CHAPTER 2

2. DESCRIPTION OF ALTERNATIVES

Note to Reviewers: Graphics in this section are under development and will be updated in subsequent drafts.

2.1 Introduction

This chapter describes the Columbia River Crossing's (CRC's) locally preferred alternative (LPA), including the proposed design, operations, and how the project would be constructed (Exhibit 2.1-1). It also describes the No-Build Alternative and the other alternatives considered in the Draft Environmental Impact Statement (DEIS). Exhibit 2.1-2 illustrates the existing conditions in the project area. This chapter also summarizes the early studies that evaluated and screened alternatives prior to the DEIS, and the process used to adopt and refine the LPA after the DEIS. The LPA is a refined version of one of the DEIS alternatives (referred to as Alternative 3 in the DEIS). This chapter concludes by summarizing the key findings that support the selection of the LPA.

Insert sidebar: Terms and Definitions. Locally preferred alternative (LPA). The locally preferred alternative represents the alternative preferred by the local and regional agencies sponsoring the CRC project. The FTA and FHWA preferred alternative is the same as the LPA.

Exhibit 2.1-1
Project Area Map

INSERT NEW GRAPHIC

Exhibit 2.1-2
Current Project Area

INSERT NEW GRAPHIC

2.1 The Locally Preferred Alternative

The following are the primary transportation improvements included in the LPA; these are described in more detail in the following sections, in the order listed.

- ~~The new river crossing over the Columbia River and the I-5 highway improvements, including improvements to seven interchanges, north and south of the river, as well as related enhancements to the local street network.~~

~~Extension~The Interstate Bridge Replacement (IBR) program is a renewal of the previously suspended Columbia River Crossing (CRC) project. The program will replace the aging Interstate 5 (I-5) Bridge across the Columbia River with a modern, seismically resilient multimodal structure. The IBR program's Modified Locally Preferred Alternative (Modified LPA) is a modification of the Locally Preferred Alternative (LPA) that was selected for the CRC Project, which completed the NEPA process with a signed Record of Decision (ROD) in 2011 (CRC 2011b) and two re-evaluations that were completed in 2012 and 2013. The CRC Project was discontinued in 2014.

The Modified Locally Preferred Alternative (LPA) was developed through a collaborative process with the local and regional agencies sponsoring the IBR program.

The Modified LPA is a set of transportation components agreed upon by federal, tribal, state, regional, and local project partners. The proposed infrastructure improvements are located along a 5-mile stretch of the I-5 corridor in Portland, Oregon, and Vancouver, Washington, as shown in Figure 2-1 and Figure 2-2, respectively.

Sections 2.2 and 2.3 of this chapter describe specific components of the IBR program's Modified LPA and how they would be constructed. Section 2.4 describes the No-Build Alternative, which will serve as a baseline for evaluating environmental impacts. Section 2.1 a discusses how design options for the Modified LPA were developed and evaluated, and Section 2.6 addresses additional regulatory compliance that is underway for the Modified LPA.

