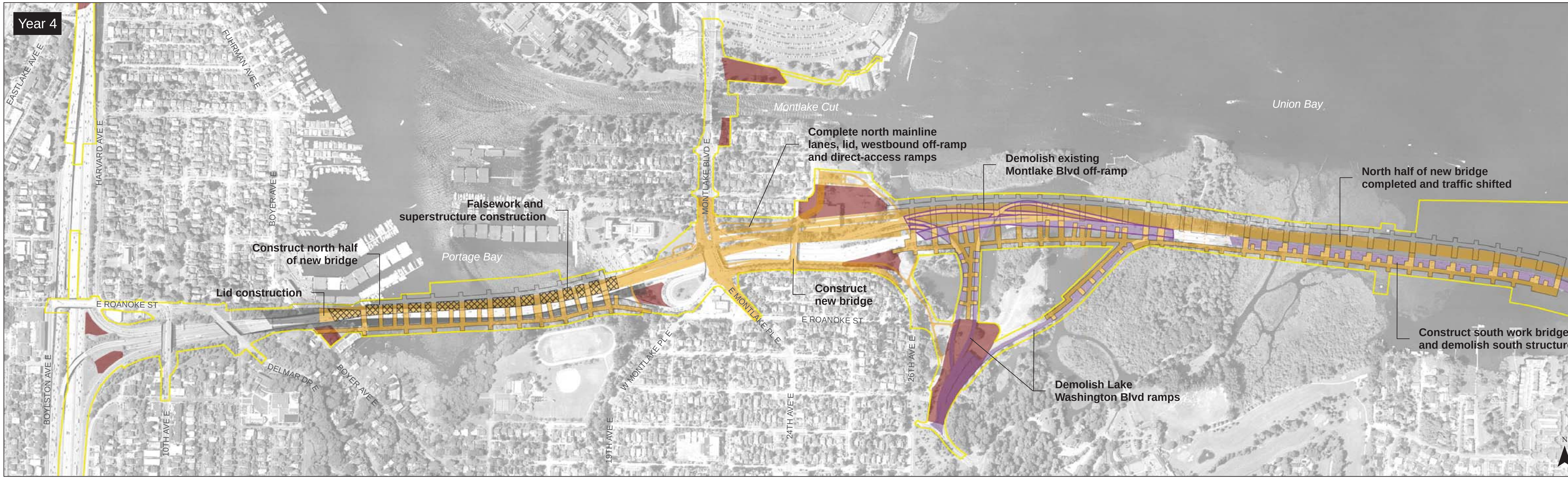
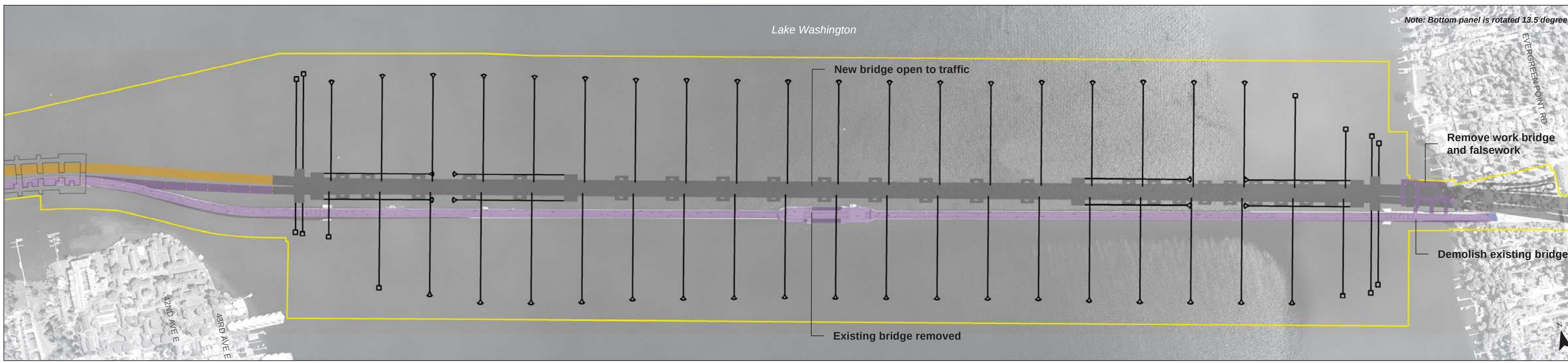
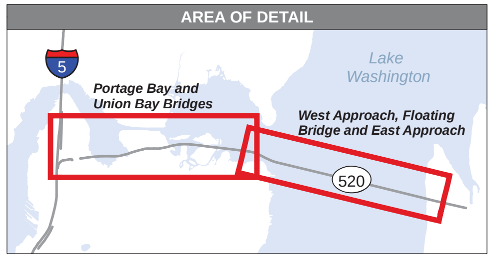




