CHAPTER 2

Description of Alternatives

This chapter describes the alternatives and components evaluated in this DEIS, and outlines the process followed to develop them. The CRC project proposes improvements to the river crossing, bicycle and pedestrian connections, and highway safety and capacity, and the addition of a high-capacity transit system. Other elements include tolling the river crossing, and transportation system and demand management measures.

CHAPTER CONTENTS

2.1 Introduction

This Draft Environmental Impact Statement (DEIS) evaluates four build alternatives and a No-Build alternative. Each build alternative is designed to comprehensively address the project's purpose and need using a package of multimodal transportation improvements, referred to as "components." These components include river crossing and highway improvements, high-capacity transit (HCT), tolling scenarios, and other measures that address the various transportation needs discussed in Chapter 1.

The build alternatives differ from each other in how they cross the Columbia River, the amount of highway capacity proposed, the high-capacity transit mode included, the proposed level of transit operations, and highway tolling. Other components, such as four different transit terminus options, are included in all of the build alternatives.

Each component represents an independent choice. For example, choosing a particular river crossing does not preclude choosing any of the transit modes or alignments that are also being considered. Components are independent pieces that when combined comprise a full alternative that will comprehensively address this project's purpose and need. Therefore, an important part of the evaluation in this DEIS is the assessment of individual components, in addition to analysis of the full alternatives.

To understand how each component affects an alternative's performance, this DEIS describes and evaluates the impacts of the individual components. Some components are physical improvements, such as the river crossing, high-capacity transit mode, and transit alignments. Other components are purely operational, such as tolling and transit operation levels (frequency of light rail trains or buses in the proposed transit guideway). All build alternatives include a representative combination of both physical and operational components.

The CRC alternatives are described in Section 2.2. Components that make up the alternatives are described in Section 2.3. Section 2.4 describes how the alternatives could be constructed, and the anticipated duration of construction. Finally, Section 2.5 explains how the current range of alternatives was determined, and describes the alternatives that were previously evaluated but dropped from consideration prior to this DEIS.

2.2 Alternatives

There are four build alternatives and a No-Build Alternative. Each build alternatives is a combination of components that, taken together, comprise a multimodal package of transportation improvements that comprehensively address the CRC project's purpose and need.

Exhibit 2.2-1 outlines the components that are included with each of the alternatives. These components are described in Section 2.3.

Exhibit 2.2-1
Components Making up the Project Alternatives

Components	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Multimodal River Crossing and Highway	Existing	Replacement[a]	Replacement[a]	Supplemental	Supplemental
HCT Mode[b]	None	Bus Rapid Transit	Light Rail	Bus Rapid Transit	Light Rail
HCT Terminus	N/A	(A) Kiggins Bowl, (B) Lincoln, (C) Clark College MOS, or (D) Mill Plain MOS	(A) Kiggins Bowl, (B) Lincoln, (C) Clark College MOS, or (D) Mill Plain MOS	(A) Kiggins Bowl, (B) Lincoln, (C) Clark College MOS, or (D) Mill Plain MOS	(A) Kiggins Bowl, (B) Lincoln, (C) Clark College MOS, or (D) Mill Plain MOS
TDM/TSM	Current Programs	Expanded TDM/TSM programs			
I-5 Bridge Toll	None	Standard rate	Standard rate[c]	Higher rate	Higher rate
Transit Operations	Existing	Efficient	Efficient	Increased	Increased

[a] The Replacement crossing has two designs, a 3-bridge design and a Stacked Transit/Highway Bridge design; these are described in Section 2.3.1.

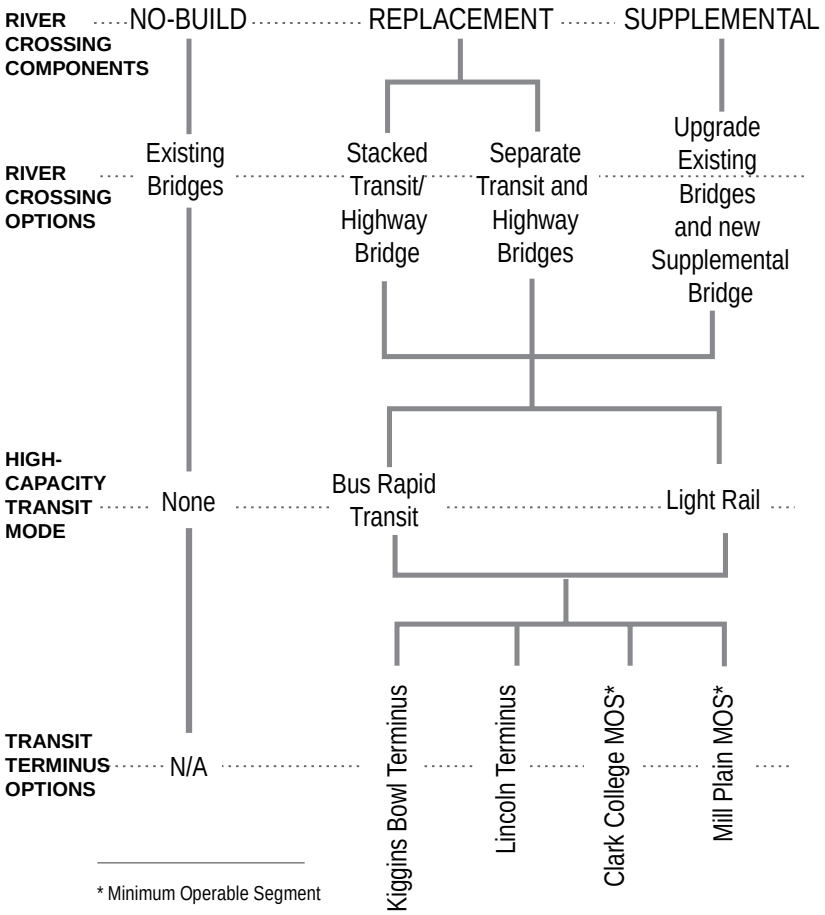
[b] HCT Mode also dictates the location of a maintenance base expansion. BRT would entail expanding a bus maintenance facility in eastern Vancouver. LRT would entail expanding the Ruby Junction maintenance base in Gresham. See Section 2.3.2.

[c] Alternative 3 was also evaluated without a toll to quantify the traffic affects of tolling the I-5 crossing. This is discussed more in Section 2.3.5.

Alternatives 2 and 3 provide similar, relatively balanced combinations of investments in highway and investments in high-capacity transit. They each include a new replacement river crossing, highway improvements, bicycle/pedestrian improvements, and a new high-capacity transit line into Vancouver. Both alternatives include the same four terminus

options—Kiggins Bowl, Lincoln, Clark College minimum operable segment (MOS), and Mill Plain MOS (these may be abbreviated A, B, C, and D respectively)—and transit alignment options (see Exhibit 2.2-2 below). Alternative 2 includes bus rapid transit, while Alternative 3 includes light rail.

Exhibit 2.2-2
Highway and Transit Component Options



Alternatives 4 and 5 differ from 2 and 3 largely in how they address travel demand. Alternatives 4 and 5 put less emphasis on highway improvements, and are configured to test how more investment in transit operations and other measures could address transportation needs. Because these alternatives reuse the existing bridges for northbound interstate traffic, they are restricted to four lanes in each direction. This is because each of the existing bridges can only accommodate two lanes while leaving enough room for safety shoulders that, while still below highway standards, would be better than existing or No-Build conditions. Because Alternatives 2 and 3 use all new bridges for the river crossing, they have been designed to represent a more balanced highway and transit investment, and provide six lanes in each direction. Exhibit 2.2-3 on the following page identifies the key elements of each alternative.

The major features of each alternative are summarized in Exhibits 2.2-5 through 2.2-9. Alternatives 2 through 5 each include the four different transit terminus options that are shown on Exhibits 2.2-6 through 2.2-9. These terminus options represent a range of possibilities for balancing ridership and cost, as well as local land use compatibility and the potential for future phasing.

All four build alternatives include the same four high-capacity transit terminus options and various alignment options (Exhibit 2.2-2). Alternatives 4 and 5 would provide much more frequent transit service to increase the capacity of the transit system, and a higher toll on the river crossing to encourage alternative modes of transportation. Transit mode—bus rapid transit or light rail—is the key distinction between Alternatives 2 and 3 and between Alternatives 4 and 5.

Exhibit 2.2-3
Key Transit and Highway Features of the Alternatives

Alternative	Transit Features	Highway Features
1: No-Build Alternative	Modest increases to C-TRAN's service hours for bus routes throughout Vancouver and Clark County to keep pace with anticipated changes in congestion. Modest increases to TriMet's services hours for bus routes throughout north and northeast Portland to keep pace with anticipated changes in congestion. Completion of the first phase of the South Corridor light rail project on the Portland Mall and I-205.	I-5 widening and improvements around Delta Park.
2: Replacement crossing with bus rapid transit	Exclusive bus lanes from the Expo Center, over Hayden Island, across the Columbia River, and to a terminus in Vancouver. The exclusive bus lanes would extend 2.07– 4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending upon the transit terminus. Introduction of a new bus rapid transit service, including a simplified payment method (e.g. the use of off-board ticket vending machines) and 60-foot articulated vehicles with special markings to create a "branded identity." Expansion of the current C-TRAN bus maintenance facility in eastern Vancouver. Changes to C-TRAN local bus routes to connect with the new bus guideway and park and rides. Twenty-four bus-rapid-transit vehicles would be included in this alternative.	A new replacement crossing over the Columbia River with either three separate bridges (two for interstate traffic, and a third for buses, bicycles, and pedestrians) or a "Stacked Highway/Transit Bridge" design that would include transit beneath the western highway bridge deck (note: these designs are discussed in Section 2.3.1 below). Improvements to the following I-5 interchanges: Marine Drive, Hayden Island, SR 14, Mill Plain, Fourth Plain, and SR 500. Additional auxiliary lanes for traffic entering and/or exiting I-5 between Marine Drive and SR 500. A toll would be charged on the I-5 crossing, with higher rates during peak travel periods.
3: Replacement crossing with light rail	Extension of the light rail guideway from the Expo Center over Hayden Island and across the Columbia River to a terminus in Vancouver. The light rail guideway would extend 2.07– 4.22 miles north from the Expo Center, and would include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending upon the transit terminus. Changes to C-TRAN local bus routes to connect with the new light rail stations and park and rides. Expansion of TriMet's Ruby Junction light rail maintenance facility in Gresham. Fourteen light rail vehicles would be included in this alternative.	Same highway features as Alternative 2. This alternative was also modeled without a toll to determine the potential effects of tolling on traffic patterns.
4: Supplemental crossing with bus rapid transit	Same transit features as Alternative 2, but higher frequency operations of bus rapid transit and local bus routes. This alternative would include 38 bus-rapid-transit vehicles, and 143 standard buses.	A new, supplemental crossing for southbound Interstate traffic and exclusive lanes for buses. The existing I-5 bridges would be re-striped for two lanes each to carry northbound I-5 traffic. Seismic retrofits to the existing bridges. Improvements to the following I-5 interchanges: Marine Drive, Hayden Island, SR 14, Mill Plain, Fourth Plain, and SR 500. Additional auxiliary lanes (generally one less additional lane than Alternatives 2 and 3) for traffic entering and/or exiting I-5 between Marine Drive and SR 500. A toll would be charged on the I-5 crossing, with higher rates during peak travel periods. During these peak travel periods, the toll would be higher than with Alternatives 2 or 3.
5: Supplemental crossing with light rail	Same transit features as Alternative 3, but higher frequency operations for light rail and for local bus routes This alternative would include 18 light rail vehicles, and 147 standard buses.	Same highway features as Alternative 4.

Exhibit 2.2-4 lists the transit alignment options evaluated in this document. The Kiggins Bowl terminus has two alignment options on Hayden Island (adjacent to, or offset from, I-5), two alignment options in downtown Vancouver (two-way travel on Washington Street, or one-way travel on Washington and Broadway Streets), and another pair of options north of downtown to connect with Clark College (travel on McLoughlin or 16th Street). The Lincoln terminus has the same alignment options on Hayden Island and in downtown Vancouver, but has unique alignment options in northern Vancouver (two-way travel on Broadway or one-way travel on Broadway and Main Streets). The Clark College minimum operable segment (MOS) has the same alignment options as the Kiggins Bowl terminus, but ends the transit guideway at Clark College rather than continuing north to Kiggins Bowl. The Mill Plain MOS has the same alignment options on Hayden Island and in downtown Vancouver, but ends the transit guideway before northern Vancouver. These alignment options are described in detail in Section 2.3.3.

Exhibit 2.2-4
Transit Alignment Options for Each Transit Terminus

Segment of Project Area	Transit Alignment Option	(A) Kiggins Bowl Terminus	(B) Lincoln Terminus	(C) Clark College MOS[a]	(D) Mill Plain MOS[a]
Expo Station to south downtown Vancouver	Adjacent	X	X	X	X
	Offset	X	X	X	X
Downtown Vancouver	Two-way Washington	X	X	X	X
	Washington-Broadway Couplet	X	X	X	X
North Vancouver	Two-way Broadway		X		
	Broadway-Main Couplet		X		
	McLoughlin	X		X	
	16th Street	X		X	

[a] Minimum Operable Segment (MOS).

Chapter 3 describes the range of impacts and performance that would occur with each of the full alternatives. In addition, it describes how the individual components, listed above and described in Section 2.3, would impact the environment. This allows the public and decision-makers to understand the impacts and trade-offs of the full alternatives and the impacts and trade-offs of the various component choices that comprise each of the alternatives.

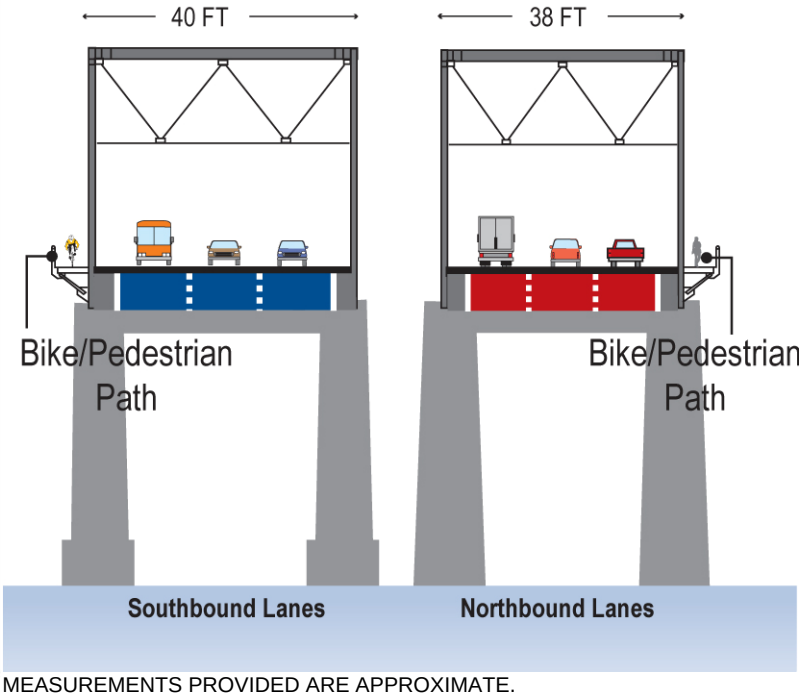
Exhibit 2.2-5

ALTERNATIVE 1: No-Build

DIMENSIONS ARE APPROXIMATE.

The No-Build Alternative illustrates how transportation and environmental conditions would change by the year 2030 if the I-5 CRC project is not built. This alternative makes the same assumptions as the build alternatives regarding population and employment growth through 2030, and also assumes that the same transportation and land use projects in the region would occur as planned. For example, the No-Build Alternative includes the I-5 widening around Delta Park that is schedule to begin construction in 2008. The No-Build Alternative also includes several large land use changes that are planned within the project area, such as the Riverwest development just south of Evergreen Boulevard west of I-5, the Columbia West Renaissance project along the western waterfront in downtown Vancouver, and redevelopment plans for the Jantzen Beach shopping center on Hayden Island. All traffic and transit projects within or near the CRC project area that are anticipated to be built by 2030 separately from this project are included in the Cumulative Effects Technical Report. All these projects are also assumed in the build alternatives.

Existing River Crossing



MEASUREMENTS PROVIDED ARE APPROXIMATE.

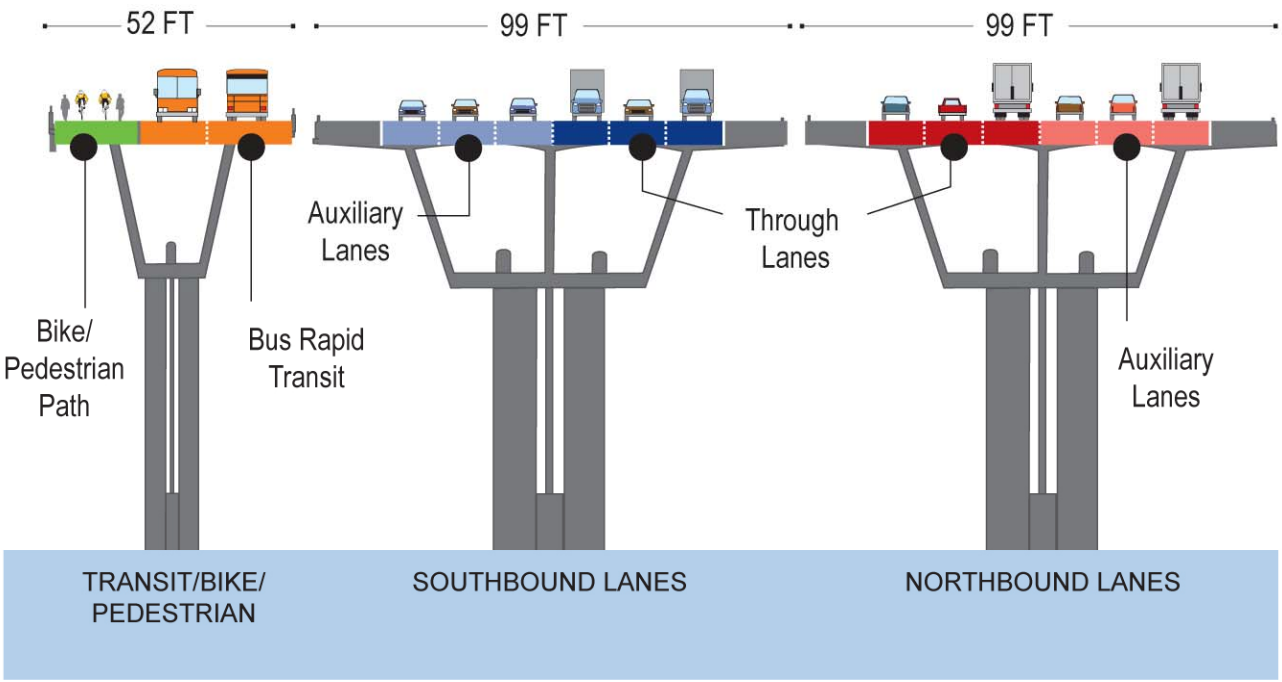
Exhibit 2.2-6 (page 1 of 2)

ALTERNATIVE 2: Replacement Crossing with Bus Rapid Transit

This alternative would replace the existing I-5 bridges with a new crossing downstream (west) of the current I-5 alignment. The existing bridges would be removed. The new crossing could include three bridges, two for northbound and southbound Interstate traffic, and a third bridge for buses in dedicated transit lanes, bicyclists, and pedestrians. There is also a "Stacked Transit/Highway Bridge" (STHB) design that would require two new bridges, rather than the three needed for the standard replacement crossing design. The STHB design would include transit beneath the highway deck of the I-5 southbound bridge and would suspend the bicycle and pedestrian path under the eastern edge of the northbound I-5 bridge.