Figure 2-1. Overview of the IBR Modified LPA in Oregon

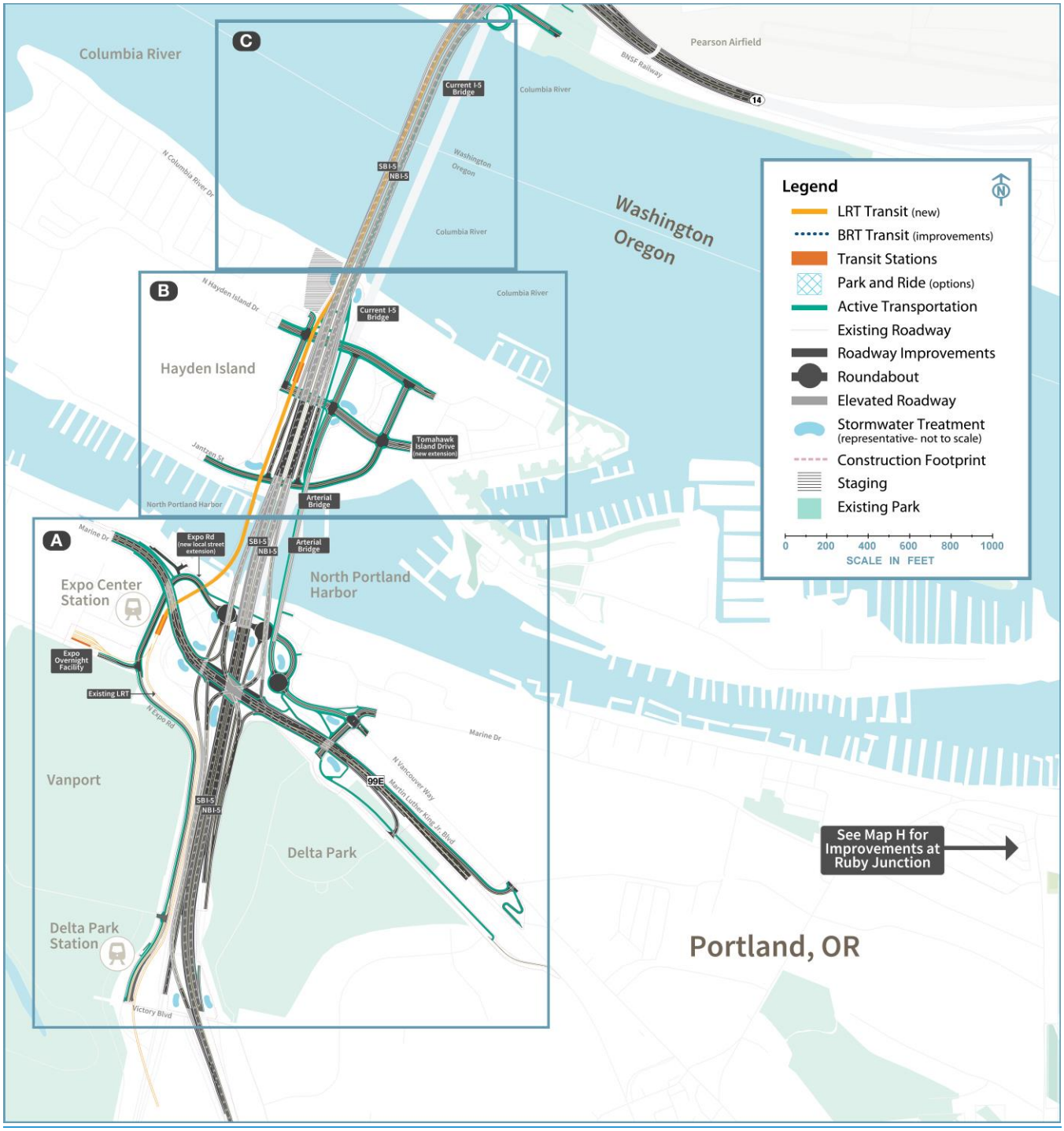
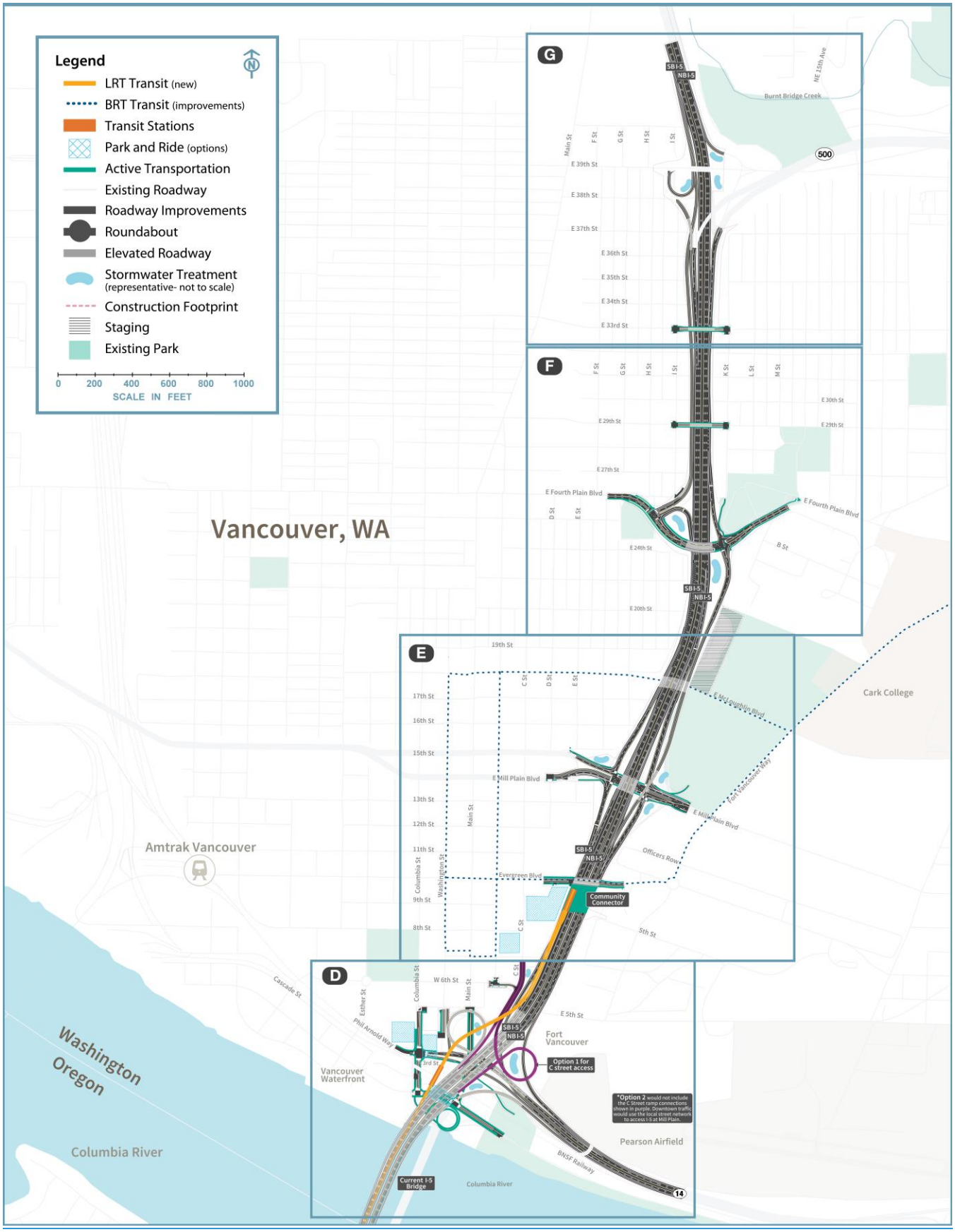