AREA OF DETAIL

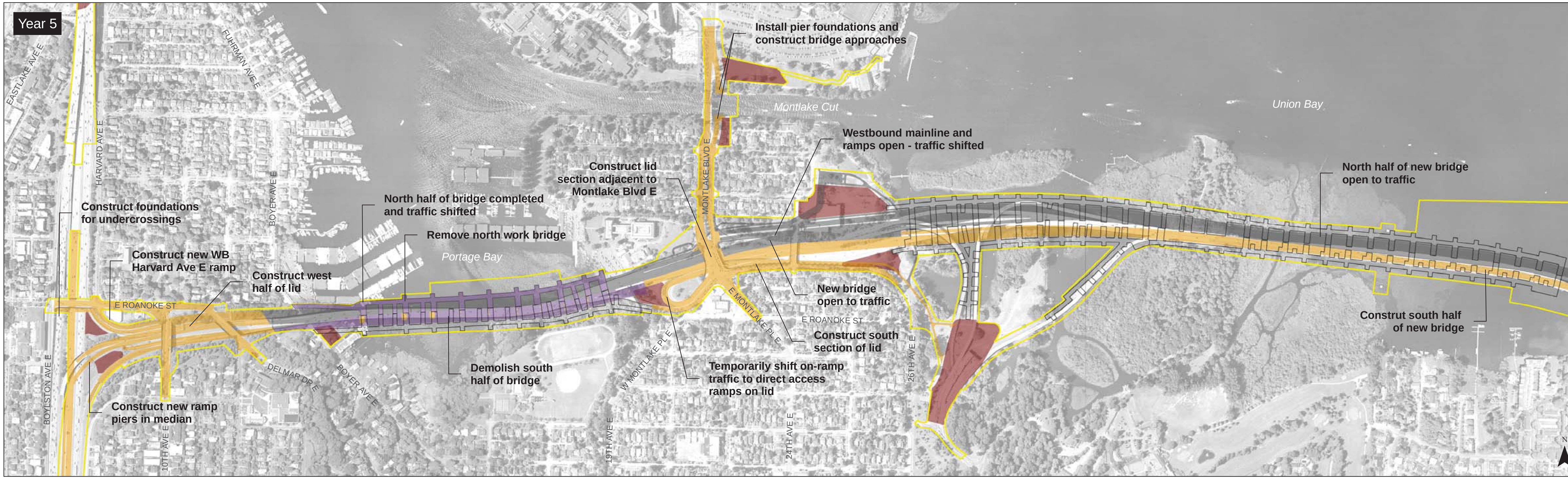


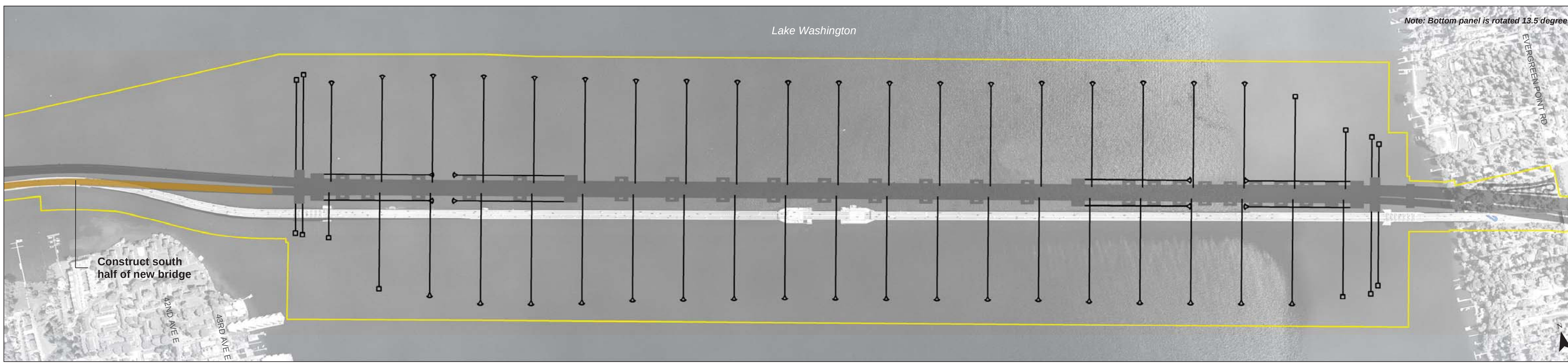
- Anchor & Cable
- Limits of Construction
- Falsework
- Bridge or Roadway Removal
- Construction in Progress
- Completed Construction
- Staging Area

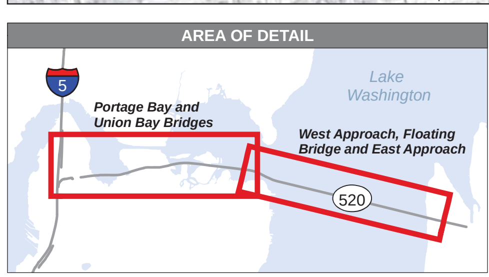
0 500 1,000 2,000 Feet

Exhibit 10e. **Preferred Alternative Construction Sequence - Year 4**

I-5 to Medina: Bridge Replacement and HOV Project







- Anchor & Cable
- Limits of Construction
- Work Bridge
- Construction in Progress
- Bridge or Roadway Removal
- Completed Construction
- Staging Area

0 500 1,000 2,000 Feet

Exhibit 10f. **Preferred Alternative Construction Sequence - Year 5**

I-5 to Medina: Bridge Replacement and HOV Project

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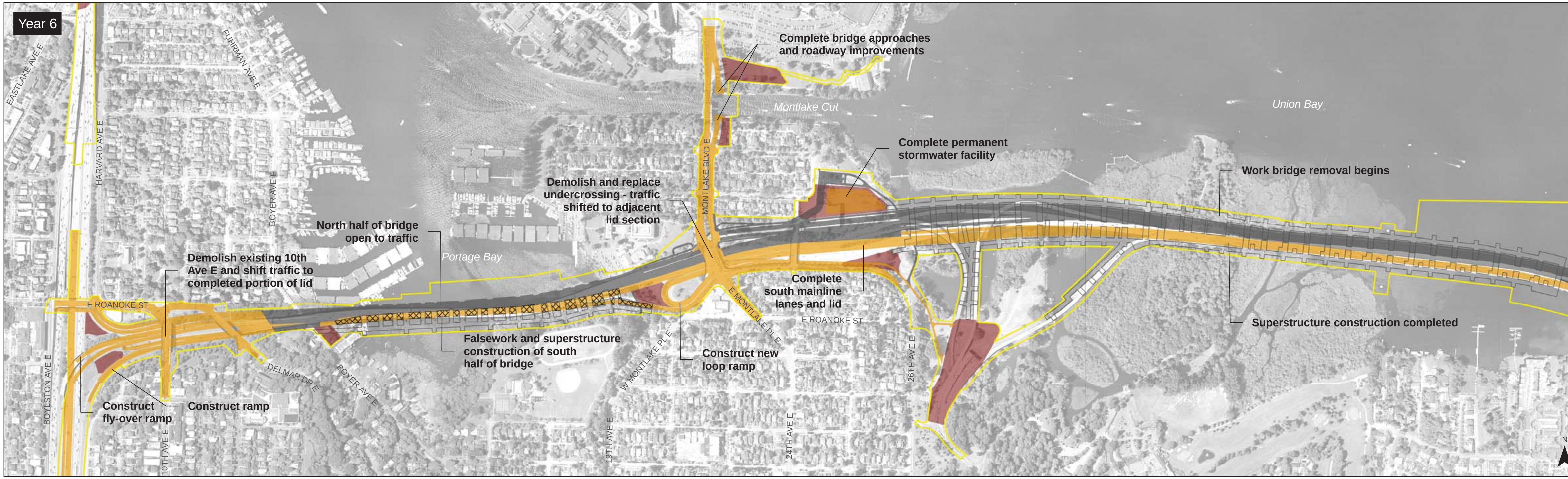
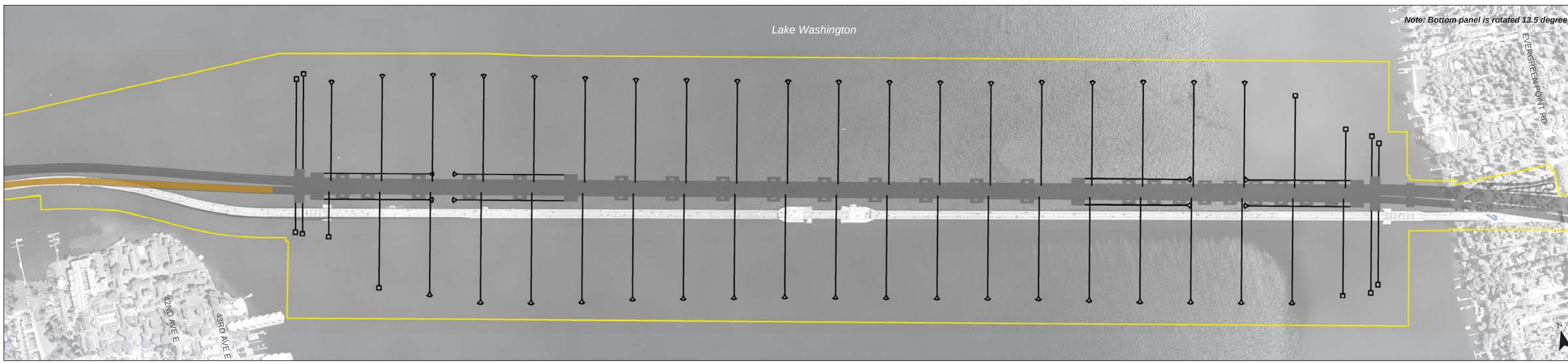
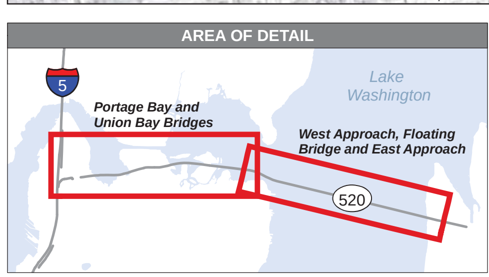