Bus rapid transit would operate in an exclusive guideway from the Expo Center in Portland along one of several alignment options through the project area to end at one of four possible terminus options (a description of these options is contained in Section 2.3.1 below). The exclusive bus lanes would extend 2.07–4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending upon the transit terminus. Riders could transfer at the Expo Center to the existing MAX light rail system. Local bus service in Vancouver would increase to serve new transit passengers. Automobiles and trucks would pay a toll to cross the Columbia River on the new I-5 bridges.

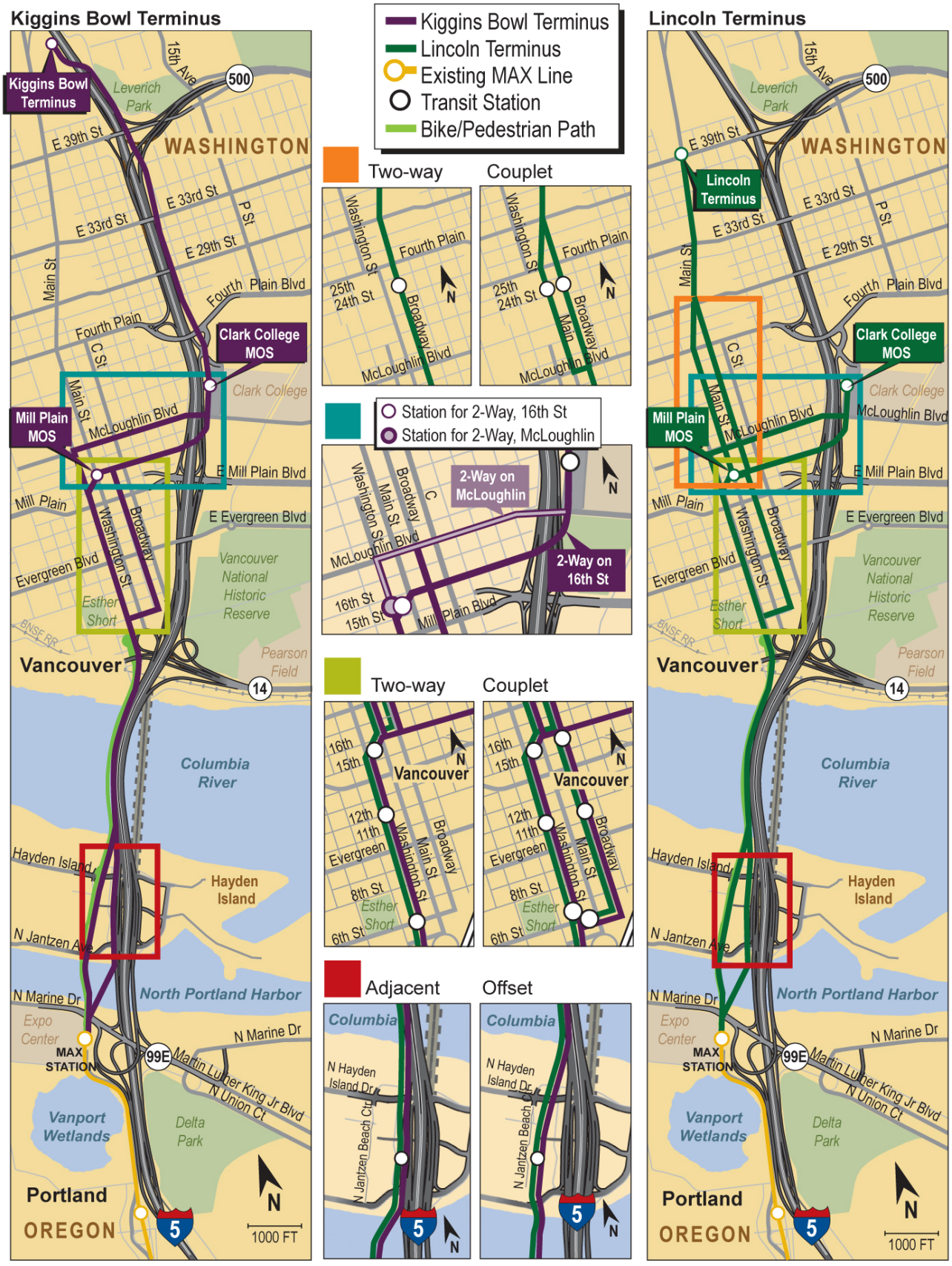
Replacement River Crossing with Bus Rapid Transit



Please see page 2-19 for a definition of Auxiliary Lanes.
MEASUREMENTS PROVIDED ARE APPROXIMATE.

Exhibit 2.2 6 (page 2 of 2)

Transit Terminus and Alignment Options for Alternative 2



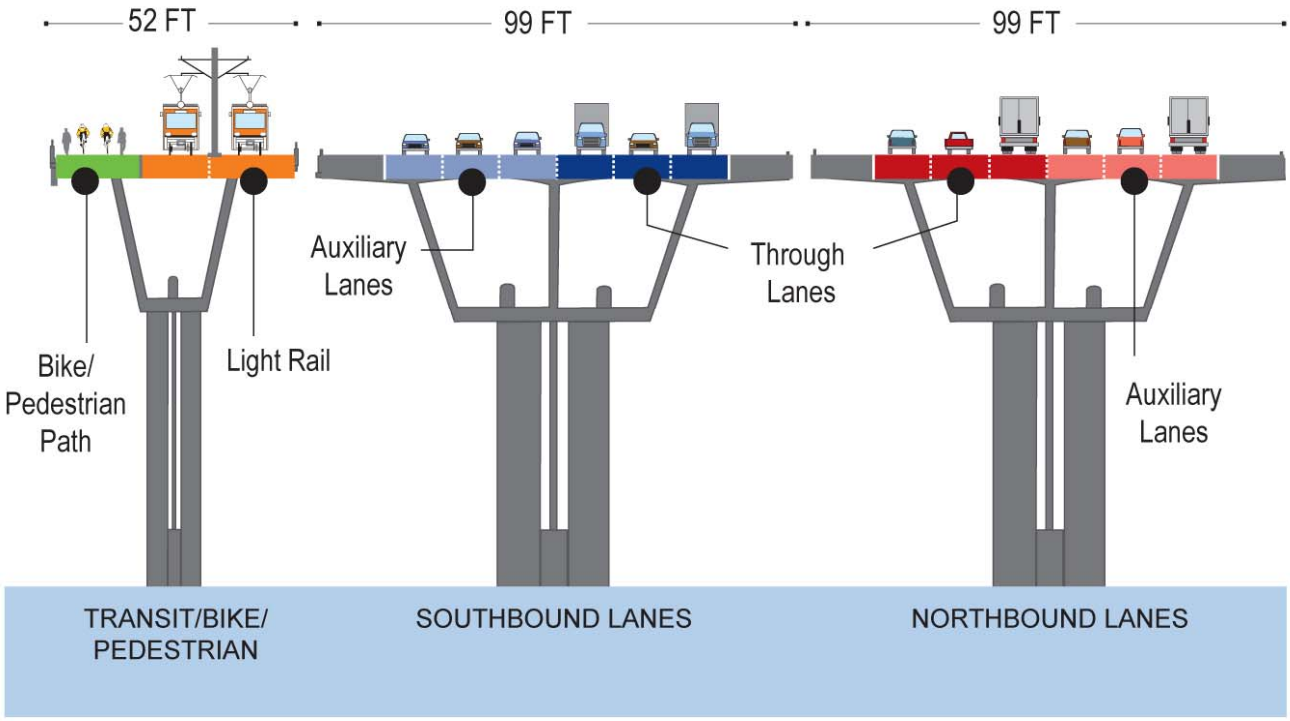
MAP DIMENSIONS ARE APPROXIMATE.
MOS=Minimum Operable Segment

Exhibit 2.2-7 (page 1 of 2)

ALTERNATIVE 3: Replacement Crossing with Light Rail

Alternative 3 is similar to Alternative 2 except that light rail would be used instead of bus rapid transit. Light rail could use the same alignments and station locations as bus rapid transit. Trains would not run as frequently as the buses in Alternative 2 because they have higher capacity. The light rail guideway would connect with the MAX system at the Expo Center, allowing trains to continue directly into downtown Portland without a transfer. This alternative includes the same tolling scenario as Alternative 2, but was also modeled without a toll on the I-5 crossing in order to determine the effects that tolling could have on traffic patterns.

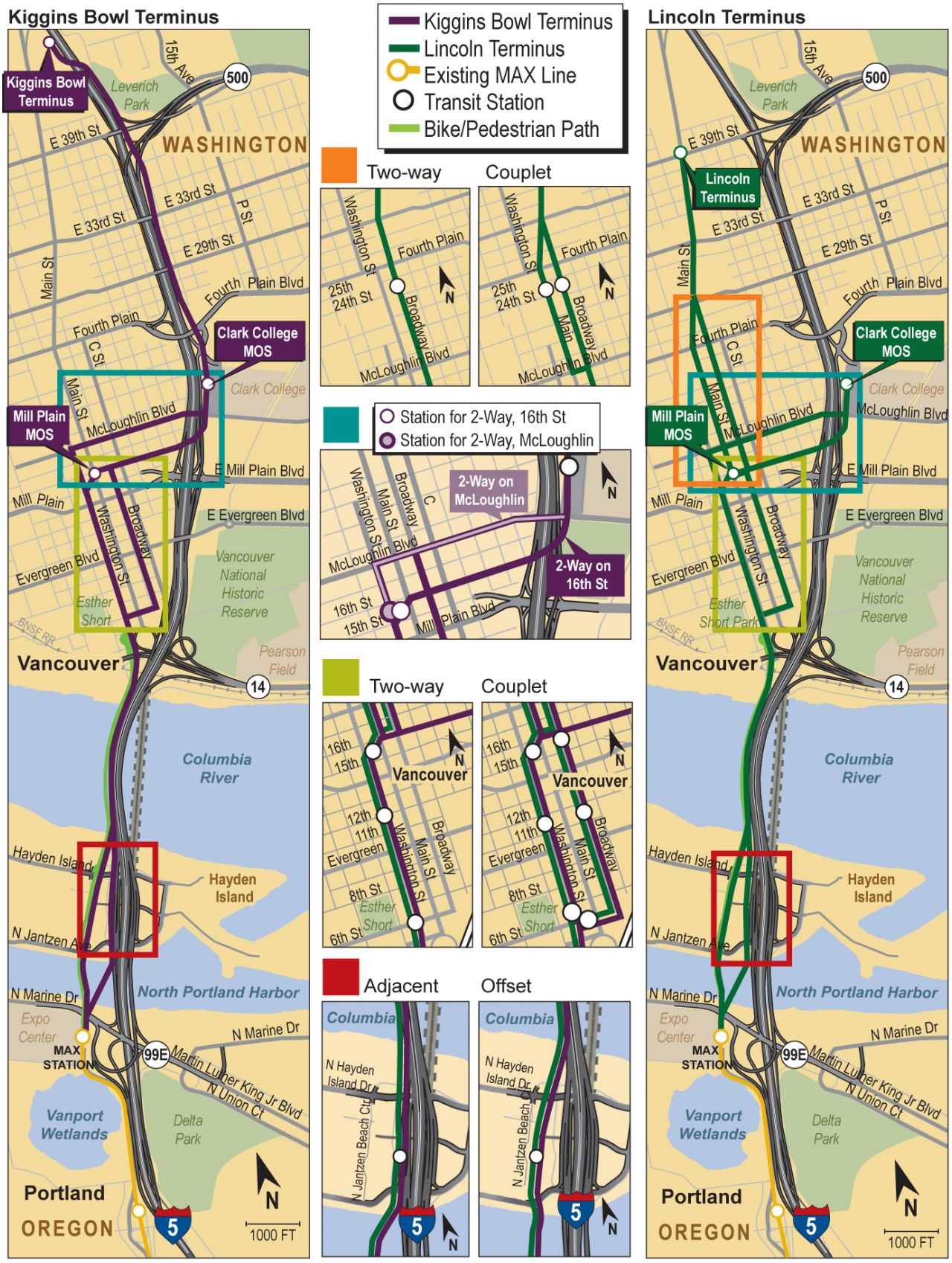
Replacement River Crossing with Light Rail



Please see page 2-19 for a definition of Auxiliary Lanes.
MEASUREMENTS PROVIDED ARE APPROXIMATE.

Exhibit 2.2 7 (page 2 of 2)

Transit Terminus and Alignment Options for Alternative 3



MAP DIMENSIONS ARE APPROXIMATE.
MOS=Minimum Operable Segment

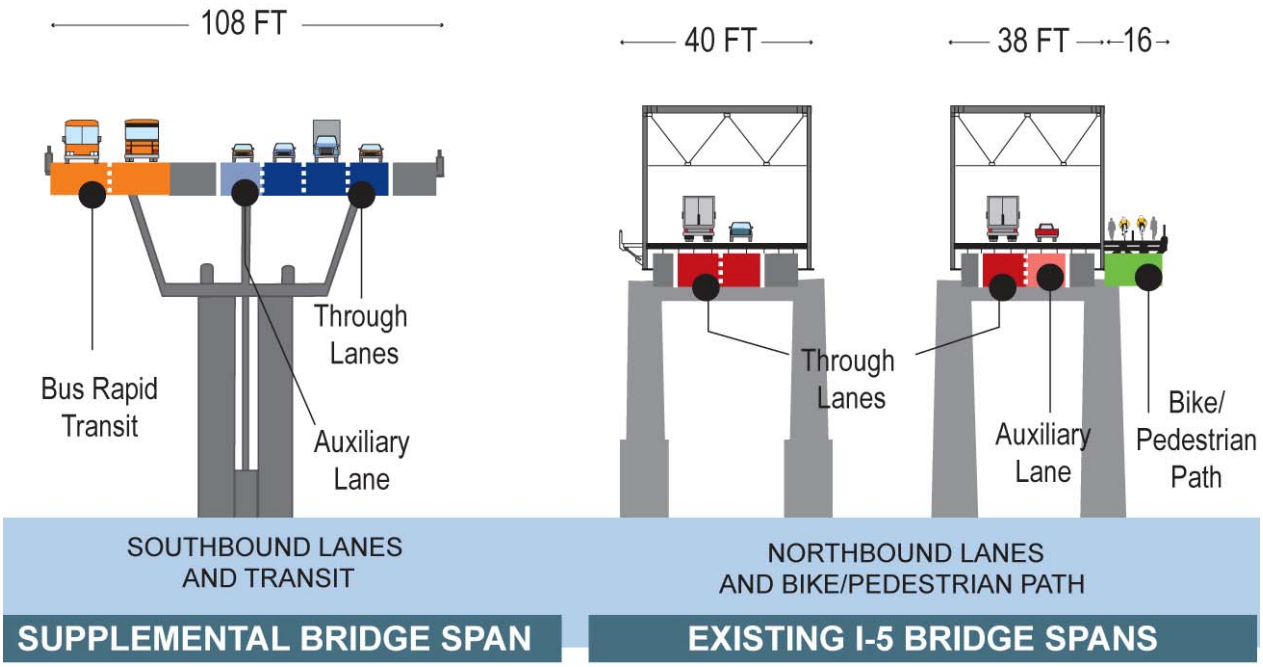
Exhibit 2.2-8 (page 1 of 2)

ALTERNATIVE 4: Supplemental Crossing with Bus Rapid Transit

This alternative would retain both existing I-5 bridges and add one new bridge. The existing I-5 bridges would be re-striped to provide two northbound lanes on each bridge and provide safety shoulders for disabled vehicles. Currently each bridge has three lanes and no shoulders. A new, wider bicycle and pedestrian facility would be added to the east side of the existing northbound (eastern) bridge. A new supplemental bridge would be constructed downstream of the existing bridges, and would include four southbound I-5 traffic lanes, safety shoulders and a bus rapid transit guideway.

Buses would operate in an exclusive guideway from the Expo Center in Portland along one of several possible alignments through the project area to end at one of four possible terminus options (a description of these options is contained in Section 2.3.1 below). The exclusive bus lanes would extend 2.07–4.22 miles north from the Expo Center through Vancouver, and include five to seven transit stations and three to five structured or surface park and rides with up to 2,410 spaces, depending upon the transit terminus. Buses would operate more frequently than with Alternative 2, to compensate for the reduced auto capacity of the supplemental crossing compared to the replacement crossing. Local bus service in Vancouver and Clark County would increase to serve new transit passengers. Automobiles and trucks would pay a toll to cross the Columbia River that would be slightly higher during peak commute periods than for Alternatives 2 and 3.

Supplemental River Crossing with Bus Rapid Transit



Please see page 2-19 for a definition of Auxiliary Lanes.
MEASUREMENTS PROVIDED ARE APPROXIMATE.