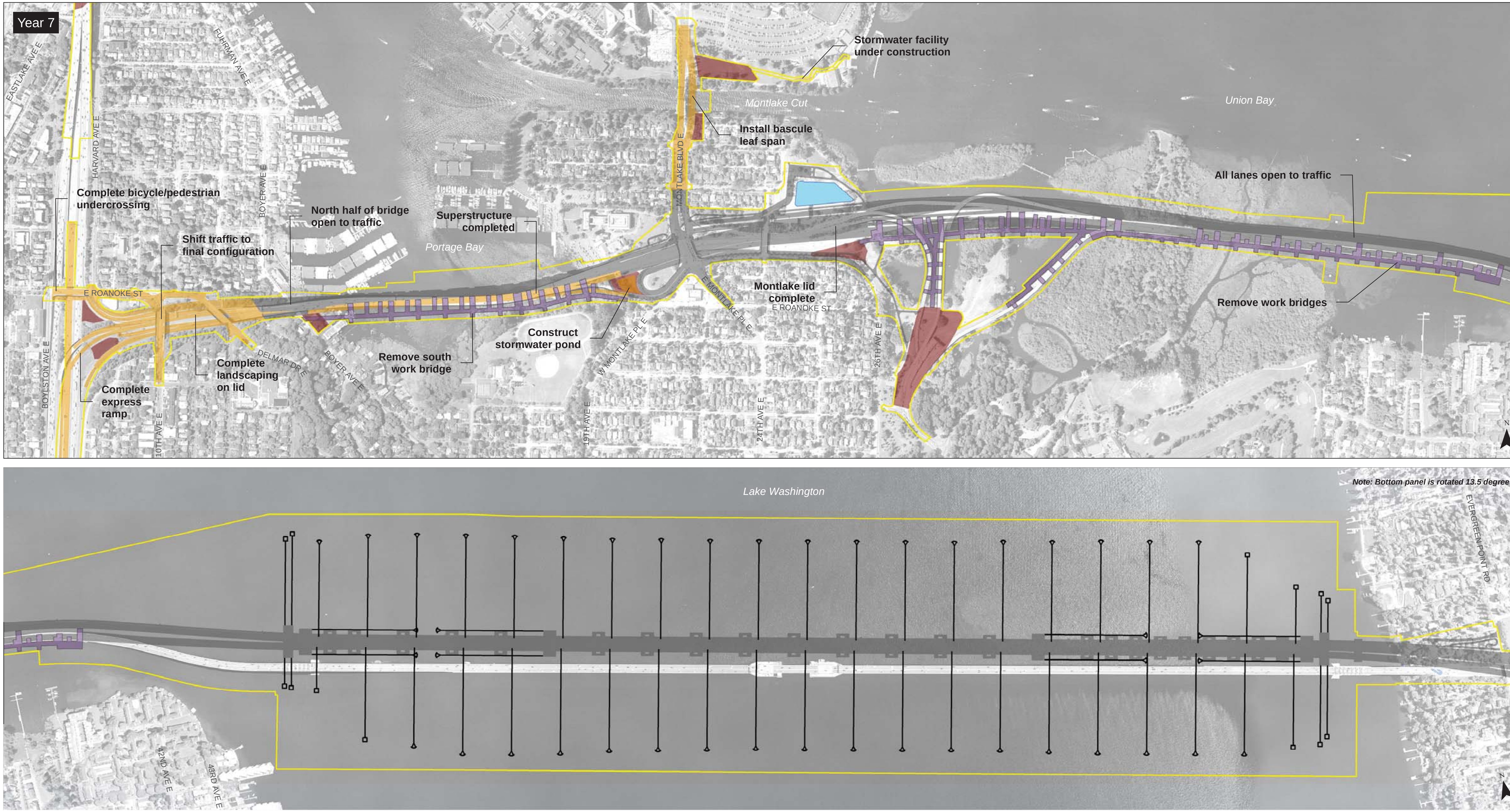


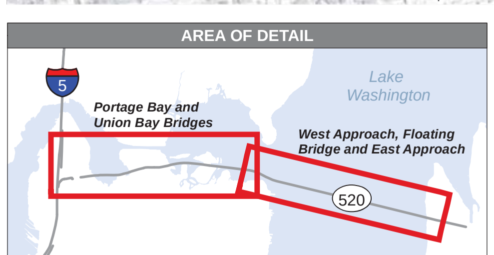
- Anchor & Cable
- Limits of Construction
- Work Bridge
- Falsework
- Bridge or Roadway Removal
- Construction in Progress
- Completed Construction
- Staging Area

0 500 1,000 2,000 Feet

Exhibit 10g. **Preferred Alternative Construction Sequence - Year 6**

I-5 to Medina: Bridge Replacement and HOV Project





- Anchor & Cable
- Limits of Construction
- Bridge or Roadway Removal
- Construction in Progress
- Completed Construction
- Stormwater Treatment Facility
- Staging Area

0 500 1,000 2,000 Feet

Exhibit 10h. **Preferred Alternative Construction Sequence - Year 7**

I-5 to Medina: Bridge Replacement and HOV Project

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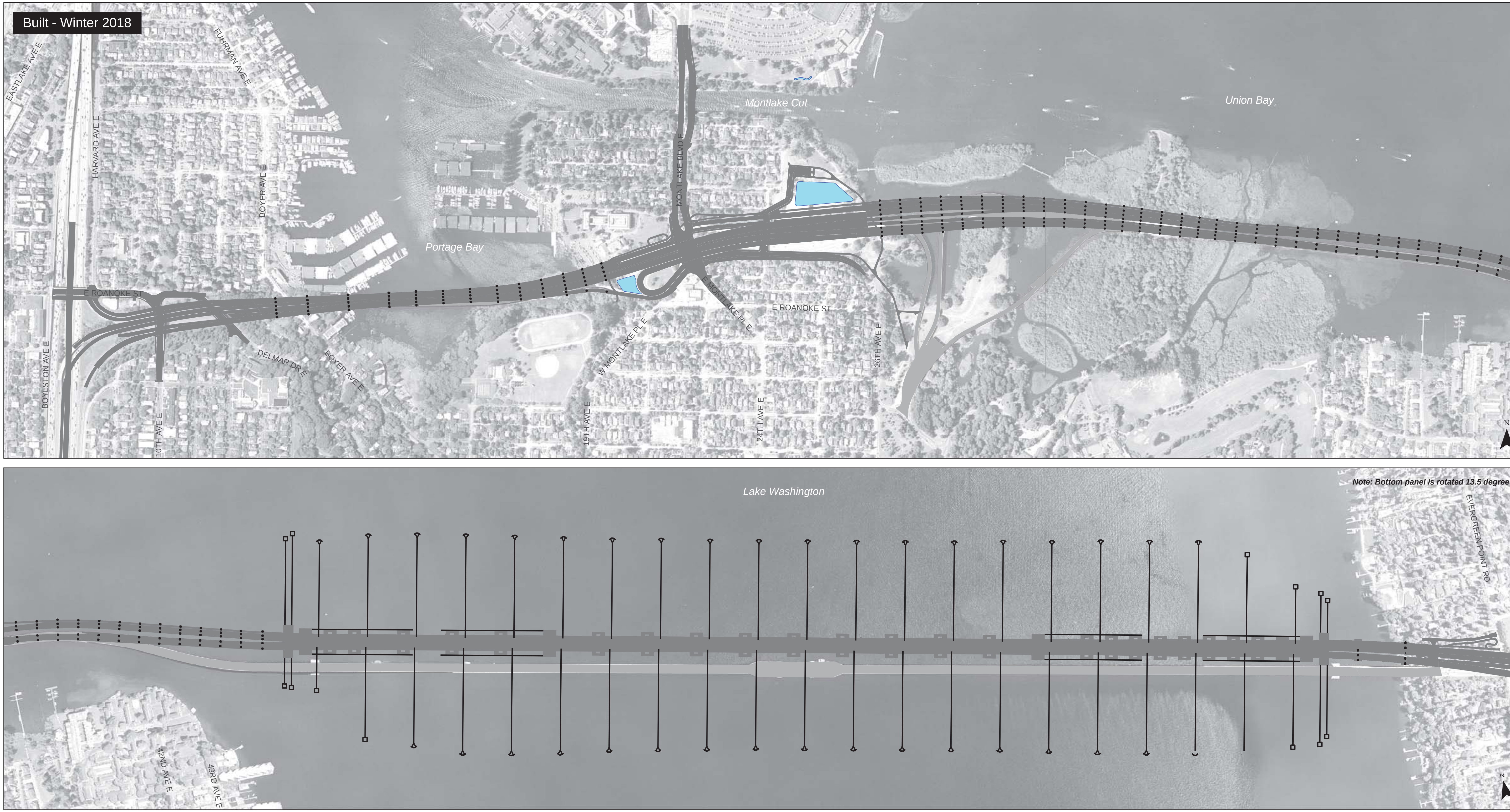

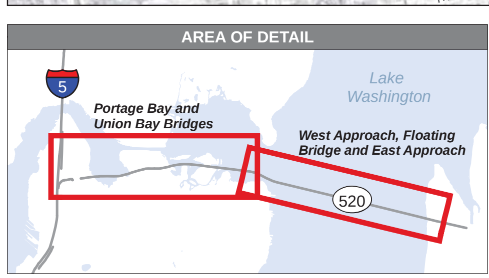

- Anchor & Cable
- Bridge Pier Column
- Completed Construction
- Stormwater Facility

0 500 1,000 2,000 Feet

Exhibit 10i. **Preferred Alternative Construction Sequence - Built, Winter 2018**

I-5 to Medina: Bridge Replacement and HOV Project

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Portage Bay Area

Under the Preferred Alternative, the Portage Bay Bridge would be rebuilt with six lanes, including two general-purpose lanes and one HOV lane in each direction, and a westbound managed shoulder that would function as an auxiliary lane during peak traffic conditions. Construction activities in the Portage Bay Bridge area are expected to last between 5 and 6 years. Exhibit 12 shows the estimated construction durations and quantities for the Portage Bay Bridge area.

Exhibit 12. Construction Durations and Quantities for Portage Bay Area

Construction Duration	64 months
Excavation	33,200 cubic yards
Daily truck trips (average)*	15-20
Daily truck trips (peak)	120-230

*Truck trips described are for local streets only, and do not include truck trip estimates utilizing major highways only.

Construction would begin by first installing temporary work bridges 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.

Following work bridge construction, the existing bridge would be temporarily widened along the southern edge to maintain four lanes of traffic (two in each direction) during construction. Additional columns and superstructure would be placed in line with the existing bridge to support the temporary widening. Traffic would be shifted to the south portion of the existing bridge to allow the north portion of the existing structure to be demolished. Once the north part of the existing bridge is demolished, the north half of the new bridge would be constructed. Following construction of the north half of the bridge, traffic would be shifted to the north portion of the bridge to allow demolition of the existing and temporarily widened south bridge lanes. Once the remaining existing structure is demolished, the new southern columns and superstructure would be constructed. If the final architectural treatment of the Portage Bay Bridge includes false arches underneath the bridge deck, these would be completed last. Traffic would be shifted onto the new bridge, and the work bridges would be removed. Stormwater treatment facilities would be completed toward the end of bridge construction.

Montlake Area

Under the Preferred Alternative, the Montlake interchange would be rebuilt at its current location. A new bascule bridge would be built parallel to and east of the existing bascule bridge over the Montlake Cut. New bridges over SR 520 at Montlake Boulevard and 24th Avenue East would be constructed as part of the lid extending from Montlake Boulevard to just west of the Union Bay shoreline. Construction activities for the Montlake interchange are expected to last approximately 5 years (not including bascule bridge construction). Exhibit 13 shows the estimated construction durations and quantities for the Montlake interchange and bascule bridge area.