Exhibit 2.2 8 (page 2 of 2)

Transit Terminus and Alignment Options for Alternative 4

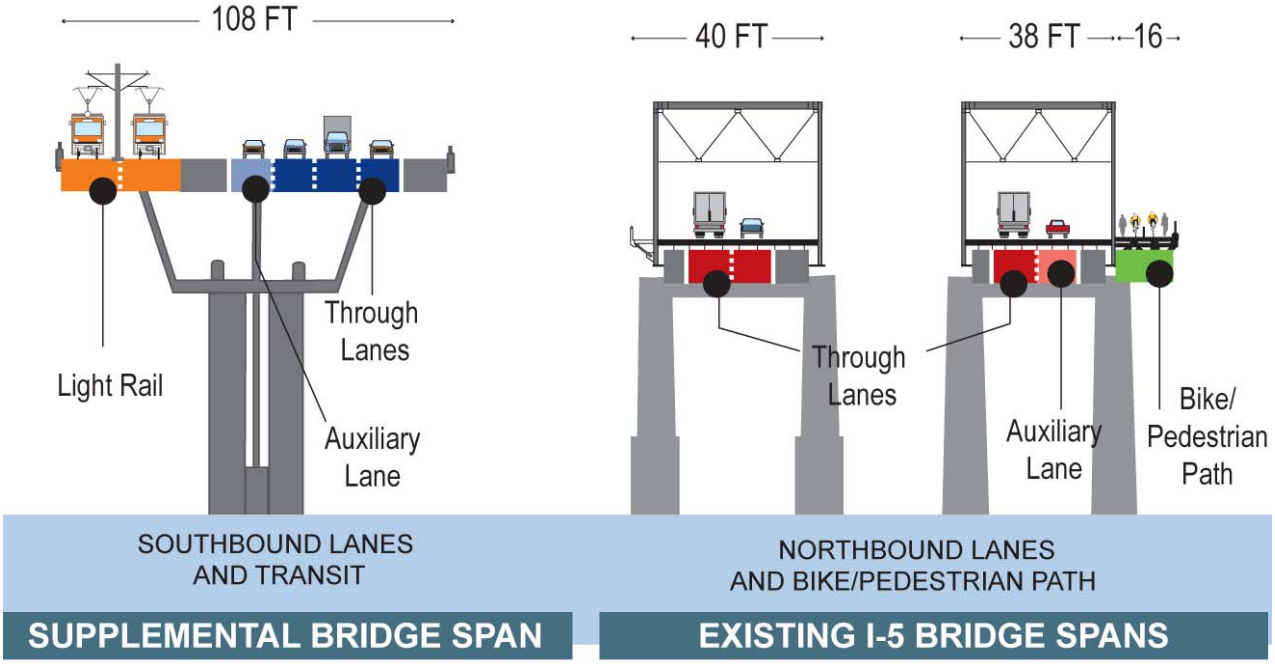
MAP DIMENSIONS ARE APPROXIMATE.
MOS=Minimum Operable Segment

Exhibit 2.2-9 (page 1 of 2)

ALTERNATIVE 5: Supplemental Crossing with Light Rail

Alternative 5 is similar to Alternative 4 except that light rail would be used instead of bus rapid transit. Light rail would have the same possible alignments and station locations. Compared to Alternative 3, trains would operate more frequently to increase the capacity of the transit system in order to compensate for the lower capacity of the supplemental crossing compared to the replacement crossing.

Supplemental River Crossing with Light Rail



Please see page 2-19 for a definition of Auxiliary Lanes.
MEASUREMENTS PROVIDED ARE APPROXIMATE.

Exhibit 2.2 9 (page 2 of 2)

Transit Terminus and Alignment Options for Alternative 5

MAP DIMENSIONS ARE APPROXIMATE.
MOS=Minimum Operable Segment

2.3 Components

Components are the building blocks of the alternatives. When combined, the components create the multimodal CRC alternatives intended to address the project's purpose and need. The components of the alternatives include:

- Multimodal river crossing and highway improvements
  - Bridges over the Columbia River carrying transit, highway, and bicycle and pedestrian traffic
  - Bicycle and pedestrian improvements between north Portland and downtown Vancouver
  - Highway and interchange improvements between Marine Drive in north Portland and SR 500 in Vancouver
- High-capacity transit modes
- Transit terminus and alignment options
  - Transit terminus options
  - Transit alignment options
- Transit operations (frequency of train or bus rapid transit service, as well as local buses)
- Bridge tolls
- Transportation System and Demand Management measures

2.3.1 Multimodal River Crossing and Highway Improvements

There are two primary multimodal river crossing options under consideration:

- A replacement multimodal river crossing (included with Alternatives 2 and 3), and
- A supplemental multimodal river crossing (included with Alternatives 4 and 5).

Both river crossings provide improved facilities for highway users, transit users, and bicyclists and pedestrians to enhance the multimodal crossing of the Columbia River and to improve safety, capacity, and mobility on I-5. The replacement and supplemental river crossings differ in the three key elements that comprise this component:

- The bridges over the Columbia River (with dedicated lanes for transit vehicles, cars and trucks, and bicycles and pedestrians),
- Bicycle and pedestrian facilities through Hayden Island, over the Columbia River, and at the Vancouver waterfront, and
- Highway and interchange improvements on I-5 throughout the project area.

Upcoming decisions to define a locally preferred alternative (LPA) will select between a supplemental or replacement crossing (or No Build), but will not decide the specific bridge type or material selection. To narrow the decision further, more analysis is required, and such decisions will be

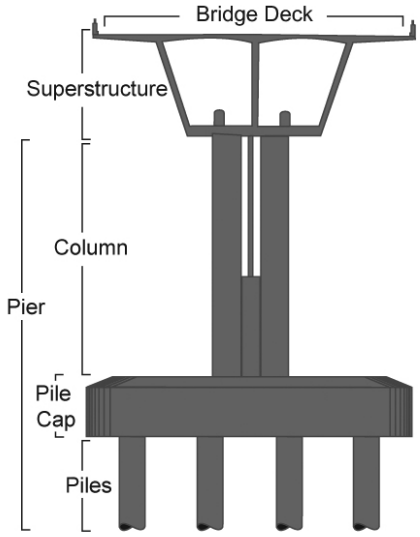
made after the Draft Environmental Impact Statement (DEIS) and after adoption of an LPA. The decision for this phase of the project regarding the river crossing is only to choose a replacement or a supplemental crossing, or the No-Build Alternative. This process will ensure that the appropriate structural and material selection is evaluated fully before any decision becomes final.

If a replacement crossing is chosen, this will not yet determine the bridge type (for example, three parallel bridges or a stacked transit/highway bridge—see below for information on these design concepts) or bridge material (for example, concrete, steel, or composite). Decisions on bridge type and design would have to be approved by the Federal Highway Administration (FHWA) before a final selection is made. The Federal Transit Administration (FTA) will also take an approval action on the final structure type.

Likewise, if a supplemental crossing is chosen, bridge type or material of the new bridge would be determined during further design and evaluation after adoption of an LPA. Should the supplemental crossing move forward in the National Environmental Policy Act (NEPA) process and become part of the LPA, a bridge type study will be done to determine the bridge type and material, and that information will be submitted to FHWA for approval. FTA will also take approval action on the final structure type.

TERMS & DEFINITIONS

Bridge Terms



NOTE: The bridge type shown is for display purposes only.

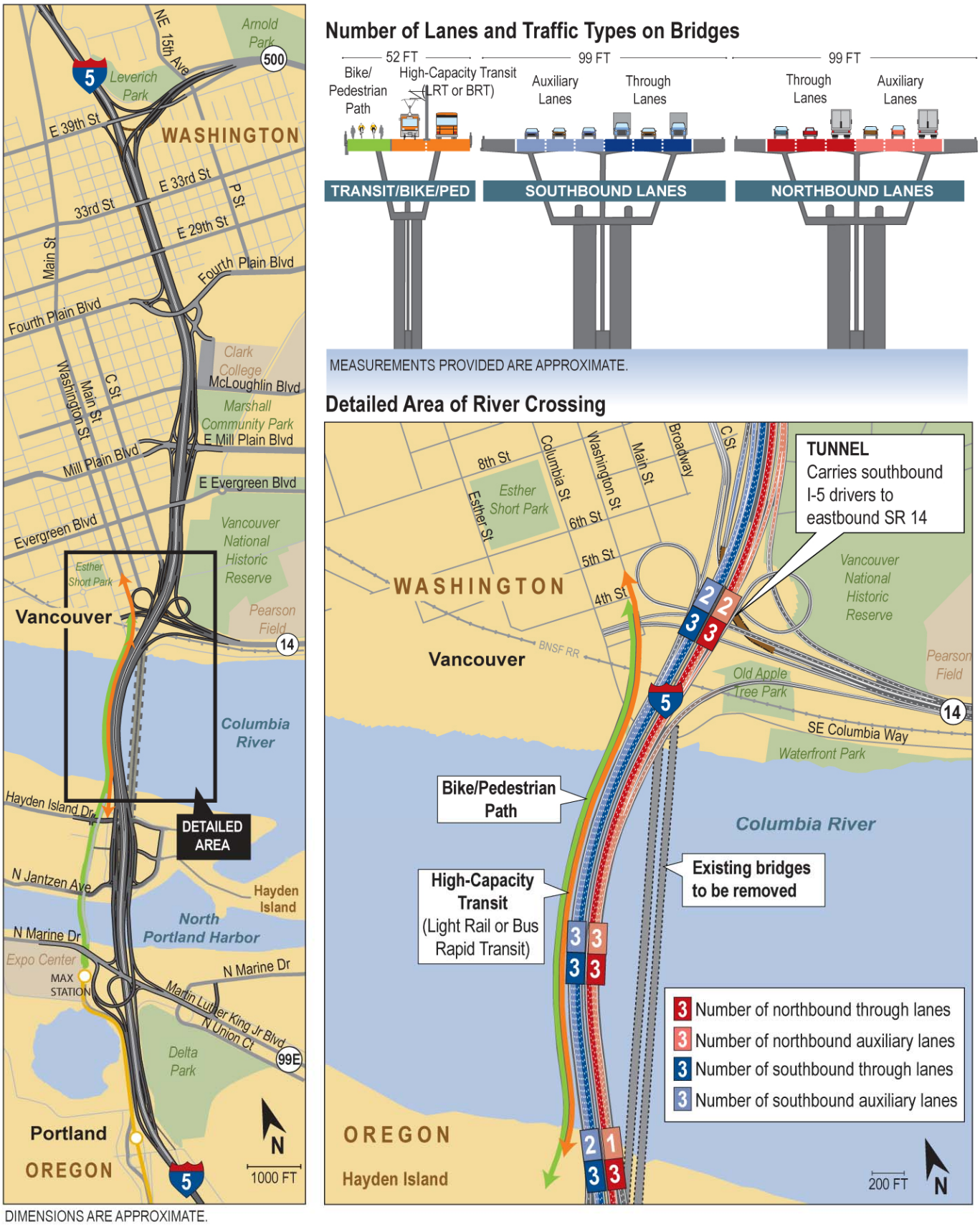
Replacement River Crossing Bridges (Alternatives 2 and 3)

A replacement river crossing (Exhibit 2.3-1) would include removing the existing I-5 bridges and building new bridges west of the existing I-5 bridges. Two new bridges would carry north and southbound interstate traffic, and the third would have a high-capacity transit guideway and an exclusive path for bicycles and pedestrians. North and southbound interstate traffic would each travel on a separate bridge approximately 99 feet wide. A third bridge approximately 52 feet wide would carry transit vehicles, bicyclists, and pedestrians. (Note: there is a possible design that would include placing transit vehicles under one of the highway bridges; see the stacked transit/highway bridge discussion below for this description.)

Bridge design will be determined later in the project, but the basic size and height requirements have been defined. The bridge spans over the river must be tall enough for large barges and tugboats to pass underneath without the need for a lift span (approximately 90 feet vertical clearance), but low enough to minimize interference with aircraft using the nearby Pearson Field or Portland International Airport. The bridges cannot include tall towers, such as those associated with cable-stay or suspension bridges, because these would pose a hazard to aircraft.

Exhibit 2.3-1

Replacement River Crossing



Spacing between the three bridges is likely to be between 10 and 50 feet. Wider spacing would reduce the visual mass of the structures and allow easier access for maintenance. Narrower spacing would reduce the breadth of bridge foundation coverage. Each structure would have separate piers, but pier spacing has not been finalized. The analysis in this DEIS is based on a typical 500-foot span length that would require six in-water piers for each of the new bridges, and potentially one to three smaller piers for ramps at either end of the bridges. The size of the piers at the water line would vary depending upon the type and size of piles used to construct these support structures.

TERMS & DEFINITIONS

Piles

Piles are large-diameter steel pipes hammered or drilled into the soil until they reach dense soil or bedrock. The piles provide support to hold the weight of the bridge and traffic. Piles also provide stability in the event of an earthquake.

The highway bridges would be wide enough to be striped for six lanes in each direction, and would include safety shoulders on both sides. Each lane, and the safety shoulders, would be a standard 12-foot width. Three lanes would carry through-traffic, with three other "auxiliary lanes." Auxiliary lanes can improve safety and capacity by accommodating cars and trucks entering or exiting the highway or traveling short distances between adjacent interchanges, and reduce potentially unsafe weaving and merging movements. This is especially important at the river crossing, where three large interchanges (Marine Drive, Hayden Island, and SR 14) all have traffic entering and exiting I-5 within a very short (1.5 miles) distance.

Auxiliary Lanes

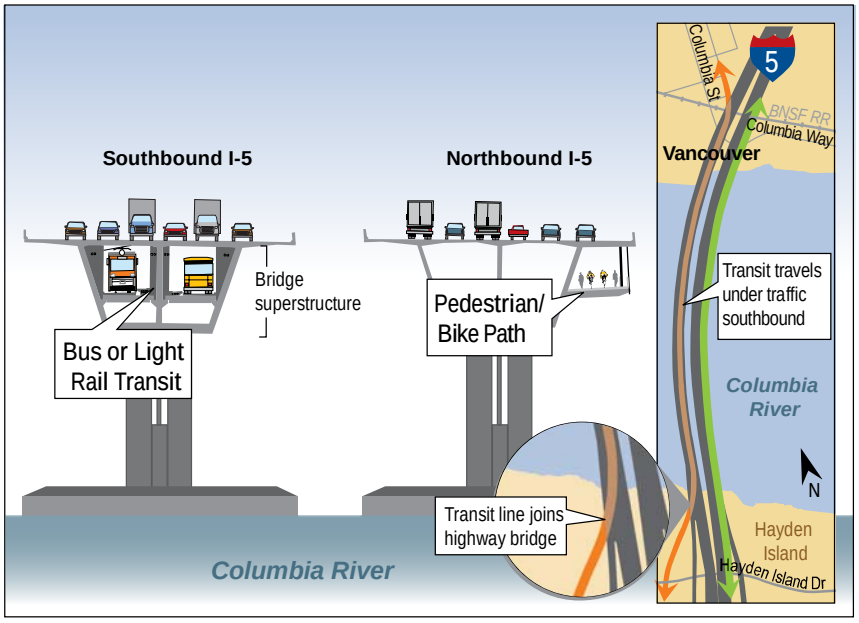
Auxiliary lanes can improve safety, reduce congestion by accommodating cars and trucks entering or exiting the highway or traveling short distances between adjacent interchanges, and reduce conflicting weaving and merging movements. This is especially important at the river crossing, where three large interchanges (Marine Drive, Hayden Island, and SR 14) all have traffic entering and exiting I-5 within a 1.5-mile segment.

A third bridge, parallel to these two bridges, would accommodate transit vehicles, bicyclists, and pedestrians. Two lanes or tracks would accommodate bus rapid transit or light rail, and a path at least 12 feet wide would be dedicated to bicyclists and pedestrians.

Replacement Crossing Option – "Stacked Transit/Highway Bridge"

This option for the replacement river crossing (Exhibit 2.3-2) could accommodate transit, bicycles, and pedestrians on two rather than three bridges over the Columbia River. This option, referred to as a "stacked transit/highway bridge" or "STHB," would allow transit to travel beneath the highway deck of the I-5 southbound bridge. From the south, the transit guideway would join the highway bridge near the northern shore of Hayden Island. Before reaching Vancouver, the transit guideway would diverge to the northwest on a separate, smaller viaduct (possibly requiring additional piers in the Columbia River) before touching down on Washington Street between the intersections of Fifth and Sixth Streets and Washington Street. Bicyclists and pedestrians would use a path suspended under the eastern edge of the northbound highway bridge.

Exhibit 2.3-2
Conceptual Design of Stacked Transit/Highway Bridge Design



NOT TO SCALE

Note: The bridge type shown is for display purposes only.

Bridge Type

Bridge type dictates the structural elements of a bridge, and strongly influences the visual and aesthetic design. In addition, the bridge type affects the duration and methods of construction. Some examples of different bridge types include:

- Steel box girder
- Cast-in-place segmental concrete box girder
- Precast segmental concrete box girder

The bridge type for this project will be determined during later phases after further engineering design refinement and environmental evaluation.

Supplemental River Crossing Bridges (Alternatives 4 and 5)

A supplemental river crossing would include a new bridge downstream of the existing I-5 crossing, and would include two lanes or tracks for high-capacity transit and four lanes of southbound interstate traffic. The supplemental river crossing would use both existing I-5 bridges to carry four lanes of northbound interstate traffic, bicycles, and pedestrians. Substantial modifications would be made to the existing bridges—upgrading the piers, trusses, and lift towers for improved stability during an earthquake, replacing the bridge deck, and adding a cantilevered path for bicycles and pedestrians.

The new supplemental bridge would be built high enough to allow river traffic to pass underneath without the need for a lift span. The existing bridges would remain, thus continuing to require the current bridge lifts to accommodate some vessels, particularly during times of high water. The new bridge would be approximately 108 feet wide, enough to accommodate a two-way transit guideway, four southbound interstate lanes, and standard 12-foot wide shoulders. The size of the piers at the waterline would vary depending upon the type and size of piles used to construct these support structures.

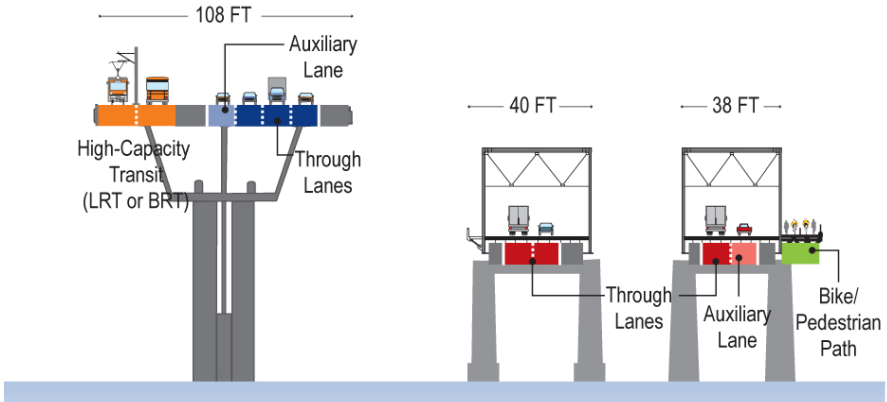
The bicycle and pedestrian paths on the existing bridges would be consolidated into a single 16-foot wide path cantilevered on the east side of the current northbound (upstream) bridge. New beams would be added to the substructure of the bridge to support this widened pathway.

Exhibit 2.3-3

Supplemental River Crossing

DIMENSIONS ARE APPROXIMATE.

Number of Lanes and Traffic Types on Bridges



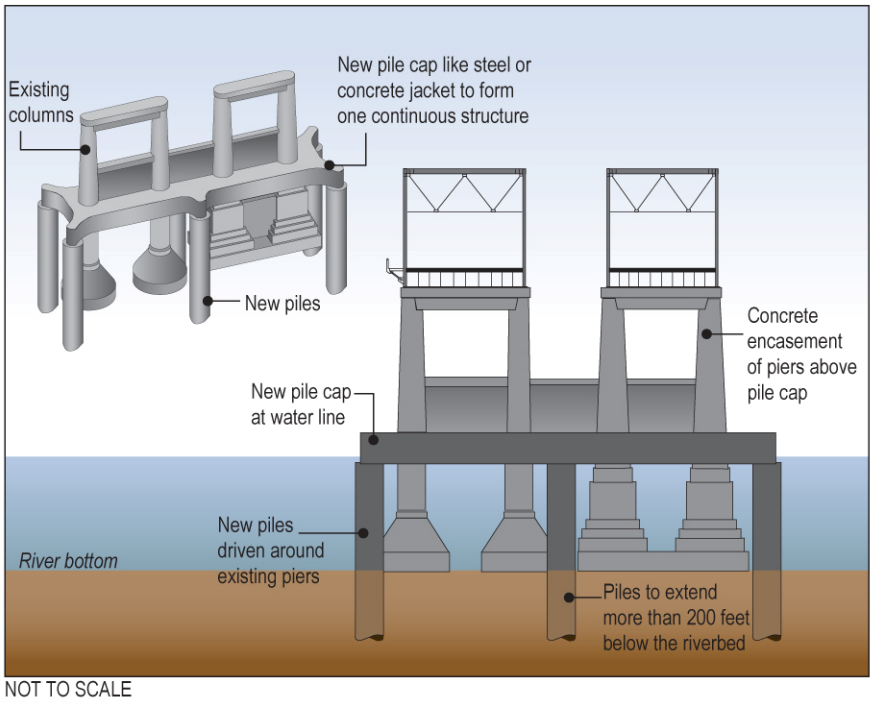
MEASUREMENTS PROVIDED ARE APPROXIMATE.

Detailed Area of River Crossing

The decks of both existing bridges are wide enough to provide two standard width (12-foot) lanes, for a total of four northbound lanes, and still accommodate safety shoulders. The two lanes on the existing southbound bridge would serve northbound through-traffic. The inside (western) lane on the existing northbound bridge would serve both through-traffic and serve as an auxiliary lane. The outside (eastern) lane on the existing northbound bridge would be an auxiliary lane. Both bridges would have a 4-foot wide interior shoulder. The current northbound structure would have a 10-foot outside shoulder and the current southbound structure would have a 12-foot outside shoulder.

The foundations, piers, and superstructure of the existing bridges would be strengthened to improve stability during an earthquake (Exhibit 2.3-4). Large diameter (>10 feet) piles would be placed around the existing piers to reach firm substrate or bedrock, which lies more than 200 feet below the riverbed. New pile caps would connect these piles to the existing piers at the water line. A concrete or steel jacket would encase the piers of both existing bridges to form one continuous structure above the river. New or reinforced cross-bracing would strengthen trusses on the superstructure of the bridges. The lift span towers would be rebuilt in a style that resembles the current towers but provides much greater support for the counterweights used to raise the lift span.

Exhibit 2.3-4
Seismic Retrofits Concept for Existing Bridges



NOT TO SCALE

Bicycle and Pedestrian Improvements Provided by Replacement and Supplemental River Crossings

The replacement river crossing includes a pathway for bicyclists and pedestrian to travel between downtown Vancouver and the Expo Center. The pathway could be on either or both sides (east and/or west) of the river crossing; current designs have the pathway west of and adjacent to

the high-capacity transit alignment. The pathway would be continuous and above-grade from Marine Drive to Sixth Street in Vancouver, would be approximately 16 feet wide over the river, and would pass under Marine Drive to connect to the Expo Center. The STHB design could include a 16 foot wide path underneath the northbound (eastern) Interstate bridge deck.

The supplemental river crossing would widen the east sidewalk on the existing eastern bridge to approximately 16 feet in order to accommodate both pedestrians and bicyclists in a safe manner. Ramps would connect this widened pathway with Columbia Way in Vancouver and with Tomahawk Island Drive on Hayden Island. An above-grade multi-use pathway would also be provided alongside the transit guideway between Tomahawk Island Drive and Marine Drive, crossing over the Portland Harbor. Pedestrians and bicyclists using both pathways would need to travel along Tomahawk Island Drive, under I-5, and through at-grade intersections.

With all of the CRC alternatives, the multi-use pathway over North Portland Harbor would be on the transit structure; therefore, its location would vary depending on the transit route selected in this location. The transit routes are discussed in Section 2.3.3.

For either river crossing, connections consisting of stairs, ramps, and/or elevators would be provided to connect with existing and planned sidewalks and pathways in Vancouver, on Hayden Island, and near Marine Drive. Most of the connections will need to be coordinated with ongoing planning, such as the potential redevelopment and streetscape planning on Hayden Island.

Highway and Interchange Improvements Provided by Replacement and Supplemental River Crossings

The highway improvements included with both river crossings would add additional auxiliary lanes as shown in Exhibit 2.3-5. Both the replacement and supplemental crossings would provide three through lanes on I-5 in each direction from Marine Drive to SR 500, but would differ in the number of auxiliary lanes provided and in the design of some interchanges. The replacement crossing would include two to three auxiliary lanes in each direction between Marine Drive and SR 500. The highway improvements provided by the supplemental crossing would generally include one fewer auxiliary lane through the project area than the replacement crossing, because it is designed to represent a lower highway investment.

Both river crossing components provide safety, access, and capacity improvements to the interchanges in the project area, as described below. The specific design of these interchanges could change as design progresses, but the basic performance, footprints, and impacts would be similar to those described here.

The southern extent of highway improvements is the Marine Drive/I-5 interchange. Merge lanes for southbound traffic entering the highway from Marine Drive would be extended past Victory Boulevard. A new roadway would cross over Vancouver Way to connect Marine Drive and Martin Luther King Jr. Boulevard.

There are three design options for the Marine Drive interchange (Exhibit 2.3-6); each configuration is available for both the replacement and supplemental river crossing. These options include a "standard" design option that would retain most of the existing Marine Drive alignment, a "southern realignment" that would realign Marine Drive south of the Expo Center property, and the "diagonal realignment" design option. The southern design would introduce a traffic signal at the new intersection of Marine Drive and Force Avenue; the other designs would largely retain the existing configuration. Each design option would add free-flow access (no stop signs or signals) for the most frequently used connections between I-5 and Marine Drive.

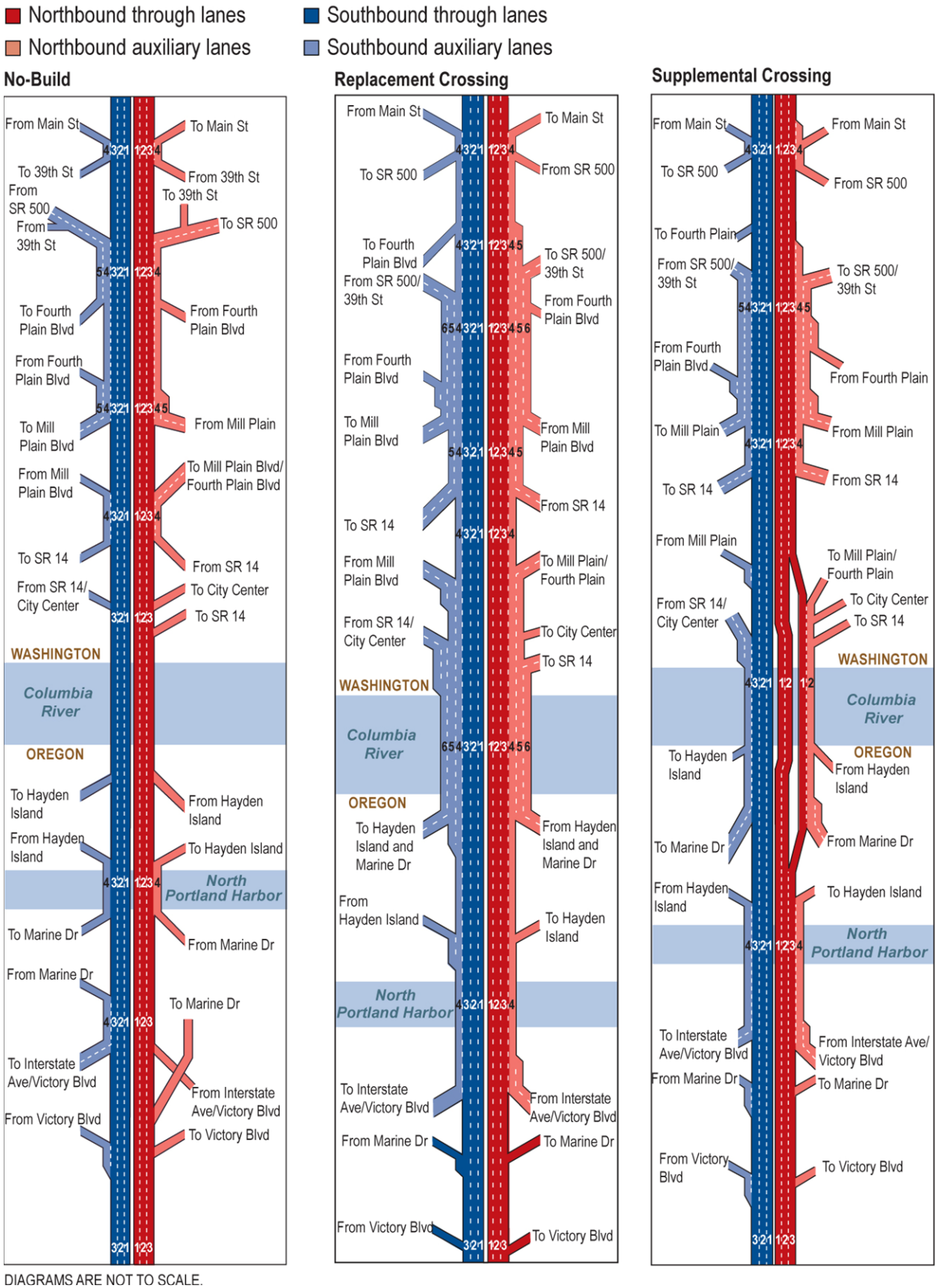
The Hayden Island interchange (Exhibit 2.3-6) would use ramps parallel to the mainline rather than looped ramps to minimize the east-west footprint of the highway. This would stretch the interchange footprint along the highway, narrowing its east-west footprint. A replacement crossing would provide auxiliary lanes connecting Hayden Island to Marine Drive and SR 14, allowing vehicles to travel between these points without merging into mainline interstate traffic. The replacement crossing would afford two to three auxiliary lanes in each direction, while a supplemental bridge would only provide one to two auxiliary lanes.

Local streets on Hayden Island near I-5 would be modified to connect with the redesigned I-5 interchange. Hayden Island Drive and Jantzen Drive would be widened to two lanes in each direction to connect with Jantzen Beach Center and provide circulation around the I-5 interchange. Tomahawk Island Drive would be extended to run underneath I-5 and provide a connection between the eastern half of the island and Jantzen Beach. The City of Portland is currently preparing a new land use plan for Hayden Island, which could revise local circulation and connections to the Hayden Island interchange.

With either river crossing, the SR 14 interchange (Exhibit 2.3-7) would be rebuilt to allow direct access (no stop signs or signals) between I-5 and SR 14 in all directions. Three interchange designs are being considered. A replacement river crossing could use ramps looping around both sides of the mainline to connect I-5 and SR 14, or utilize a left-turn loop on the eastern side of I-5 to connect I-5 northbound to SR 14 eastbound. With a supplemental crossing, the SR 14 interchange would be similar to the "dual-loop design," but would differ slightly because of the different grades of the southbound and northbound highway.

Exhibit 2.3-5

HIGHWAY & INTERCHANGE IMPROVEMENTS: Through/Auxiliary Lanes



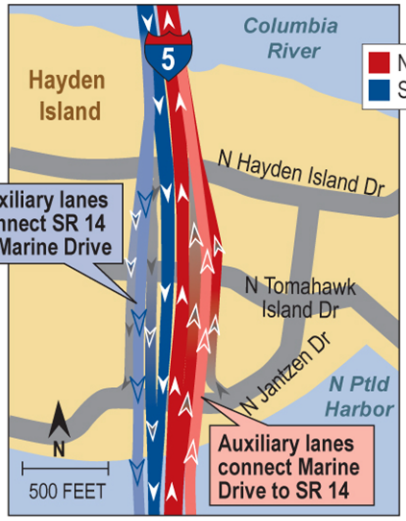
DIAGRAMS ARE NOT TO SCALE.

Exhibit 2.3-6

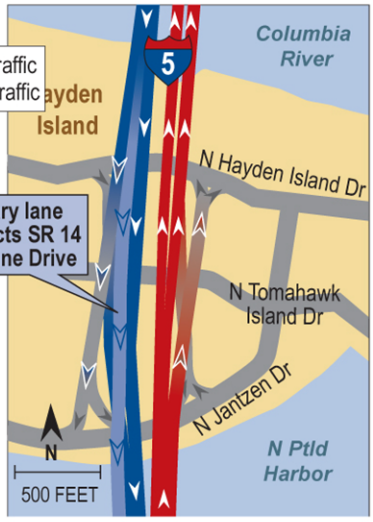
HIGHWAY & INTERCHANGE IMPROVEMENTS: Marine Drive and Hayden Island

Hayden Island Interchange

Replacement

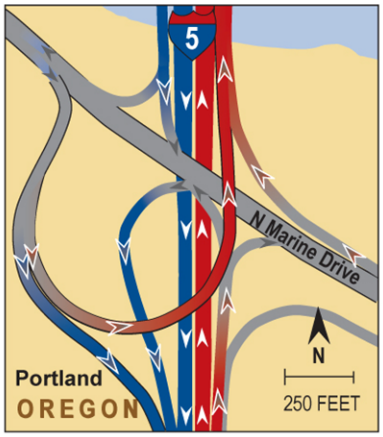


Supplemental

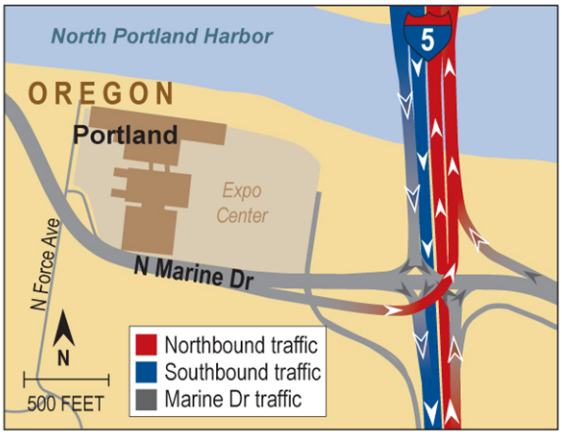


Marine Drive Interchange

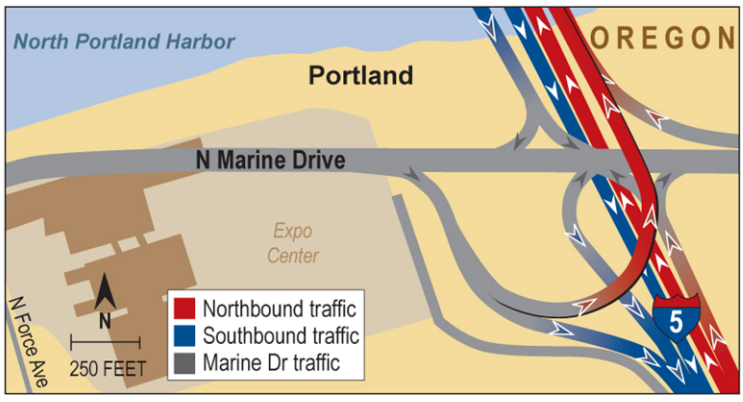
Standard



Southern Realignment



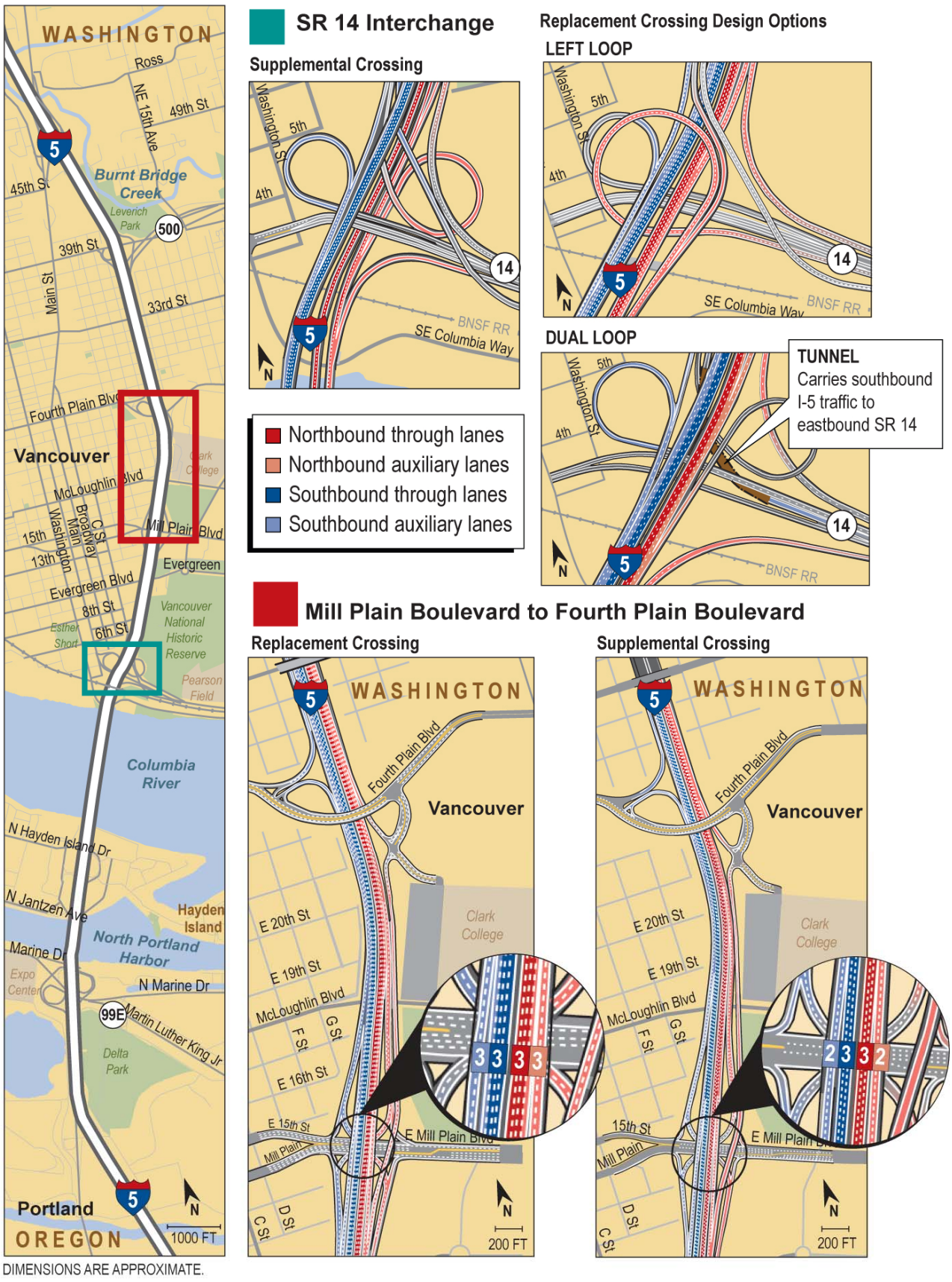
Diagonal Realignment



DIMENSIONS ARE APPROXIMATE.