Exhibit 13. Construction Durations and Quantities for Montlake Area

Construction Duration	56 months
Excavation	181,000 cubic yards
Daily truck trips (average)*	10-30
Daily truck trips (peak)	100-290

* Truck trips described are for local streets only, and do not include truck trip estimates utilizing major highways only.

The Montlake freeway transit station would be closed in the first year of reconstructing the interchange. At the beginning of the construction period, the 24th Avenue East bridge would be closed and demolished. The north half of the Montlake interchange and new lid would be constructed first. The new westbound off-ramp would be constructed first to add capacity and handle detour traffic when the Lake Washington Boulevard ramps are closed. Eastbound and westbound on-ramps would be improved. Once the north portion of the interchange and lid is constructed, westbound and eastbound lanes of SR 520 would be constructed and traffic would shift to the north portion of the Montlake interchange until the south portion of the lid, interchange, and main line reconstruction is completed. A constructed stormwater treatment wetland with an outfall to Lake Washington would be built at the current Museum of History and Industry (MOHAI) site, and would be completed toward the end of interchange reconstruction.

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

Construction for the new bascule bridge across the Montlake Cut would take approximately 2 to 3 years. 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.

Most construction activities would be staged from the shoreline; however, barges would also be temporarily positioned in the Montlake Cut and stabilized using spud anchors at the corners of the barge, or with the assistance of tug boats. Construction would begin by first installing cofferdams around the area for the new bridge foundations to protect the slopes of the Montlake Cut. The cofferdams would be located upland of the Montlake Cut, so there is no in-water work anticipated for this activity. The cofferdams would be installed, sealed, and then dewatered. At that time, the drilled foundations for the piers would be installed inside the dry cofferdam. Following shaft construction, the new bridge piers, control towers, and mechanical mechanisms would be constructed. At this time, the new north and south approaches along Montlake Boulevard would be constructed north and south of the Montlake Cut.

The bascule leaf structural steel spans (bridge deck) would either be assembled piece-by-piece onsite or the entire leaf may be assembled offsite, barged to the project, and installed using barge-mounted cranes. In either case, a barge-mounted crane would lift the bridge sections into position while they are attached to the bridge support structures. These activities would likely require closing the Montlake Cut to boat traffic periodically. Any barge moorage for bascule bridge construction support would occur for less than 48 hours at a time. The construction barges would likely only be located in the Montlake Cut during actual bridge assembly work. Based on these closure requirements, it is likely that this work would be scheduled during the winter months, when reduced boat traffic through the area is expected.

If a concrete deck is part of the final design, the deck would be poured after the bascule leaf spans were installed. The new bridge would undergo testing, and then illumination, roadway signing and striping would be installed along Montlake Boulevard before opening the bridge to traffic.

West Approach Area

Construction of the new west approach bridge could take approximately 4 to 5 years. Construction of the new west approach would be closely coordinated with improvements made to the Montlake interchange. Exhibit 14 shows the estimated construction durations and quantities for the west approach area.

Exhibit 14. Construction Durations and Quantities for West Approach Area

Construction Duration	59 months
Excavation	55,000 cubic yards
Daily truck trips (average)*	30
Daily truck trips (peak)	290

* Truck trips described are for local streets only, and do not include truck trip estimates utilizing major highways only.

Construction of the new west approach bridge would begin by first installing 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 new west approach bridge (westbound lanes) in Union Bay, across Foster Island, and east of Foster Island would be constructed from a work bridge. In Lake Washington waters deeper than 10 feet, barges would be used to construct the new structures and demolish the existing structures. Portions of the existing west approach would be demolished to make way for the new structure.

Once the new north structure is complete, traffic would be shifted to the new northern half of the west approach bridge to allow demolition of the remaining existing west approach structures, and construction of the new south (eastbound lanes) structure. The proposed bicycle/pedestrian path located on the north structure would be temporarily used to provide sufficient road width for the eastbound and westbound traffic until the south structure is complete.

Once the south structure is complete, eastbound traffic would shift to the new south structure, and the new bicycle and pedestrian path would be completed to the north. Following construction of the new west approach bridge, the existing Lake Washington Boulevard and R.H. Thomson Expressway ramps would be demolished. Exhibits 10a to 10i show the overall construction sequence and Exhibit 4 shows the staging areas for the west approach area.

What is the construction sequence in the Lake Washington area?

Pontoon Towing

Pontoons would be constructed outside of Lake Washington, and towed to the lake for floating bridge assembly. Pontoon construction activities are detailed in a later section entitled "Pontoon Construction and Launch."

As previously described on page 54 of the 2009 discipline report, 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 intaternational rules of right-of-way. Exhibit 15 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 to outfitting and moorage locations, and towing would be limited to times when the ocean waves are 7 feet or less. Pontoons could take approximately 2 days to get from Grays Harbor into the calmer Strait of Juan de Fuca. Pontoons would either be towed directly to Lake Washington for incorporation into the new floating bridge, or to an outfitting location in Puget Sound for roadway outfitting prior to entering the lake.

The 77 pontoons needed for the new 6-lane floating bridge would be towed to Lake Washington over approximately 24 months. As many as 12 or as few as 3 pontoons could be towed to Lake Washington in a single month.