Exhibit 2.3-7

HIGHWAY & INTERCHANGE IMPROVEMENTS: SR 14 to Fourth Plain



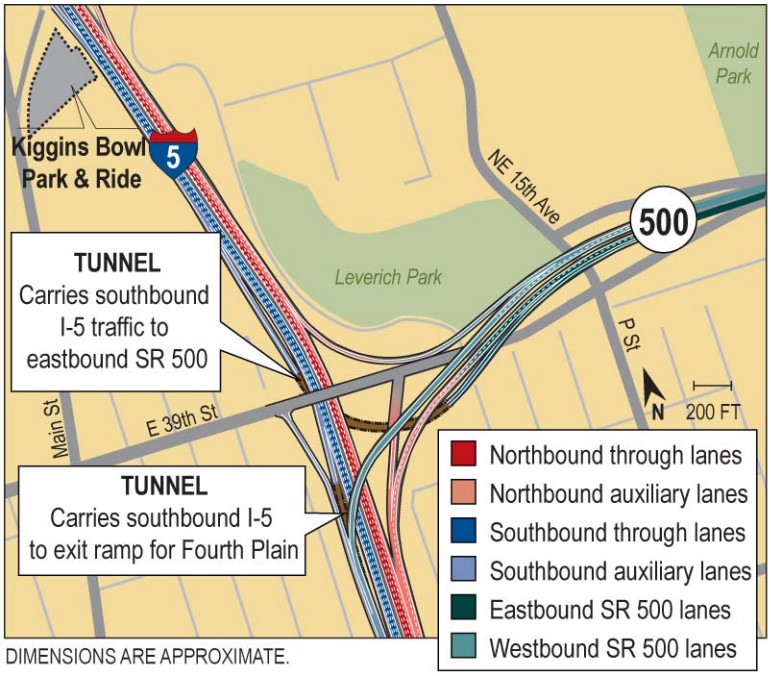
DIMENSIONS ARE APPROXIMATE.

The Mill Plain interchange would use on- and off-ramps running parallel to the mainline, similar to the design on Hayden Island. A replacement crossing would have two auxiliary lanes in each direction, rather than one with a supplemental crossing. Northbound traffic could exit to Mill Plain Boulevard, or could merge onto an elevated structure that would continue north, parallel to I-5, to connect with Fourth Plain Boulevard.

The Fourth Plain interchange design would be functionally the same for a replacement or a supplemental river crossing. Both crossings would include on- and off-ramps for traffic exiting or entering I-5 southbound. Northbound exits to Fourth Plain Boulevard would use the off-ramp at the Mill Plain Boulevard interchange. The Fourth Plain overpass would be rebuilt to accommodate the additional width of I-5. A new access road would connect the Clark College Park and Ride (Section 2.3) to the Fourth Plain interchange and allow northbound entrances onto I-5. The replacement river crossing would include two to three auxiliary lanes, while the supplemental river crossing would provide two auxiliary lanes through this intersection.

The SR 500 interchange would be rebuilt to provide free-flow movements in all directions between SR 500 and I-5 (Exhibit 2.3-8). The I-5 southbound to SR 500 connection would include a tunnel that runs under the I-5 mainline and other interchange ramps. Highway improvements would continue north to Kiggins Bowl where the new auxiliary lane(s) would merge with the existing three through lanes. Southbound I-5 traffic would not access 39th Street directly from this interchange, but could do so from the preceding Main Street off-ramp.

Exhibit 2.3-8
SR 500 Interchange



2.3.2 High-Capacity Transit Modes

The CRC alternatives include two high-capacity transit modes—bus rapid transit (Alternatives 2 and 4) or light rail (Alternatives 3 and 5). Bus rapid transit and light rail would both operate separately from other traffic in an exclusive right-of-way on city streets or on separate structures. Both transit modes are being evaluated for the same set of alignments, park and rides, and station locations. This section describes the general characteristics of each transit mode, as well as the transit improvements included in the No-Build Alternative. The upcoming decision to define a locally preferred alternative will select between bus rapid transit and light rail.

Bus Rapid Transit (Alternatives 2 and 4)

Bus rapid transit (BRT) would be comprised of three types of bus services: bus rapid transit service, express bus service, and local bus service. Bus rapid transit service, as well as existing and new express and local bus routes, would be able to use the exclusive transit guideway provided by this project where these services' routes coincide with the transit guideway.

Bus rapid transit service would include:

- An exclusive transit guideway from the Expo Center station over Hayden Island, across the Columbia River, and into Vancouver;
- Simplified, faster fare payment methods on the BRT lines (such as the use of off-board ticket vending machines);
- Passenger stations with increased amenities, similar in size and scale to existing light rail stations in Portland;
- 60-foot articulated vehicles (typical buses are 40 feet long) with special markings and paint colors for a "branded identity"; the DEIS analysis assumes the buses would be powered by diesel, although diesel/electric hybrids are also under consideration; and
- An expansion of the current C-TRAN bus maintenance facility in eastern Vancouver.

The Expo Center light rail station in Portland would be the southern end of the bus rapid transit service and would be expanded to accommodate passengers transferring between buses and light rail. Bus rapid transit service would provide a one-transfer ride from downtown Portland and other points on the existing MAX system, to stations in downtown Vancouver, the Salmon Creek Park and Ride, the Vancouver Mall, and Fisher's Landing Transit Centers.

Bus rapid transit service would consist of limited-stop versions of C-TRAN's three most popular routes and a fourth BRT route running solely within the exclusive guideway. Limited-stop versions of routes 4, 37, and 71 would travel along the same routes as their corresponding local service routes, but would operate with limited stops, located about one-half mile to one mile apart (Exhibit 2.3-9). Through downtown Vancouver and over Hayden Island, the bus rapid transit routes, as well as six local bus routes, would travel in an exclusive guideway to a new transfer center at the Expo Center light rail station.

Exhibit 2.3-9
Bus Rapid Transit Routes

DIMENSIONS ARE APPROXIMATE.

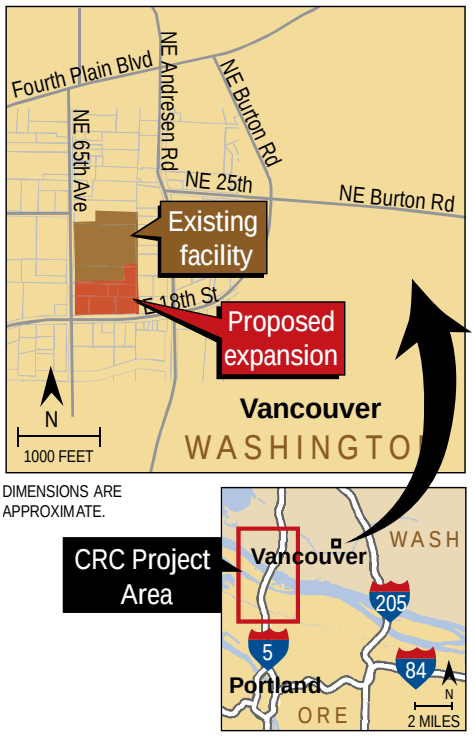
C-TRAN bus line numbers used in this document are based on the line numbers used during 2005 for consistency with other modeling details that use 2005 data to ensure accurate calibration data. C-TRAN has changed several bus line numbers since 2005.

Express bus service would provide direct, non-stop service from Clark County park and ride lots to downtown Portland. These express bus routes in the I-5 corridor would not use the exclusive transit guideway, but would travel in general purpose lanes southbound and would use the existing I-5 northbound high-occupancy vehicle lane from Going Street to Marine Drive.

Most local bus lines would operate on routes similar to their current ones, but would connect to BRT in downtown Vancouver at the Mill Plain and Seventh Street stations (see Section 2.3 for a description of these locations). Some local buses would use the exclusive guideway to gain travel time advantage in downtown Vancouver. Six local routes would be extended across the Columbia River in the exclusive guideway to connect to Hayden Island and the Expo Center light rail station.

Bus rapid transit would require expanding C-TRAN's existing bus maintenance facility on NE 65th Avenue in Vancouver to accommodate new, larger sized buses (Exhibit 2.3-10). This expansion would include additional office space, and new bays and maintenance facilities for both standard 40-foot buses as well as the larger, 60-foot BRT vehicles.

Exhibit 2.3-10
C-TRAN Bus Maintenance Base Expansion
Bus Rapid Transit



Light Rail (Alternatives 3 and 5)

This component would extend light rail service from the existing Expo Center light rail station in Portland over Hayden Island and through Vancouver. This would allow a no-transfer ride between points in Vancouver and downtown Portland. Light rail would serve the inner urban transit market (western Vancouver to downtown Portland) directly, and would serve suburban commuters through park and ride lots and transfers from local bus service.

Light rail vehicles would be similar to those currently used by TriMet's MAX system. Trains could operate in single- and double-car configurations. Exhibit 2.3-11 compares the transit vehicles being considered.

Exhibit 2.3-11
Transit Vehicle Characteristics

Vehicle Type		Length	Seats	Average Vehicle Passenger Capacity[a]
Local Bus		40 feet	43	61
Express Bus		40 feet	43	61
BRT		60 feet	47	91
LRT	Single Train	90 feet	64	133
	Two-Car Train	180 feet	128	266

[a] Average vehicle capacity is the total number of seats and floor area of the transit vehicle divided by 3 persons per square meter.

The suburban commuter transit market would also continue to be served by express bus service to downtown Portland from suburban Clark County park and rides. Express bus routes 105 and 157 would be replaced by light rail service and three new limited-stop bus routes. The 4, 37, and 71 limited-stop versions would travel on the same routes as

their corresponding local buses, but would operate with limited stops at least one-half mile apart and would terminate in downtown Vancouver to transfer to the light rail system. Express bus routes would operate on I-5 in general purpose lanes southbound and would use the existing northbound high-occupancy vehicle lane from Going Street to Marine Drive. Specific bus routing, and headways could vary from these descriptions, but the basic transit coverage and service concept would be similar.

Light rail would require power substations to provide power to the catenary system used to propel light rail vehicles. These substations could be located in public right of way, but may require property acquisitions and/or easements. Substations would be placed based on voltage load but are generally needed about every mile along the guideway but especially near steep grades such as bridges. One substation would be needed on Hayden Island, one in downtown Vancouver near the bridge, and another near, or in, the Mill Plain District. A fourth sub-station would be required for either the Lincoln terminus or Kiggins Bowl terminus near the northern end of either of these termini. Signal and communications buildings may also need to be sited off the public right-of-way. These buildings are placed near, or on, every station. Siting for sub-station and signal and communication buildings will occur during future design efforts if light rail is advanced for further evaluation.

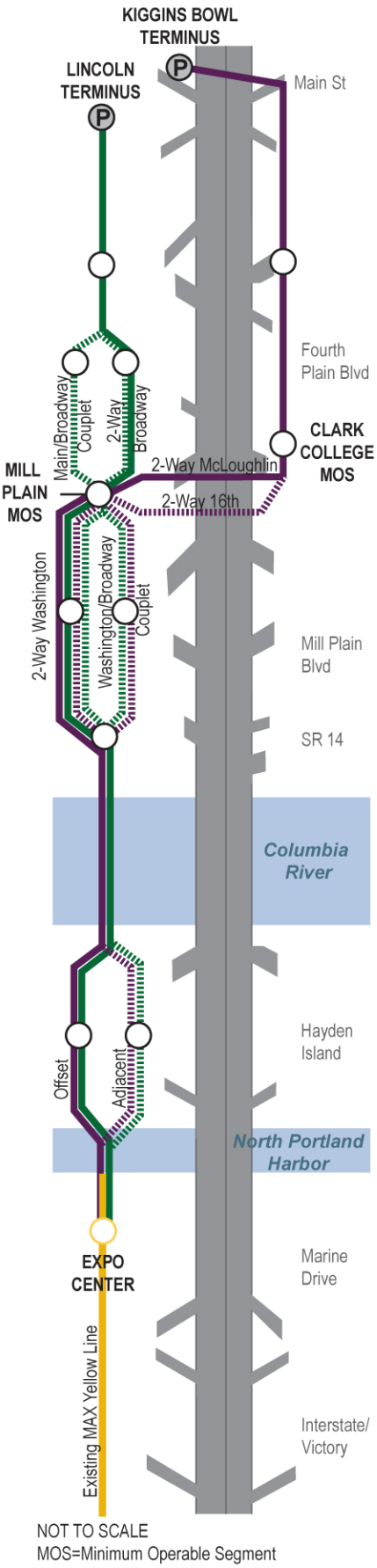
Light rail would also require expanding TriMet's existing Ruby Junction maintenance facility on NW Eleven Mile Avenue in Gresham to accommodate the additional light rail vehicles included for the light rail component of this project. This expansion would include the need to acquire additional right-of-way (see Exhibit 2.3-12), and to build new storage tracks as well as a new operations control facility. This expansion of right-of-way would also provide enough land to accommodate light rail vehicles that might be added to TriMet's system by other future projects, such as the possible Milwaukie light rail extension that is currently being studied, although additional storage tracks and other improvements to the land would be required.

Exhibit 2.3-12

Ruby Junction Maintenance Base Expansion

Light Rail Transit

Exhibit 2.3-13
Transit Terminus and Alignment Options



2.3.3 Transit Terminus and Alignment Options

Each of the CRC build alternatives includes four terminus options—Kiggins Bowl terminus, Lincoln terminus, Clark College minimum operable segment (MOS), and Mill Plain MOS (Exhibit 2.3-13). Each terminus option is inclusive of both the specific terminus or end of the transit guideway that it refers to, as well as the entire guideway and stations preceding this terminus through the project corridor. For example, the Kiggins Bowl terminus is the high-capacity transit guideway extending from the Expo Center to the Kiggins Bowl Park and Ride. Likewise, the Clark College MOS is the transit guideway extending from the Expo Center to the Clark College Park and Ride.

These terminus options are included in each alternative to provide the public and project co-lead agencies with a range of choices to consider and to provide possibility for extension in the future based on funding availability. The upcoming decision to select a locally preferred alternative is expected to select a transit terminus, but may maintain the option of an MOS pending additional design, refined cost estimates, land use impacts, park and ride access, and convenience to attract more transit riders, can identify the most cost effective transit guideway.

Exhibit 2.3-14 describes each of the four terminus options, including the unique elements such as park and rides and station locations that are part of each terminus option. The transit alignment options on Hayden Island, in downtown Vancouver and in northern Vancouver are described at the end of this section.

Exhibit 2.3-14
Station Locations and Guideway Length

	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College MOS (C)	Mill Plain MOS (D)
Guideway Length	4.22 miles	3.43 miles	2.65	2.07
Hayden Island Station	Adjacent or Offset from I-5	Adjacent or Offset from I-5	Adjacent or Offset from I-5	Adjacent or Offset from I-5
Downtown Vancouver Stations	7th Street 12 Street Mill Plain	7th Street 12 Street Mill Plain	7th Street 12 Street Mill Plain	7th Street 12 Street Mill Plain
North Vancouver Stations	Clark College 33rd Street Kiggins Bowl	24th Street 33rd Street Lincoln	Clark College	None
Park and Rides	Expo Center (existing) Clark College (structure) Kiggins Bowl (structure)	Expo Center (existing) Clark College (surface lot)[a] Lincoln (structure) Kiggins Bowl (surface lot)[a]	Expo Center (existing) Clark College (surface lot) Kiggins Bowl (surface lot)[a]	Expo Center (existing) SR-14 surface lots Clark College (surface lot) Lincoln (surface lot)[a] Kiggins Bowl (surface lot)[a]

[a] These park and rides are proposed at sites that would not be on the HCT guideway, but would be connected to the HCT guideway via local bus routes.

Kiggins Bowl Terminus

The Kiggins Bowl terminus would route high-capacity transit from the Expo Center, across Hayden Island, over the Columbia River, through downtown Vancouver, and east to cross under I-5 and connect to Clark College. It would then continue north adjacent to I-5 and end at a park and ride at Kiggins Bowl. The guideway would turn east at the Mill Plain station on either 16th Street or McLoughlin Boulevard, and cross under I-5 to the Clark College Park and Ride. The guideway would then continue north on the eastern edge of the current I-5 right-of-way, and end at a new Kiggins Bowl Park and Ride. The Clark College Park and Ride would be a three-level parking structure. The Kiggins Bowl Park and Ride would be a six-level parking structure.

Lincoln Terminus

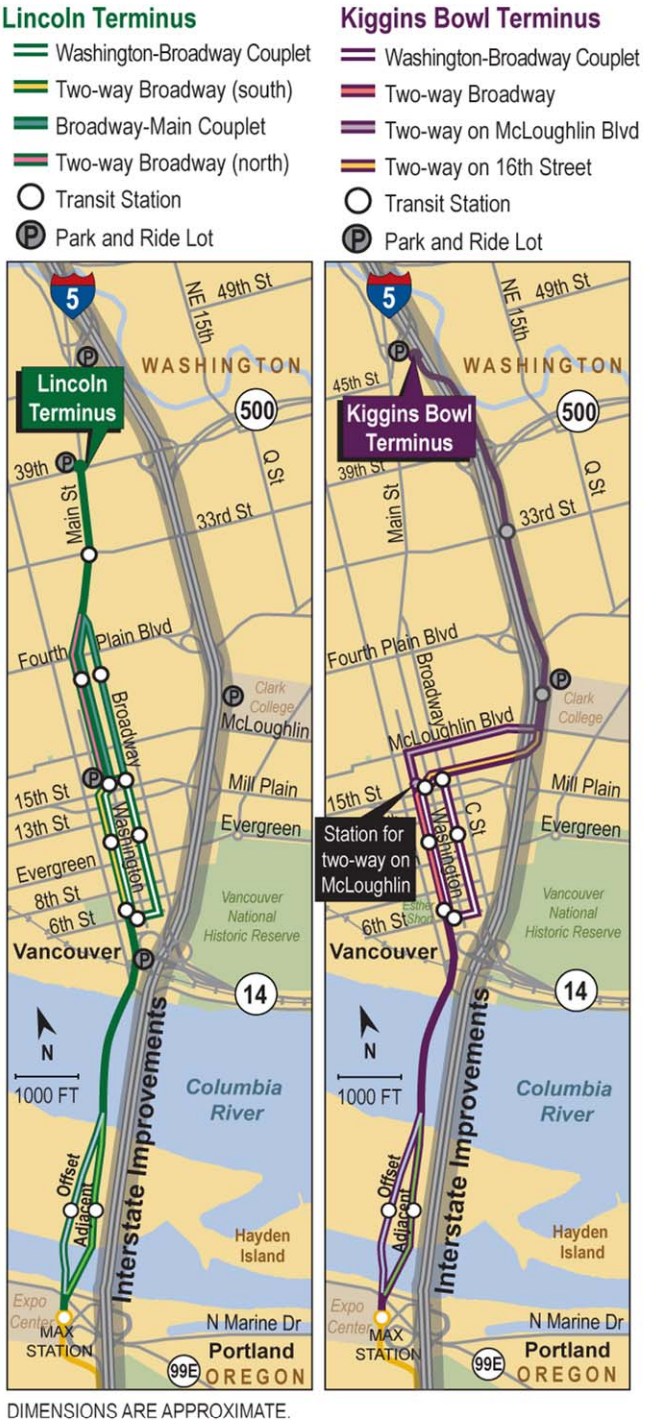
The Lincoln terminus would route high-capacity transit from the Expo Center, across Hayden Island, over the Columbia River, through downtown Vancouver, and continue north on local streets to the Lincoln Park and Ride north of 39th Street on Main Street. The guideway would extend north from the Mill Plain station using either Broadway for two-way travel or a couplet on Broadway and Main Street. Either of these alignment options would then merge to a two-way guideway on Main Street north of Fourth Plain Boulevard, and end at a new Lincoln Park and Ride north of 39th Street.

The Lincoln Park and Ride would contain up to two levels below ground and one level at grade or above ground. The footprint of this park and ride could be reduced by providing more spaces below grade or by reducing the total number of parking spaces.

To provide a wider range of access across Clark County, the Lincoln terminus would also include a surface parking lot at Clark College and another surface lot at Kiggins Bowl. Local bus routes would connect these lots to Lincoln Park and Ride or the Mill Plain station for transfer to the high-capacity transit line.

Exhibit 2.3-15

Transit Terminus and Alignment Options



DIMENSIONS ARE APPROXIMATE.

Clark College Minimum Operable Segment

The Clark College MOS ends the HCT guideway at the Clark College Park and Ride. This terminus option would provide flexibility for future extension, as part of another project, to either the Kiggins Bowl terminus or the Lincoln terminus.

Exhibit 2.3-16
Minimum Operable Segment (MOS) Options

DIMENSIONS ARE APPROXIMATE.

The Clark College MOS would include the same three-level parking structure at Clark College as the Kiggins Bowl terminus. Local buses could carry passengers from a surface lot at Kiggins Bowl to the Mill Plain transit station. The terminus station could be between the park and ride and the highway, as indicated in the graphics, or it could be parallel to McLoughlin, either in the middle or to the side of the street.

Mill Plain Minimum Operable Segment

The Mill Plain District MOS would end the transit guideway at the new Mill Plain station between 15th and 16th Streets and between Washington and Main Streets, and could serve as a shortened version of either the Kiggins Bowl terminus or the Lincoln terminus. Future projects could extend the transit guideway to either full-length terminus.

This terminus option would include a Park and Ride structure one block north of the Mill Plain Station, as well as additional Park and Ride surface lots around the SR 14 interchange. Additional Park and Rides at Clark College, Lincoln, and Kiggins Bowl would be connected to the HCT guideway by local bus routes.

Transit Alignment Options

This section describes, from south to north, the transit alignment options that are available for each of the four terminus options. Three segments, or geographic sub-areas, of the project area are defined by discrete sets of transit alignment options in each:

- Segment from Delta Park to downtown Vancouver,
- Segment from downtown Vancouver to the Mill Plain District, and
- Segment from the Mill Plain District through North Vancouver.

Any alignment option in one segment can be matched to any alignment option in another segment. The same terminus and alignment options, as well as station locations, are being evaluated for light rail and bus rapid transit.

DELTA PARK TO DOWNTOWN VANCOUVER

The transit guideway would start at the existing Expo Center MAX station. The light rail component would extend the existing tracks. Bus rapid transit would entail building bus bays and other modifications for a bus transfer center and a new bus-only guideway north from the Expo

Center. The transit guideway would rise to cross North Portland Harbor to an elevated station on Hayden Island, then cross the Columbia River into downtown Vancouver.

There are two alignment options for running the transit guideway across Hayden Island (Exhibit 2.3-17):

- Offset from I-5, or
- Adjacent to I-5

Either of these can be built with any of the project alternatives and any of the four terminus options. On Hayden Island, the offset option would locate the guideway approximately 450 feet west of I-5, immediately east of Jantzen Beach Mall. The adjacent option would locate transit immediately west of I-5. The offset transit guideway would be in the same location for either the replacement or supplemental crossing.

For the offset option, the Hayden Island station would be located just south of the Tomahawk Island Drive extension and oriented to the existing Jantzen Beach mall entrance. For the adjacent option, the Hayden Island station could be located on the north side of the island near North Hayden Island Drive, in the center, or on the south side at North Jantzen Avenue. Both alignment options would likely use an elevated structure, approximately 25 to 38 feet above grade, although the potential for placing part of the alignment at a similar height but on retained fill will be explored. The design and location of the transit station will be coordinated with the City of Portland's Hayden Island Master Plan, currently under development.

North of the station, transit would continue on an exclusive guideway across the Columbia River before touching down in Vancouver. With the replacement crossing, the transit bridge would touch down on Washington Street, between Fifth and Sixth Streets. A supplemental river crossing would keep the transit bridge elevated farther north, touching down at the intersection of Seventh and Washington Streets.

Exhibit 2.3-17
Hayden Island
Transit Alignment Options

DIMENSIONS ARE APPROXIMATE.

DOWNTOWN VANCOUVER TO MILL PLAIN DISTRICT

There are two alignment options for running high-capacity transit through downtown Vancouver. Either of these can be built with any of the project alternatives and any of the terminus options:

- Two-way transit on Washington Street, or
- Couplet transit on Broadway and Washington Streets.

Both options would have stations at Seventh Street, 12th Street, and Mill Plain station between 15th and 16th Streets and between Main and Washington Streets. Reconfiguring the streets as described below could entail adding or modifying bicycle facilities along these streets in addition to the transit guideway.

The two-way Washington Street option would place the north and southbound transit guideways in the center of Washington Street. Each station would have a single platform between the guideways, and transit would be separated from cars and trucks with a physical barrier such as a curb. This alignment option would allow two-way automobile traffic and, where feasible, on-street parking on blocks without stations. The

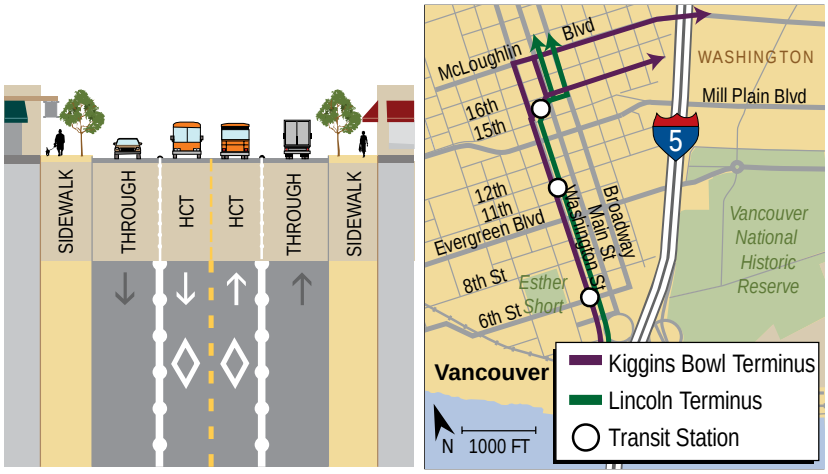
TERMS & DEFINITIONS

Couplet

A couplet is a method of routing two directions of travel on two adjacent, parallel streets, instead of placing both directions of travel on a single street. For example, the Washington-Broadway couplet alignment option would place northbound transit vehicles on Broadway, and southbound transit vehicles on Washington.

Mill Plain station would include space for local buses, providing connections between high-capacity transit and the local bus network.

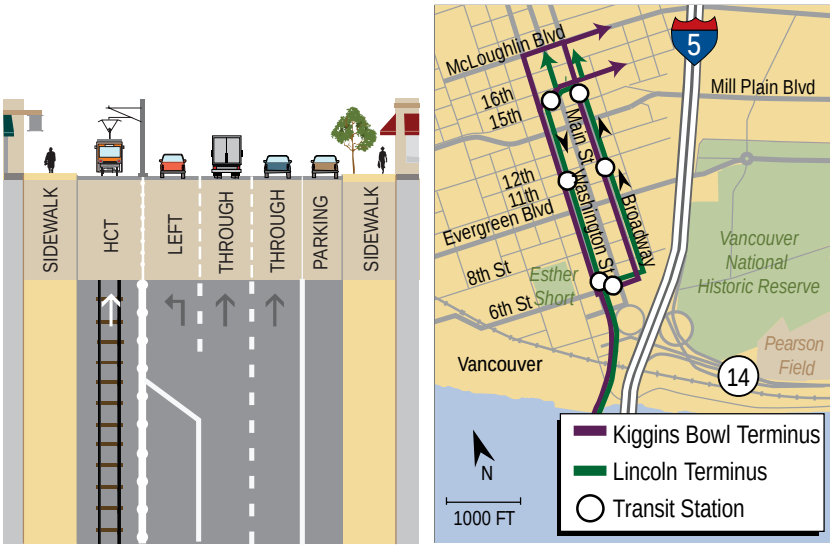
Exhibit 2.3-18
Downtown Vancouver, Two-Way on Washington Transit Alignment Option



CONCEPTUAL DESIGNS / DIMENSIONS ARE APPROXIMATE.

A couplet on Washington and Broadway Streets would route northbound travel on Broadway Street and southbound travel on Washington Street. A replacement river crossing would allow the transit guideway to connect to Broadway as far south as Sixth Street, although it could use Seventh, Eighth, or Ninth Street instead. A supplemental crossing would require the transit guideway to use Seventh, Eighth, or Ninth Street. Light rail would likely run on the left side of the street. Bus rapid transit would run on the right side of the street. One or two lanes of vehicular travel, and left-turn lanes would be next to the transit guideway. On-street parking would be located on blocks without stations.

Exhibit 2.3-19
Downtown Vancouver,
Washington-Broadway Couplet Transit Alignment Option



CONCEPTUAL DESIGNS / DIMENSIONS ARE APPROXIMATE.

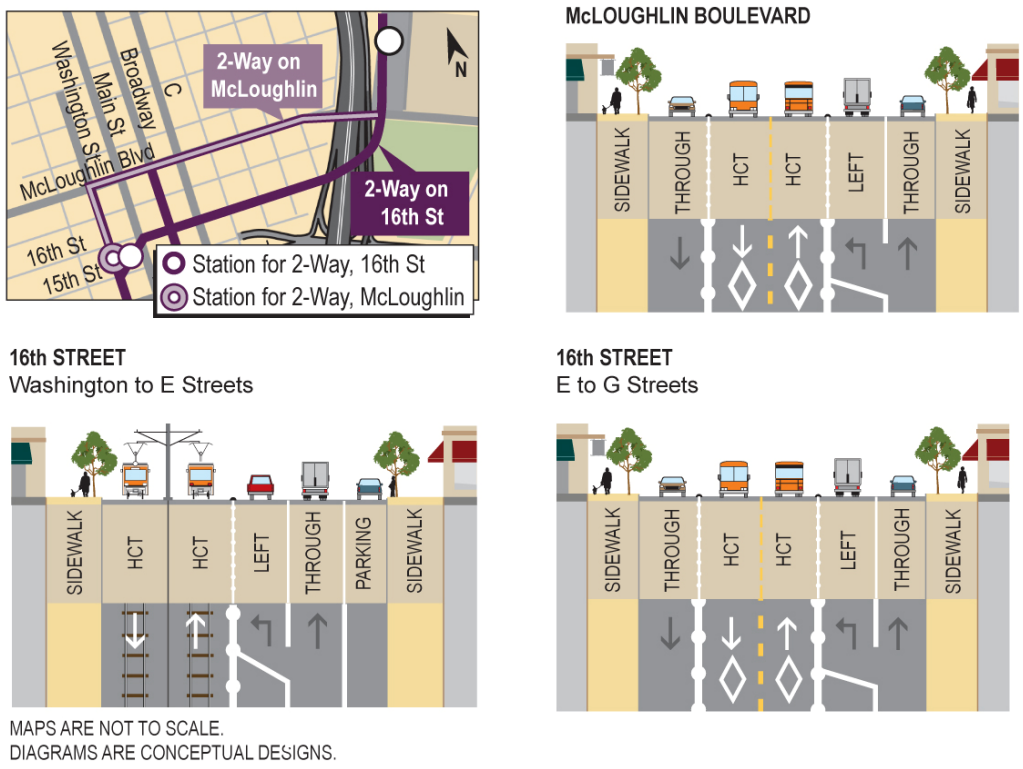
The Washington and Broadway couplet alignment option would use a slightly different route from the bridge to the beginning of the couplet, depending on whether the replacement or supplemental crossing is chosen. With the replacement crossing, northbound transit could turn east on Sixth, Seventh, or Ninth Street to connect with Broadway. The supplemental crossing would need to turn east at Ninth Street with light rail, but could use Seventh Street with bus rapid transit.

NORTHERN VANCOUVER

The Kiggins Bowl and Lincoln terminus options (Exhibits 2.3-20 and 2.3-21) diverge to use significantly different routes north of downtown Vancouver. Each has a pair of alignment options. The Clark College MOS shares the same alignment options as the Kiggins Bowl terminus. The Mill Plain MOS would end south of the northern Vancouver segment, and thus has no alignment options in this area.

Note that the street configurations described in this section are conceptual; other configurations may be explored during future engineering and evaluation.

Exhibit 2.3-20
Kiggins Bowl Terminus Transit Alignment Options, Two-Way On McLoughlin Blvd or Two-Way on 16th Street



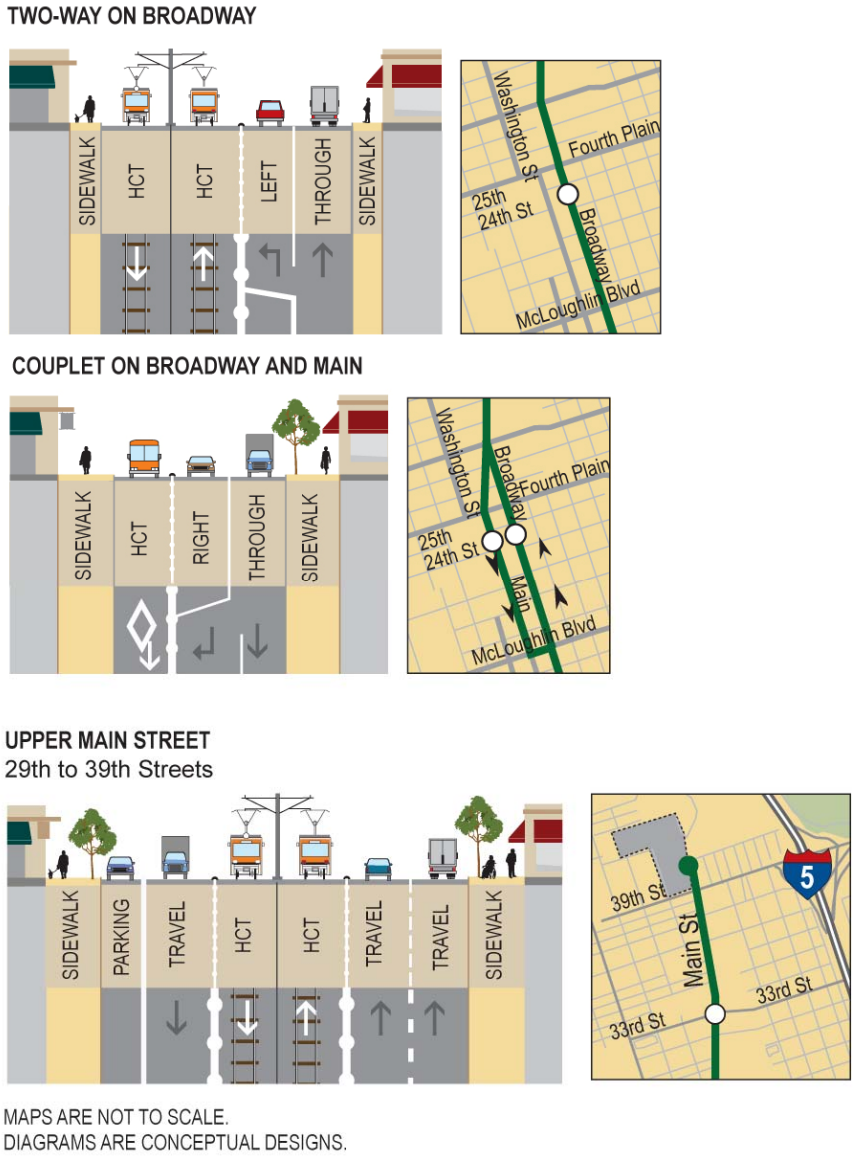
MAPS ARE NOT TO SCALE.
DIAGRAMS ARE CONCEPTUAL DESIGNS.