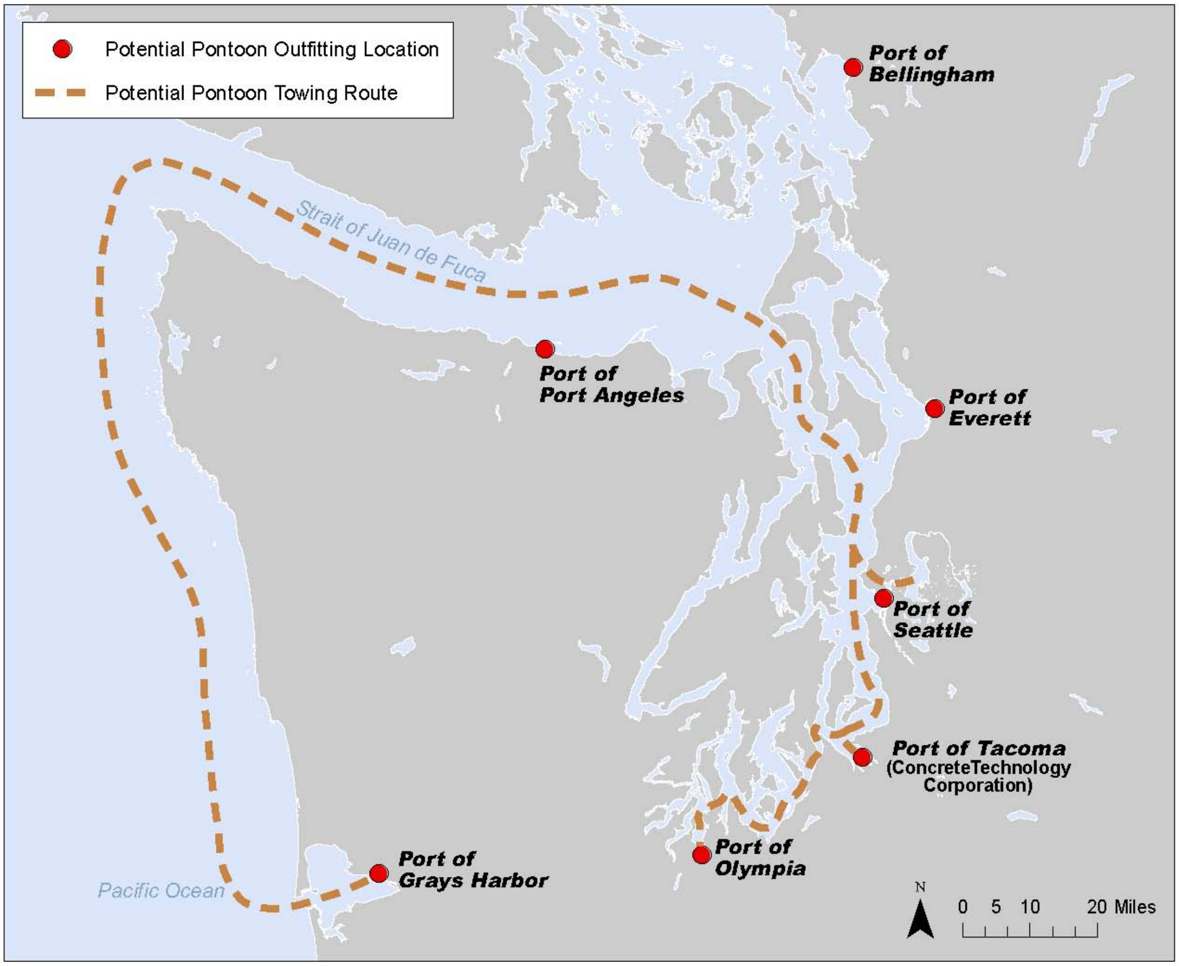

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Exhibit 15. Potential Towing Route and Pontoon Outfitting Locations (Update to Exhibit 6 of the 2009 Discipline Report)

Pontoon Outfitting

As previously described on page 55 of the 2009 discipline report, as many as 23 pontoons would be outfitted with bridge and roadway structures at available port locations in Puget Sound. Pontoons may be moored at outfitting locations in Puget Sound until needed for construction of the floating 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.

Floating Bridge 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. Construction of the new floating bridge and demolition of the old bridge would last between 3 and 4 years. Exhibit 16 shows the estimated construction durations and quantities for the floating bridge area.

Exhibit 16. Construction Durations and Quantities for Floating Bridge Area

Construction Duration	39 months
Duration of pontoon towing	24 non-consecutive months
Peak barge activity (square feet)	199,000

Construction would begin by first installing the new permanent bridge anchors. Anchors are reinforced concrete structures that would be built offsite (outside of Lake Washington) at an existing industrial facility and transported to Lake Washington using barges. Fifty-eight anchors would be used to secure the new floating bridge pontoons in place. As with the existing bridge, the two main anchor types used would be gravity anchors for harder lake bed materials and sloped areas (approximately 13, near the shores), and fluke anchors for soft bottom sediments and flat areas (approximately 45, middle of the lake).

Gravity anchors would consist of large concrete blocks stacked on top of one another to provide the necessary weight to hold the pontoons in place. The number of stacked segments that make up each gravity anchor would vary depending on each anchor location. Gravity anchors could be as large as 30 feet long by 30 feet wide by 20 feet tall (Exhibit 17).

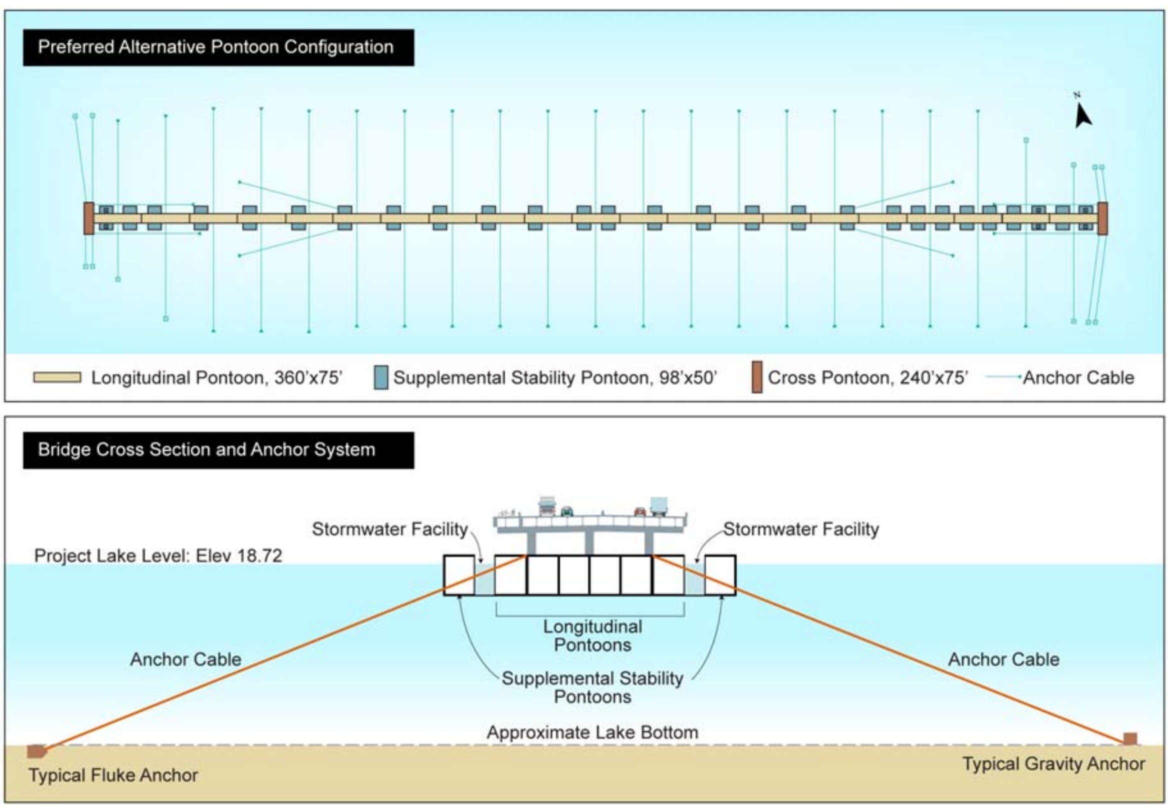

Exhibit 17. Preferred Alternative Pontoon Configuration (Update to Exhibit 23 of the 2009 Discipline Report)

A fluke anchor is a large concrete structure, shaped like a broad triangle. These anchors could be as large as 40 feet long by 20 feet wide by 20 feet tall. Fluke anchors are installed using a combination of their own weight and water-jetting to set them below the lakebed surface. Water would be pumped through hoses and jetted through pipes cast into the concrete anchors. As the high-pressure water exits the bottom of the anchor, it liquefies the soft lakebed substrate and allows the anchor to settle into the lakebed sediment.

Both types of anchors would be installed using barge-mounted cranes, and anchors would be connected to the floating pontoons with high-strength steel cables. In addition to these two primary anchor types, shaft anchors would be used in portions of the lake where gravity anchors would present a navigation hazard, or in areas with steep or unstable underwater slopes. Shaft anchors would be constructed in the same manner as drilled shaft foundation elements as described on page 19 of the 2009 discipline report.

Once the anchors are in place, floating bridge construction would start from each end of the bridge and move toward the middle. Pontoons would be fastened together in their final locations to assemble the foundation of the floating bridge. In general, pontoons are floated into position using tug boats and assembled by bolting the individual floating pontoons together to form a continuous floating structure. One 240-foot-long by 75-foot-wide cross pontoon at each end of the bridge would be installed first, and a longitudinal pontoon set perpendicularly to each cross pontoon. The longitudinal pontoons would be bolted to the cross pontoons to form the main floating length of the bridge. While the longitudinal pontoons are being set into place, the supplemental stability pontoons would simultaneously be attached to the north and south sides of the longitudinal pontoons to provide stability and buoyancy. Exhibit 17 illustrates how the pontoons would be arranged to replace the floating portion of the Evergreen Point Bridge to a 6-lane capacity.

The pontoons would be outfitted with the new bridge deck and roadway while the pontoons are being installed. Some pontoons would arrive at the lake with bridge structure already in place. Some pontoons would need bridge structure constructed on the pontoon once it was placed in the new floating bridge alignment. After the pontoon is outfitted with the bridge substructure and superstructure, the bridge deck would be poured and cured.

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, disposed of, or recycled in accordance with all applicable federal, state, and local requirements.

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 north structure (westbound) of the east approach would be constructed first, followed by the south (eastbound) structure. Both the north and south structures would be completed prior to shifting traffic onto the bridge. Exhibit 18 shows the estimated construction durations and quantities for the east approach.

Exhibit 18. Construction Durations and Quantities for East Approach Area (Including Bridge Maintenance Facility)

Construction Duration	41 months
Excavation	44,213 cubic yards
Peak barge activity	2,880 square feet
Daily truck trips (typical average)*	2 to 20
Daily truck trips (peak)	10 to 100

* Truck trips described are for local streets only, and do not include truck trip estimates utilizing major highways only.

Bridge Maintenance Facility

The new bridge maintenance facility would be built at the same time as the east approach structure. Construction activities associated with the maintenance facility and dock would include excavation and embankment work, retaining wall construction, roadway paving, and in-water and over-water construction to install the dock and berth. Construction techniques associated with the dock are similar to in-water techniques previously described for bridge structures.

What is the construction sequence in the Eastside transition area?

As described on page 58 of the 2009 discipline report, 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 SR 520, Medina to SR 202: Eastside Transit and HOV Project. If necessary, the Evergreen Point Road transit station would be relocated from an interim location to the Evergreen Point lid. To make ramps and lanes connect for proper traffic operations, the SR 520 main line 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.

What are the estimated construction durations?

As indicated in the previous section *When will the project be built?*, construction of the Preferred Alternative is scheduled to begin in 2012, after project permits are received. The project will be built in stages (Exhibit 3), and the vulnerable structures would be replaced first, followed by other project features. Overall project construction duration is estimated to be approximately 7 years. Construction durations are estimated using engineering experience and best professional judgment. Construction schedule experts considered approximate durations for construction activities along with other factors such as in-water work windows, avoiding construction conflicts with special events, and considering important cultural activities such as tribal fishing. Construction schedules and durations are only estimates meant to inform effects analyses, and could be further modified as permits are received and community coordination continues. Exhibit 19 provides a summary of the durations expected for major construction elements. Construction durations for the I-5 and Portage Bay Bridge elements presented in Exhibit 19 may not add up to geographic area durations presented earlier in this report because some elements within a geographic area would undergo concurrent construction.

Exhibit 19. Estimated Construction Durations for Elements of the Preferred Alternative Compared to SDEIS Options (Update to Exhibit 27 of the 2009 Discipline Report)

Project Element	Preferred Alternative	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	26 months	21 months	21 months	21 months
10th Avenue and Delmar Lid	26 months	27 months	27 months	27 months
Portage Bay Bridge (north half – 4 lanes)	39 months	30 months	30 months	30 months
Portage Bay Bridge (south half – widen to 6 lanes, including demolition of existing structure)	31 months	42 months	42 months	42 months
Montlake Interchange and Lid	56 months	45 months	Not Applicable	Not Applicable
SPUI, Montlake Lid; Lake Washington Boulevard South of SR 520	Not Applicable	Not Applicable	78 months	60 months
Pacific Street/Montlake Boulevard Intersection with Lid	Not Applicable	Not Applicable	18 months	18 months
New Bascule Bridge	29 months	27 months	Not Applicable	30 months
Tunnel from SR 520 to Pacific Avenue/Montlake Boulevard East	Not Applicable	Not Applicable	45 months	Not Applicable

Exhibit 19. Estimated Construction Durations for Elements of the Preferred Alternative Compared to SDEIS Options (Update to Exhibit 27 of the 2009 Discipline Report)

Project Element	Preferred Alternative	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)
West Approach (north half – 4 lanes, includes work in Union Bay)	31 months	30 months	54 months (Includes Foster Island lid)	30 months
West Approach (south half – widen to 6 lanes, includes demolition of existing structure)	40 months	30 months	30 months	30 months
Floating Bridge and East Approach (includes pontoon construction, towing, outfitting, and installing pontoons for a 6-lane bridge)	45 months	54 months	54 months	54 months
Bridge Maintenance Facility	24 months	24 months	24 months	24 months

Note: 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. Construction durations presented in this table do not add up to area totals due to overlapping construction efforts.

Pontoon Production and Transport

As described in the SDEIS, WSDOT recognized the urgent need to prepare for catastrophic failure of the Evergreen Point Bridge and initiated the SR 520 Pontoon Construction Project under an independent NEPA process in January 2008. Construction of 21 longitudinal pontoons, 2 cross pontoons, and 10 supplemental stability pontoons (33 total pontoons) necessary to replace the existing 4-lane capacity of the bridge in the event of a catastrophic failure was evaluated in the EIS for the SR 520 Pontoon Construction Project (WSDOT 2010b). The Final EIS for the SR 520 Pontoon Construction Project was published in December 2010, and the Record of Decision (ROD) was published in January 2011. A pontoon construction facility as described in the Final EIS and Record of Decision is currently under construction in Aberdeen, Washington.