The Kiggins Bowl terminus (and Clark College MOS) has two alignment options for traveling east to cross under I-5 and connect with Clark College. High-capacity transit could travel on 16th Street through a new tunnel under I-5, or on McLoughlin Boulevard and through the existing underpass beneath I-5. The 16th Street alignment option would run on the south side of the street, with one lane for westbound traffic between Washington and E Streets and two lanes for two-way traffic between E and G Streets. The McLoughlin Boulevard alignment would expand the current, 80-foot wide right-of-way to approximately 94 feet to

accommodate a transit guideway in the middle of the road, one traffic lane on either side, and a left turn lane on some blocks.

The Lincoln terminus would continue north from the Mill Plain station, using either Broadway for two-way travel or a couplet on Broadway and Main Streets. Either of the alignment options would then merge to a two-way guideway on Main Street at approximately 29th Street and end at the Lincoln Park and Ride north of 39th Street. North of 29th Street, Main Street would be widened from the current 60 feet to 100 feet.

Exhibit 2.3-21
Lincoln Terminus Transit Alignment Options



2.3.4 Transit Operations

The CRC alternatives include two options for transit operations:

- Efficient transit operations (with Alternatives 2 and 3)
- Increased transit operations (with Alternatives 4 and 5)

These operation components differ in the assumed "headways," or frequency, of transit vehicles. Headways are expressed as the average number of minutes between vehicle arrivals. For example, a 2.5-minute headway means that there will be, on average, a train or bus stopping at a station every 2.5 minutes. Specific bus routing and headways could vary from the description below (and throughout this chapter), but the basic transit coverage and service levels would be similar.

Efficient operations assume longer headways, or more time between transit vehicles, than Increased operations. The Increased operations component was designed to test how boosting the capacity of the transit system could affect the number of people using transit and the number of cars using I-5, and local streets and the community. Increased operations have been evaluated with Alternatives 4 and 5, while Efficient operations have been evaluated with Alternatives 2 and 3; however, either transit operation level could be paired with either river crossing.

Increased operations would increase the frequency of most bus lines operated in Clark County, and would include six additional local bus routes in outer Vancouver and Clark County that would connect to the high-capacity transit guideway in the project area.

Exhibit 2.3-22 lists the headways for both transit operation options. These headways apply to light rail north of the Expo Center, and to bus rapid transit between the Expo Center and Mill Plain Boulevard, where all three of the bus rapid transit lines would run in the transit guideway. Because light rail trains can carry more people than buses, the trains could come less often and still provide comparable capacity to bus rapid transit.

Exhibit 2.3-22
Transit Vehicle Headways in the Guideway (Minutes)

	Efficient Operations (Alternatives 2 and 3)		Increased Operations (Alternatives 4 and 5)	
	BRT[a]	LRT	BRT[a]	LRT
Peak periods[b]	2.5	7.5	1.5	6
Off-peak period	15	15	15	15

Source: CRC Transit Technical Report.

[a] BRT headways include local buses using the guideway.

[b] Peak periods are between 6 a.m. and 10 a.m. on weekday mornings and between 3 p.m. and 7 p.m. on weekday evenings.

Exhibit 2.3-23
Number of New Transit Vehicles Required (Over No-Build Alternative)

	Efficient Operations		Increased Operations	
	BRT	**LRT**	**BRT**	**LRT**
New BRT buses	24	N/A	38	N/A
New LRT trains	N/A	14	N/A	18
New local buses	20	0	143	147

Source: CRC Transit Technical Report.

Bus rapid transit with Increased operations would also increase the frequency of the MAX Yellow line from the current 10 minutes to 7.5 minutes. Bus rapid transit with Efficient operations would not change Yellow line headways. The headways on the Yellow line would change to better align the frequencies of the light rail headways for either operations component in the table above.

2.3.5 Tolling

Tolling cars and trucks that use the I-5 river crossing is being considered as a method to help fund the CRC project and to encourage the use of alternative modes of transportation. The authority to toll the I-5 crossing is set by federal and state laws. Federal statutes permit a toll-free bridge on an interstate highway to be converted to a tolled facility following the reconstruction or replacement of the bridge, and the CRC project would fall within these conditions.[1] Prior to imposing tolls on I-5, Washington and Oregon departments of transportation (WSDOT and ODOT) would have to enter into a toll agreement with U.S. Department of Transportation. Recently passed state legislation in Washington permits WSDOT to toll I-5 provided that the tolling of the facility is first authorized by the Washington legislature.[2] Once authorized by the legislature, the Washington Transportation Commission has the authority to set the toll rates. In Oregon, the Oregon Transportation Commission has the authority to impose a toll on a facility and to set the toll rate.[3] It is anticipated that prior to tolling I-5, ODOT and WSDOT would enter into a bi-state tolling agreement to establish a cooperative process for imposing tolls, set toll rates, and guide the use of toll revenues.

Four tolling scenarios have been evaluated:

- No toll (part of the No-Build Alternative, and also modeled for Alternative 3 to help determine the traffic effects of tolling the I-5 crossing)
- Standard variable rate on the I-5 crossing (paired with Alternatives 2 and 3)
- Higher variable rate on the I-5 crossing (paired with Alternatives 4 and 5)

[1] 23 USC 129(a)(1)(C).

[2] HB 1773, 2008 Regular Session of the Washington Legislature.

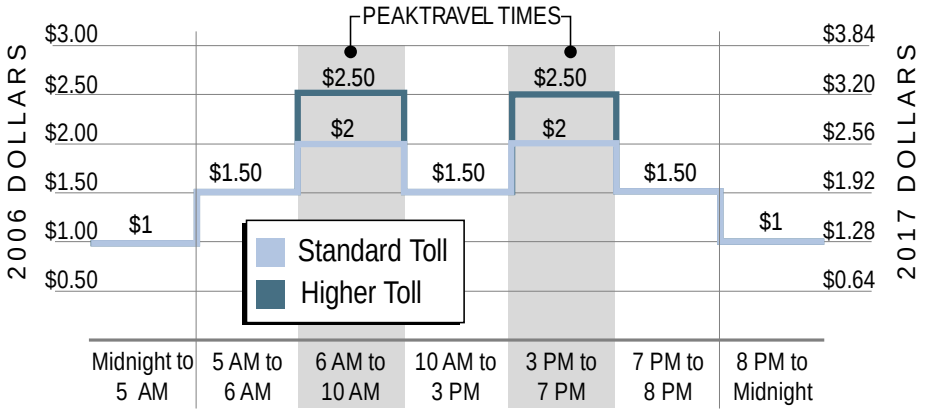
[3] ORS 383.

- Standard variable rate on both the I-5 and I-205 crossings (not paired with any build alternative, but evaluated separately to assess potential traffic diversions resulting from tolling the I-5 crossing).

Alternatives 2 and 3 have been evaluated with the "standard" variable rate structure, while Alternatives 4 and 5 have been evaluated with the "higher" variable rate structure (Exhibit 2.2-24). In addition, the project modeled the effect of two other tolling scenarios—no toll, and a toll on both I-5 and I-205—to determine how those scenarios would affect transportation, community and environmental impacts, and toll revenues. All tolling scenarios are assumed to be variable by time of day. Toll rates would be higher during peak travel periods and lower during off-peak periods. Medium and heavy trucks would be charged a higher toll than passenger vehicles.

Tolls would be collected using an electronic toll collection system, and toll collection booths would not be required. Instead, motorists could equip their cars with transponders that would automatically bill the vehicle owner each time they crossed the bridge, while cars without transponders would be tolled by a license-plate recognition system that would bill the address of the owner registered to that license plate.

Exhibit 2.3-24
Tolls for Passenger Cars (with Transponders)



2.3.6 Transportation System and Demand Management Measures

Early phases of alternative development for the CRC project evaluated a package of aggressive measures for increasing the efficiency of the regional transportation network and for reducing vehicular demand. However, without roadway and transit capacity improvements, these measures cannot meet the project's purpose and need, because they do not improve traffic safety, improve bicycle and pedestrian facilities on I-5, or reduce the vulnerability of the I-5 crossing to earthquake damage. However, all build alternatives evaluated in this DEIS include transportation system management (TSM) and transportation demand management (TDM) measures to help reduce congestion during the peak travel period, improve efficient use of the transportation network, and provide alternative transportation options to commuters.

Transportation system management measures attempt to improve the efficiency of existing roadways. These include a variety of techniques focused on keeping drivers informed and moving as safely, efficiently, and reliably as possible. The No-Build Alternative retains the existing regional approach to transportation system management. In addition to these existing measures, all build alternatives would include:

- Additional traveler information systems in the project area to alert motorists of temporary changes in highway conditions, such as a traffic accident or construction;
- Expanded incident response capabilities;
- Bypass lanes for transit vehicles and other designated vehicles at ramp signals at highway entrances; and
- Expanded traffic monitoring equipment and cameras.

Transportation demand management seeks to reduce the number of vehicles using the road system, especially single-occupant vehicles, while providing alternative options to auto travel. The progressive approach to demand management currently in place regionally already contains a mix of features that provide incentives to use alternative modes of transportation. Many of the proposed CRC features described in the previous sections would assist in regional travel demand management. These include:

- A high-capacity transit system with an exclusive right-of-way through the project area;
- An improved path for bicyclists and pedestrians over the Columbia River that complies with modern design standards; and
- A toll collection system for vehicles using the I-5 crossing.

2.4 Construction Methods and Duration

In order to understand the types of impacts that could occur during construction, the CRC team developed possible scenarios for construction methods and timelines. These scenarios represent typical methods to construct the various elements of each alternative, and are representative of the type and duration of impacts that could occur during the project construction. Since this project is still early in the design process, many refinements will be made to the construction approach as design progresses. Construction could begin as early as late 2010, but will depend on project financing and approval. Total construction duration for any of the build alternatives is expected to last up to 6 years.

The cities of Portland and Vancouver both have zoning codes that limit the off-site impacts of construction activity. Examples of prohibited off-site impacts include noise, vibration, glare, odor, stormwater, and particulate matter. Depending on the construction requirements, the CRC project may need to obtain variances for some or all of these local codes. The construction durations described below are likely not possible without some variances to these local ordinances.

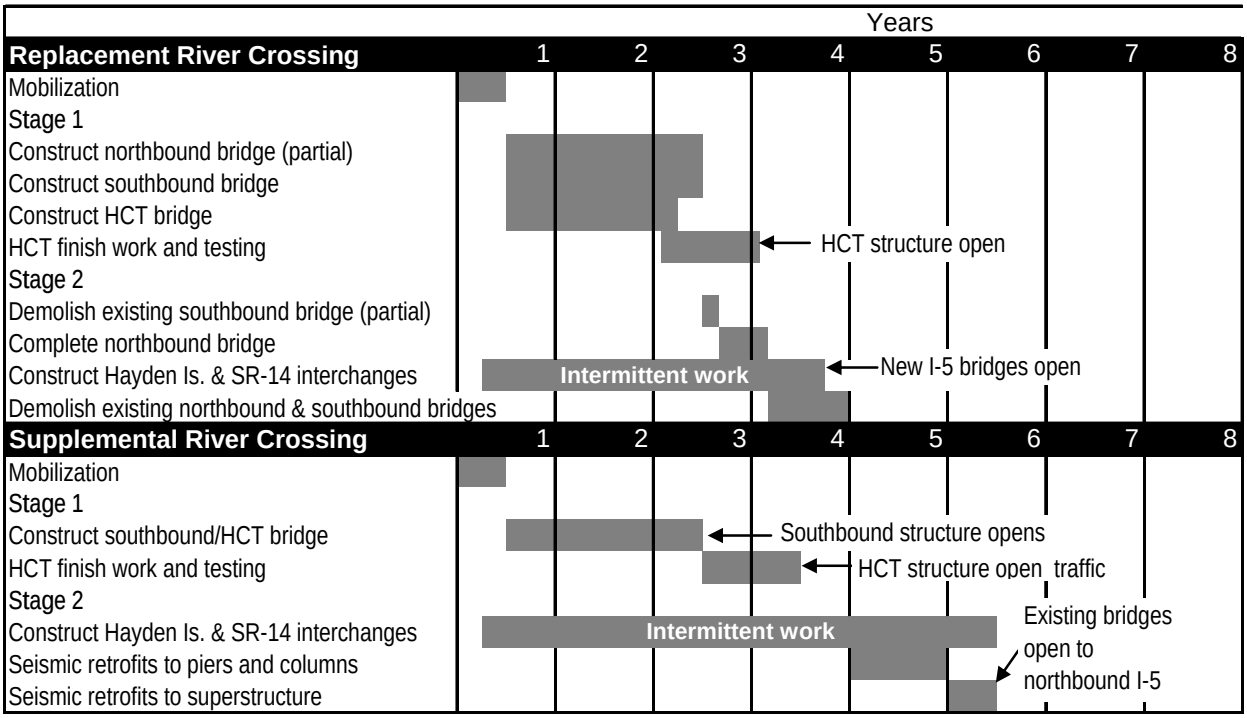
2.4.1 Bridge Construction

Building a new crossing over the Columbia River will require multiple phases of work over several years. The general sequence of constructing the bridges would likely entail the following steps:

- Initial preparation – mobilize construction materials, heavy equipment and crews; prepare staging areas.
- Installation of piles – drive and/or drill tubes into firm substrate or bedrock to support foundations and structures.
- Bridge piers – construct and anchor concrete foundations on the piles; construct or install pier columns onto these foundations.
- Bridge superstructure – build or install the horizontal structure of the bridge spans across the piers; the superstructure could be steel or reinforced concrete; concrete could be cast-in-place or pre-cast off-site and assembled on site.
- Bridge deck – construct the bridge deck on top of the superstructure.

Exhibit 2.4-1 shows the likely length of time required for each phase of the project, the stages that could overlap, their sequences, and the differing requirements for the replacement and supplemental river crossing options. As shown, for the replacement crossing, the high-capacity transit system could be operational within about three years, and the river crossing and adjacent interchanges would be completed within about four years.

Exhibit 2.4-1
River Crossing Construction Duration



For the supplemental crossing, transit could be operational within about three and a half years. The southbound highway crossing would be complete in about two and a half years, and the northbound crossing retrofits and all interchange construction would be finished in about five and a half years.

The durations shown in the chart above assume the bridge construction would use pre-cast concrete segments for the bridge deck rather than a cast-in-place technique. Pre-cast segments are sections of the superstructure and bridge deck that are built off-site in a large casting yard and later raised into place after the piers are built. This approach would require a large casting yard with access to the Columbia River. Pre-cast sections of the bridges would be transported, likely by barge, to the bridge site, where cranes would lift and install them. Another construction option is to cast the segments in place rather than off-site. This eliminates the need for a large casting yard, but requires more in-water construction and slightly more overall construction duration than indicated in the chart shown above. The stacked transit/highway bridge, described in Section 2.3.1, could differ from the durations listed in the graphic above.

All build alternatives being evaluated will require staging areas. However, since the bridge type (i.e. concrete segmental, steel beam, steel-concrete composite, etc.) is not known at this time, it is too early in the design process to know the exact size, type and location of the necessary staging areas.

What is a staging site?

Construction staging areas are areas to be used for the storage of materials and equipment, soil stockpiling, laydown areas, preassembly areas, casting areas, employee parking, etc. Typically, these areas are located as close as possible to the right-of-way.

Depending on anticipated construction methods, some of the desirable characteristics of the staging sites could include:

- A large (at least 15 acres) open site suitable for heavy machinery, material storage, and casting and storage of bridge segments;
- Waterfront property with access for barges to convey material to the construction zone; and
- Roadway or rail access for landside transportation of materials by truck or train.

The appropriate number, size, and location of staging areas will be determined after the bridge type study is done (within the next year). Selection of staging sites will involve coordination with local, state, and federal agencies, tribes, and public stakeholders to ensure that site selection balances construction requirements with environmental and community interests.

2.4.2 Highway Construction

Widening I-5 and rebuilding interchanges at Marine Drive, Hayden Island, SR 14, Mill Plain Boulevard, Fourth Plain Boulevard, and SR 500 will disrupt local and regional traffic flow. Typical construction methods could require narrowing lanes and shoulders to accommodate equipment and workers, shortening merge and exit distances, and closing some turning movements and interchanges. For example, during construction of a new SR 14 interchange, connections between downtown Vancouver and SR 14 would likely be rerouted to Columbia Way, and I-5 traffic would use the Mill Plain Boulevard interchange and local streets to access SR 14.

Construction will require staging areas to store construction material, load and unload trucks, and for other construction support activities. Multiple staging areas will be needed, given the linear nature of the CRC project and given that much of it could be under construction at the same time. The existing I-5 right-of-way will likely accommodate most of the common construction staging requirements. Interchange areas at Marine Drive, SR 14, Mill Plain, Fourth Plain and 39th Street have enough room for staging most typical earthwork, drainage, utility, and structure activities. However, some construction staging will likely be needed outside the existing right-of-way, requiring temporary easements from property owners.

2.4.3 Transit Construction

Construction methods and schedules for the transit guideway, stations and park and rides would depend upon the location, major alignment, and transit mode chosen. Even with these variables, the transit guideway on land could be completed prior to finishing the transit bridge, allowing the operation of the full system in approximately three years with the completion of the high-capacity transit bridge.

Light rail would require more construction than bus rapid transit. Utilities (water, sewer, stormwater, electrical, and communications) underneath the roadway would need to be relocated or protected before building the road surface and track to support the weight of a two-car train and allow future access without having to tear up the trackway. Additionally, light rail would require construction of overhead wires to provide electrical power to the trains.

Along all transit alignments, it may be necessary to seek temporary construction easements or small permanent easements on adjacent properties to allow construction workers to encroach on several feet of a property while rebuilding the sidewalk in front of the property or to place specific elements such as an overhead catenary pole behind the sidewalk.

The transit guideway would be on an elevated structure over North Portland Harbor, Hayden Island and the Columbia River. The guideway would touch down on Washington Street, where it would be constructed at grade on local streets through downtown. North of downtown, the Kiggins Bowl terminus and Clark College MOS would continue the guideway at grade, below grade (tunnel), and on an elevated structure. The Lincoln terminus would continue the guideway at grade on local streets to the Lincoln terminus.

For the Kiggins Bowl terminus, north of the Clark College Park and Ride the transit guideway would tunnel under the Fourth Plain interchange. This tunnel would likely be dug as a trench, removing the earth and replacing dirt and other cover after constructing the tunnel. North of Fourth Plain Boulevard, the transit guideway would be in existing I-5 right-of-way, allowing more freedom to construct it and less potential to obstruct traffic or disturb businesses and residents. An elevated structure would be built to carry high-capacity transit over the SR 500 interchange and across I-5 to the Kiggins Bowl Park and Ride. This terminus option would require additional highway construction on I-5 to shift the roadway alignment slightly west.