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 SR 520 Pontoon Construction Project for use in the SR 520, I-5 to Medina: Bridge Replacement and HOV Project. The design for the new 6-lane floating bridge would require 21 longitudinal pontoons, 2 cross pontoons, and 54 supplemental stability pontoons (77 total pontoons). As shown in Exhibit 20, the SR 520, I-5 to Medina project would require an additional 44 supplemental stability pontoons beyond those constructed for the SR 520 Pontoon Construction Project. The additional pontoons would be needed to provide buoyancy and stability for the new 6-lane floating bridge. The following section describes where pontoon construction could occur, what types of activities are involved, and estimated construction durations.

Exhibit 20. Pontoons to be Constructed for Evergreen Point Bridge

	SR 520 Pontoon Construction Project	SR 520, I-5 to Medina Project	Total
Longitudinal pontoons (360-foot-long by 75-foot-wide by 28.5-foot-deep)	21	0	21
Cross pontoons (240-foot-long by 75-foot-wide by 34.5-foot-deep)	2	0	2
Supplemental stability pontoons (98-foot-long by 50- or 60-foot-wide by 28.5-foot-deep)	10	44	54
Total number of pontoons constructed for each project	33 (4-lane replacement)	44	77 (6-lane replacement)

How and where would the 44 additional supplemental stability pontoons for the 6-lane bridge be constructed?

As described on page 53 of the 2009 discipline report, 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 location where they are constructed. The 44 supplemental stability pontoons could be constructed at large upland industrial yards near or adjacent to navigable waterways and/or in a casting basin. Possible construction locations for pontoons include a casting basin at Concrete Technology Corporation (CTC) in Tacoma, and if available, the new casting basin facility located on the shoreline of Grays Harbor. Once the SR 520 Pontoon Construction Project is complete, the new casting basin would be available for construction of additional supplemental stability pontoons needed for the SR 520, I-5 to Medina project. Actual pontoon construction locations will be identified at the discretion of the contractor. Exhibit 15 shows the approximate locations of potential pontoon construction sites.

Casting Basin Operation

A casting basin is a large concrete construction area adjacent to a navigable waterway. The interior of the casting basin provides a flat, dry work space where several pontoons can be constructed at the same time. After the pontoons are complete, the basin is flooded in a controlled manner to allow the pontoons to float. When the pontoons are floating, a gate to the basin is opened, allowing tug boats to pull the pontoons out of the basin into the navigable waterway.

The CTC casting basin is located on the Blair Waterway on the eastern edge of Commencement Bay. WSDOT used this facility to construct pontoons for the Hood Canal Bridge Project. The 6.5-acre CTC facility is fully constructed and operating and is routinely used for industrial activities that require a casting basin. The CTC casting basin is located adjacent to an existing concrete batch plant that could serve pontoon-building operations at the CTC and nearby facilities. WSDOT would lease an additional 22 acres at several nearby properties for additional upland construction areas, construction laydown areas, parking areas, and office space to support pontoon construction at the Port of Tacoma.

The casting basin facility at Grays Harbor would have a concrete batch plant, large laydown areas, and water treatment and stormwater systems that would be used and maintained during pontoon construction activities. WSDOT anticipates providing basic water quality treatment for all stormwater runoff at this location, in accordance with WSDOT's *Highway Runoff Manual* (WSDOT 2008).

A permanent dewatering system would be in place during operation of the Grays Harbor facility to keep the casting basin dry during pontoon construction. All groundwater leaving the site would be monitored and treated as needed to meet applicable water quality standards before being discharged into the harbor or an approved offsite facility.

The launch channel for the casting basin in Grays Harbor may need periodic maintenance in the form of dredging. This activity would take place within the boundaries of the previously established launch channel, and WSDOT would coordinate with resource agencies to obtain all necessary approvals and permits prior to any in-water maintenance activities. All appropriate best management practices (BMPs) would be employed to minimize effects on the aquatic environment.

What is the schedule for pontoon construction?

Pontoon construction would take place 6 days per week, 10 to 16 hours per day. Some night work would be required when launching from a casting basin, which is based on when high tides occur. Night work may also be required to expedite pontoon production. Site preparation and pontoon construction at the Port of Tacoma and CTC, and potentially at the new facility located in Grays Harbor, would occur over 32 months.

References

The following references are in addition to those listed in the Construction Techniques and Activities Discipline Report.

Washington State Department of Transportation (WSDOT). 2008. *Highway Runoff Manual*. Publication M31-16. June 2008.

WSDOT. 2009. *Construction Techniques and Activities Discipline Report*. SR 520**:** I-5 to Medina Bridge Replacement and HOV Project. Supplemental Draft Environmental Impact Statement and Section 4(f)/6(f) Evaluation. SR 520 Bridge Replacement and HOV Program. WSDOT, Olympia, WA. December 2009.

WSDOT. 2010a. *SR 520, I-5 to Medina: Bridge Replacement and HOV Project Supplemental Draft Environmental Impact Statement and Section 4(f)/6(f) Evaluation*. SR 520 Bridge Replacement and HOV Program. WSDOT, Olympia, WA. January 2010.

WSDOT. 2010b. *Pontoon Construction Project Final Environmental Impact Statement*. SR 520 Bridge Replacement and HOV Program. WSDOT, Olympia, WA. December 2010.

WSDOT. 2011a (publication pending). *Description of Alternatives Discipline Report Addendum*. SR 520, I-5 to Medina: Bridge Replacement and HOV Project. WSDOT, Olympia, WA.

WSDOT. 2011b (publication pending). *Noise Discipline Report Addendum and Errata*. SR 520, I-5 to Medina: Bridge Replacement and HOV Project. WSDOT, Olympia, WA.

WSDOT. 2011c (publication pending). *Final Transportation Discipline Report*. SR 520, I-5 to Medina: Bridge Replacement and HOV Project. WSDOT, Olympia, WA.

Attachment 1

Errata

Attachment 1
Construction Techniques and Activities Discipline Report Errata

The following table corrects errors in and provides clarifications to the Construction Techniques and Activities Discipline Report (WSDOT 2009). Information contained in this table does not change the results or conclusions of any analyses in the 2009 discipline report.

Page	Current Text	Corrected Text/Clarification
2	• Usual and accustomed fishing areas of tribal nations that have historically used the area's aquatic resources and have treaty rights	• Usual and accustomed fishing areas of the Muckleshoot Tribe, which has ~~tribal nations that have~~ historically used the area's aquatic resources and has ~~have~~ treaty rights for their protection and use