For the Lincoln terminus, construction on northern Vancouver streets would need to be sensitive to the area's active urban environment. Multiple small work zones could focus construction activity and reduce the duration of disturbances to adjacent businesses and residents. Streets would be open to traffic and pedestrians when possible, but would likely need to close during some construction activities (through pedestrian access would always be maintained except for momentary disruptions). The construction sequencing of the new MAX tracks being built in downtown Portland is a good example of how construction could occur in this area, although the bus rapid transit option would be less disruptive and would require slightly less time to construct.

Roadway construction would include restriping or rebuilding the road surface, rebuilding sidewalks in some sections, and constructing station platforms. Streetscape improvements could include removing, replacing, or adding vegetation, curb extensions, new signs and signals, and other measures to improve access to, and use of, the transit stations. Stations, park and rides, and new structures could require pile driving and earthwork for clearing and grading these sites.

The project may include joint development opportunities, such as working with a developer to build transit-oriented development on or near the alignment. No sites or specific plans have been developed, so no specific site impacts can be analyzed at this time.

Transit construction will also require staging areas. Exact locations have not been determined. Where possible, staging activities will take advantage of land that is already in the public right-of-way or in public ownership and that is not being used for other purposes, such as vacant lots. Sites will be significantly smaller than the anticipated construction staging areas for bridge construction. If any sites are used that are close to transit stations, joint developments may be considered to create transit-oriented development on the site after the construction use is completed.

2.5 Alternatives Considered But Not Advanced

This section describes the range of transportation improvements that were initially considered but eliminated during screening and subsequent evaluation due to significant engineering problems, environmental impacts, cost, or failure to meet the project's purpose and need. These transportation improvements include ideas such as a third corridor for crossing the Columbia River (in addition to the current I-5 and I-205 corridors), low-level bridges, tunnels, and multiple transit modes. The process followed to identify and screen alternatives to develop the range of alternatives that are being evaluated in this DEIS complied with US Department of Transportation (USDOT) guidance on linking planning and NEPA requirements.

The following discussion is a chronological description of the transportation improvements evaluated and dropped through the process of developing the range of alternatives evaluated in this DEIS.

2.5.1 Early Studies

Elements of the CRC project have been proposed and studied since the early 1990s, as described in Chapter 1. In 2002, the I-5 Transportation and Trade Partnership produced an evaluation of multiple highway, transit and river crossing improvements in this corridor and other parts of I-5. This process gathered public and stakeholder input on issues and potential solutions for transportation problems in the I-5 corridor. The Partnership then made recommendations for improvements and identified the CRC project as a regional priority in its Final Strategic Plan. This led to the initiation of the CRC Environmental Impact Assessment process. A "Notice of Intent" to prepare an environmental impact statement was issued in September 2005.

2.5.2 Evaluation Criteria and Initial Component Screening

Starting in October 2005, CRC project staff began working closely with the public, stakeholders, and local jurisdictions to develop the project's purpose and need (see Chapter 1). In October 2005, the CRC Task Force adopted a "Vision and Values" document that outlined broad goals and priorities, and served as a basis for developing evaluation criteria to measure and compare performance of different alternatives. Based on this document, the project team worked with local agency sponsors, the CRC Task Force, and state and federal permitting agencies to develop the Evaluation Framework, which outlined a process for generating and evaluating possible alternatives. The statement of purpose and need was finished and approved by FHWA, FTA, and the project's local sponsoring agencies in January 2006.

The project team began the process of developing alternatives by identifying possible transportation components (for example, transit technologies, and river crossing types and locations). Over 70 such components were identified in the 2002 I-5 Transportation and Trade Partnership Final Strategic Plan and through additional public and stakeholder outreach.

Project staff performed two rounds of evaluation and screening to narrow these options. Only transit and crossing components were screened. Other elements that have since been included in the alternatives evaluated in this DEIS, such as pedestrian, bike, and roadway improvements, were advanced without screening. The initial screening in April 2006 eliminated river crossing types and transit modes that did not meet the project's purpose and need[4], including:

- A replacement tunnel, which would fail to serve most of the current vehicle trips
- High-level bridges that would encroach on protected airspace for Pearson Airfield
- Transit Modes that do not effectively serve the specific needs of this region, such as high-speed rail, ferry service, monorail, magnetic levitation railway, commuter rail in freight rail corridor, and heavy rail

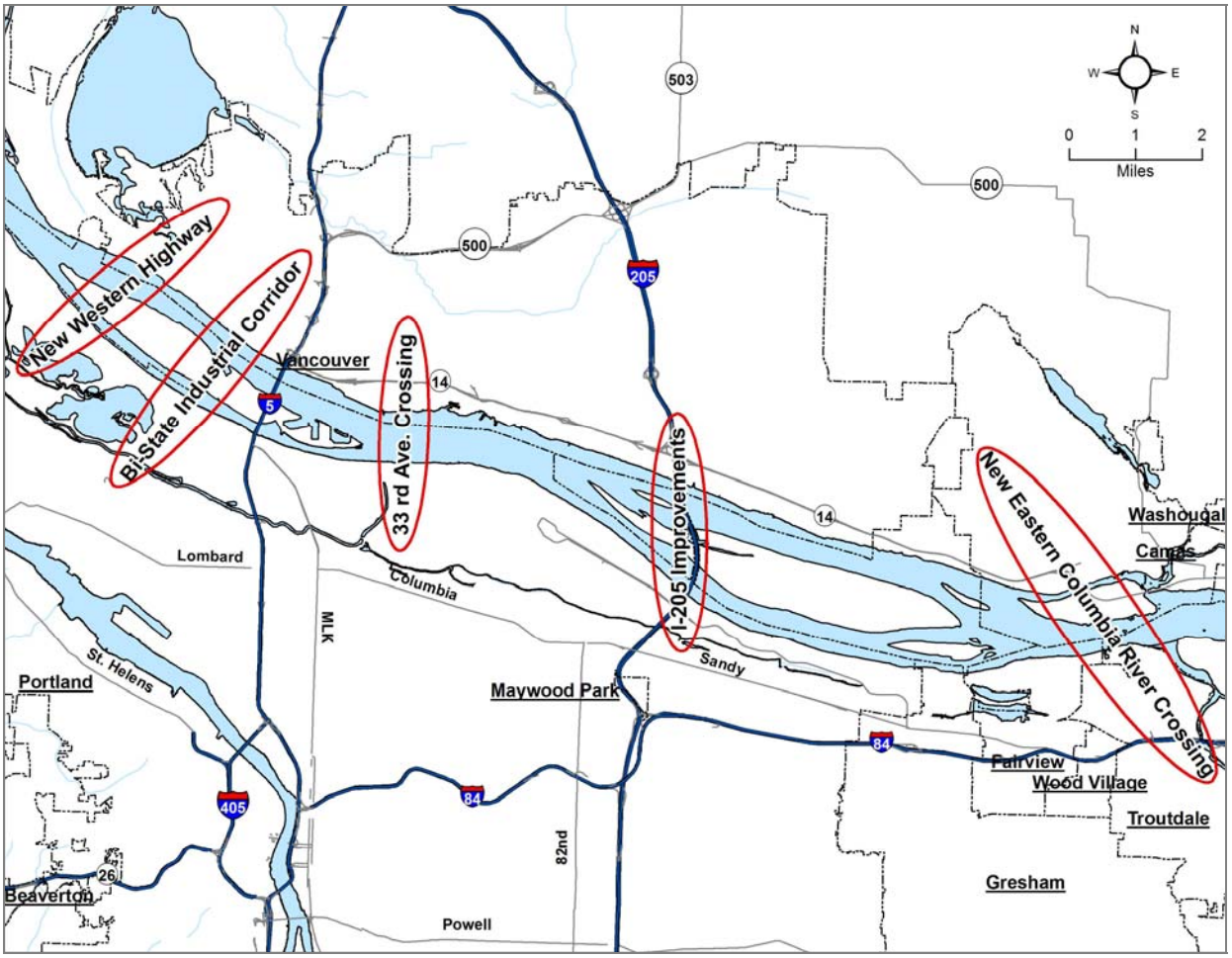
CRC Task Force

The 39-member CRC Task Force is composed of leaders representing a broad cross section of Washington and Oregon communities. Public agencies, businesses, civic organizations, neighborhoods, and freight, commuter, and environmental groups are represented on the Task Force. This group meets regularly to advise the CRC project team and provide guidance and recommendations at key decision points. The Public Involvement Appendix of this DEIS lists task force members.

[4] Step A Screening Report, CRC, 2006.

- A third corridor for crossing the Columbia River, which would fail to improve safety and mobility in the existing I-5 corridor

Exhibit 2.5-1
Alternative Corridors Evaluated During Initial Screening Process



As shown on Exhibit 2.5-1, five alternate corridors were evaluated during this screening process, located both west and east of the existing I-5 corridor. These alternate corridors included:

- A Western Highway crossing two to three miles west of I-5 that would connect suburban Clark and Multnomah counties
- A Bi-State Industrial Corridor crossing near the BNSF railroad bridge, one mile west of I-5
- A new crossing at 33rd Avenue in Portland, two to three miles east of I-5
- Improvements to I-205 only
- An Eastern Columbia River crossing 10 to 12 miles east of I-5 that would connect Camas/East Clark County to Troutdale

The initial screening process evaluated how well these corridors met the purpose and need of the project by improving congestion, transit performance, freight mobility, safety, bicycle and pedestrian mobility

within the I-5 corridor, and seismic stability of the Columbia River Crossing. While most of these alternatives could provide some degree of regional transportation benefit, they did little or nothing to address this project's purpose and need of improving traffic and transit mobility and safety problems in the I-5 corridor. Therefore, they failed to meet most or all of the elements of the project's purpose and need.

The Bi-State Industrial Corridor is the only alternative corridor that had the potential for improving I-5-related freight mobility, as it connects the industrial areas in Vancouver to those in Portland. Also, the initial traffic analysis indicated that this Industrial Corridor, as well as the Western Crossing, have potential for providing some congestion relief compared to 2030 No-Build conditions.

However, the potential highway transportation benefits of these two alternate corridors would be limited, and are outweighed by the fact that they, in addition to the three other alternate corridors, would fail to improve the stated needs related to transit performance and bicycle and pedestrian travel, and would do nothing to address the safety deficiencies and high crash rates in the I-5 CRC project area.

Appendix C provides a full list of the river crossing and transit components evaluated during the initial round of screening, and the specific reasons for dropping many of these components prior to creating the range of alternatives evaluated in this DEIS.

2.5.3 Further Narrowing of Components

A second round of screening in June 2006 evaluated the performance of the remaining 15 crossing and transit components in relation to criteria specified in the Evaluation Framework.[5] Components were scored on the following project values:

- Community livability and human resources
- Mobility, reliability, accessibility, congestion reduction, and efficiency
- Safety
- Regional economy, freight mobility
- Stewardship of natural resources
- Distribution of benefits and impacts

All of the components that entered this round were advanced for further evaluation. The screening did not highlight any clearly superior options or reveal any new fatal flaws that could not likely be mitigated with design refinements. However, further evaluations and additional information revealed important problems with a streetcar transit mode, low-level bridges, and with a supplemental tunnel river crossing option.

[5] Step B Screening Report, CRC, 2006.

Streetcar

Further analysis revealed that a streetcar option would not operate at sufficient speeds or provide enough capacity to effectively pass the test posed during first round of screening. The streetcar option had been initially passed on the assumption that it could operate on the existing MAX light rail guideway in Portland, thus providing no-transfer service between Vancouver and downtown Portland. Subsequent analysis indicated that joint light rail and streetcar operations would introduce a serious safety hazard. Streetcar vehicles are less crash-resistant than light rail vehicles, and would be severely damaged in a crash with a light rail vehicle. Furthermore, streetcars have one-third the capacity of a two-car light-rail train, but about the same operating cost.

Low-level Bridge

A new low-level bridge would have required a moveable span to allow passage of large ships, similar to the lift span on the existing I-5 bridges. Operation of a moveable span would disrupt traffic, cause more accidents on the bridges, have a greater impact on navigation, be more expensive to construct, and cost substantially more to maintain and operate. A low-level bridge was dropped from further consideration once project staff determined that a mid-level fixed-span bridge could safely avoid height restrictions imposed by Pearson Field and still provide clearance for river users.

Supplemental Tunnel

A tunnel to supplement the existing I-5 bridges was dropped, as it had marginal transportation benefits, considerably lower safety performance, very high capital cost, and higher community impacts. Nearly half of projected I-5 traffic would still have used the existing I-5 bridges, and so be subject to the same performance and safety problems—bridge lifts, substandard shoulders, and poor sight-distances.

2.5.4 Packaging the Most Promising Components

Early screening efforts identified several promising possibilities for further study. The best river crossing types appeared to be a replacement bridge or a supplemental arterial or highway bridge. Express bus, bus rapid transit, and light rail were the most promising transit modes for meeting the purpose and need of this project.

Project staff created 12 alternative packages by combining different river crossing types and transit modes, as well as specific designs to improve safety, freight movement, highway operations, and bicycle and pedestrian access. These 12 packages were a representative range of the possible combinations of river crossing and transit components that encompassed the range of impacts and transportation performance these components could produce.

Staff designed these packages to assess their performance on criteria from the Evaluation Framework, and to see how individual features performed in different combinations. This assessment focused on river crossing types and transit modes. Elements such as interchange configurations and transit alignments were used to model traffic and transit scenarios, but were not individually evaluated or screened.

Evaluation of these 12 alternative packages revealed that multimodal packages performed best. Alternatives that did not include a combination of both highway and transit improvements, such as just an aggressive TDM/TSM approach or a highway-only investment, were not recommended to be carried into the DEIS. A replacement bridge performed best on nearly all criteria, including traffic performance and impacts to the natural environment. Bus rapid transit and light rail provided the best transit performance, particularly when paired with express bus service. Based on these findings, staff recommended to the CRC Task Force that the DEIS evaluate the following alternatives: 1) No-Build, 2) replacement bridge with bus rapid transit and express bus, and 3) replacement bridge with light rail and express bus. The CRC Task Force recommended further developing these alternatives in preparation for evaluation in the DEIS and undertaking a substantial public involvement effort to gather public input.

In January 2007, the project team launched an intensive public involvement campaign to present the screening results and receive comments on the staff recommendation. Overall, the public and most agencies generally agreed with the recommendation, but some felt they did not include a wide enough range of options, particularly one that would reuse the existing I-5 bridges. Reusing the existing bridges appeared to warrant further evaluation primarily because of the possibility for reduced capital costs compared to replacing the existing bridges. This led the Task Force to explore how the existing I-5 bridges could be reused and still meet this project's purpose and need.

An additional alternative was therefore developed that uses the existing bridges for northbound I-5 traffic, bicycles, and pedestrians. With this alternative a new, supplemental bridge would carry high-capacity transit and southbound I-5 traffic. In March 2007 the CRC partners incorporated the Task Force recommendation into the DEIS range of alternatives. This produced the range of alternatives being evaluated in this DEIS:

- Alternative 1: No-Build
- Alternative 2: Replacement crossing with bus rapid transit
- Alternative 3: Replacement crossing with light rail
- Alternative 4: Supplemental crossing with bus rapid transit
- Alternative 5: Supplemental crossing with light rail

A more detailed description of the process of developing this range of alternatives is given in the Development of the Range of Alternatives memo prepared in June, 2007.[6]

[6] CRC, Development of the Range of Alternatives, 2007.

2.6 Refining Alternatives for Evaluation in the DEIS

This section describes how on-going evaluation of alternatives for the DEIS led to dropping certain options from further consideration.

2.6.1 Upstream Replacement Bridge

A replacement river crossing upstream (east) of the existing I-5 bridges was eliminated from further evaluation after analysis revealed that this alignment would pose serious construction difficulties and provide no substantial benefits to offset this problem. The downstream replacement crossing could be finished in approximately five years, with the transit bridge being completed and ready for operation in about three years. The upstream alignment would require approximately four years longer to construct than a downstream alignment because it would need to be built where the existing I-5 bridges are located and would thus require sequential construction and deconstruction of all structures. This would prolong impacts to aquatic species, disrupt river and roadway traffic, and substantially increase capital costs.

The upstream alignment would need to be very close to the existing I-5 alignment to avoid intrusion into the flight paths of aircraft using Pearson Field, while being high enough to afford enough clearance for river navigation. The replacement crossing evaluated in this DEIS crosses downstream (west) of the existing I-5 bridges, placing it farther from Pearson Field and allowing it to be offset farther from the existing I-5 crossing alignment. Placing the new bridges farther from the existing bridges would allow all three bridges (northbound I-5, southbound I-5, and high-capacity transit and bicycle/pedestrian bridge) to be constructed simultaneously. However, an upstream alignment would overlap the existing bridges, requiring each of the three new bridges to be built sequentially.

2.6.2 Transit Alignment Options

Project staff identified important problems with three transit alignments through downtown Vancouver that were under consideration:

- Two-way on Broadway south of McLoughlin Boulevard
- Washington Street/Main Street couplet
- Washington Street/Columbia Street couplet

Two-way Broadway: For either the replacement or supplemental crossing, the transit guideway would touch down in downtown Vancouver at Washington Street. Routing both directions of transit two blocks east to Broadway would require an east-west connection along Sixth and Seventh Streets. This would require acquiring several properties in downtown Vancouver, while other transit alignment options through downtown (e.g., a two-way Washington route or a Washington-Broadway couplet) avoid nearly all property acquisitions. Furthermore, the sharp turns required for routing transit from the touchdown point to Broadway would require several sharp turns that would be difficult for light rail. Ultimately, the two-way Broadway alignment was dropped because it lacks any unique benefits and would incur these additional impacts.

Washington Street/Main Street couplet: This alignment would have caused serious impacts to businesses and traffic connectivity through downtown Vancouver. Main Street is an important north-south arterial that the City of Vancouver plans to extend to the Columbia River. Running transit on this street would preclude this extension and reduce traffic capacity, effectively eliminating this street as an arterial through downtown. In addition, businesses on this street are especially reliant on on-street parking, which would have to be removed on one side of the street to accommodate transit.

Washington Street/Columbia Street couplet: This alignment would have seriously impacted traffic circulation through downtown Vancouver and removed on-street parking vital to retail businesses on Columbia Street. Columbia Street is designated a north-south arterial; running a transit guideway on this road would limit its ability to serve this function. This route would also have affected access to the St. James Catholic Church property, an important historic resource and one of the oldest buildings in downtown Vancouver.

2.6.3 Ross Park and Ride

Project staff initially considered building a 500-space park and ride at the intersection of Highway 99 and E Ross Road, in undeveloped right-of-way adjacent to I-5. Staff later found this site has important environmental constraints, and local zoning restrictions would only allow a small part of the property to be used for parking. These restrictions do not make this site a cost-effective park and ride location, despite its proximity to the endpoints of the proposed transit terminus options.

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