Figure 2-2. Overview of the IBR Modified LPA in Washington



2.2 Components of the Modified LPA

The components of the Modified LPA include:

- A new Interstate Bridge built west of the existing bridge. The new bridge would include safety shoulders and options for one or two auxiliary lanes in each direction.
- A 1.9-mile extension of light rail transit (LRT) from the current Metropolitan Area Express (MAX) Yellow Line light rail from the Expo Center ~~in Portland to Clark College in~~ station in North Portland, where it currently ends, to Evergreen Boulevard in Vancouver. Improvements would include new stations at Hayden Island, downtown Vancouver, and ~~associated transit~~Evergreen Boulevard.
- Associated LRT improvements~~, including transit stations,~~ such as park and rides, ~~bus route changes, and expansion of a light rail transit~~ an overnight light rail vehicle (LRV) facility at the Expo Center, and an expanded operations and maintenance facility at Ruby Junction.
  - ~~Bicycle and pedestrian improvements throughout the project corridor.~~
  - ~~A toll on motorists using the river crossing.~~
  - ~~Transportation demand and system management measures to be implemented with the project.~~

~~The LPA includes two design options and a construction phasing option. The two design options, referred to as LPA Option A and LPA Option B, are the result of substantial public input and additional analysis and design work around the Hayden Island and Marine Drive interchanges (see Section 2.7.9). The preferred option, which is described in this FEIS as LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on a local multimodal bridge. LPA Option B does not have traffic lanes on the light rail bridge, but instead provides direct auto access between Marine Drive and the island with collector-distributor (CD) lanes on the two new bridges that would be built adjacent to I-5. Exhibit 2.2-1 illustrates the two options.~~

~~In addition to the two design options, this FEIS also evaluates the potential for phasing construction, that is, building part of the project in an initial phase and constructing the remaining elements of the project at a later date. It has become increasingly evident that there may not be adequate funding to construct all elements of the LPA in a single phase and it is common for large projects to be built in phases. Possible phasing options for the CRC project are numerous, and the actual phasing cannot be known until the precise timing and availability of funding are finalized, which will occur sometime after the Record of Decision (ROD). However, the project team, working with stakeholder groups, identified several highway elements of the LPA that could be reasonably postponed to reduce initial construction costs. This Final Environmental Impact Statement (FEIS) identifies these potentially phased elements, and refers to that possible initial investment as the "LPA with highway phasing." The LPA with highway phasing option would build most of the LPA in the first phase, but would defer construction of specific elements of the project, including:~~

- ~~Construction of the I-5 braided on- and off-ramps at Victory Boulevard.~~
- ~~Construction of the Marine Drive interchange flyover.~~
- ~~Construction of the northern half of the I-5/SR 500 interchange.~~

~~Exhibit 2.2-1 illustrates which elements of the LPA are evaluated for potential phased construction. The phasing scenario evaluated in this FEIS is a reasonable expectation of what could be constructed in the first phase if full funding is not available. Reasonable phasing options are not likely to result in any new significant adverse impacts beyond those described in this FEIS. The primary result of construction phasing would be to delay some of the benefits that the full LPA would provide.~~

Insert sidebar: For some impacts identified in this FEIS, there is no meaningful difference between the design options (LPA Option A and LPA Option B) or the construction phasing option. In these cases, the terms "LPA" or "the project" are used when impacts or mitigation would the same for any of the design options or the construction phasing option. When impacts differ among options, it has been noted.

Exhibit 2.2-1

LPA Potential Phased Highway Construction Options

INSERT NEW GRAPHIC

2.1.1 Multimodal River Crossing and Highway Improvements

River Crossing Structures

The LPA includes construction of new bridges across the main channel of the Columbia River and new structures across North Portland Harbor, along with improvements to the existing I-5 bridges across North Portland Harbor. These improvements are described in detail below.

Columbia river bridges

The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges. The eastern structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path underneath; the western structure would carry southbound traffic on the bridge deck, with a two-way light rail guideway below. Whereas the existing bridges have only three lanes each, with virtually no shoulders, each of the new bridges would be wide enough to accommodate three through lanes and two add/drop lanes (Exhibit 2.2-2). Lanes and shoulders would be built to full Washington State Department of Transportation (WSDOT) and Oregon Department of Transportation (ODOT) design standards (i.e., no reduced width lanes or shoulders will be constructed). See the discussion of Highway and Interchange Improvements for additional description of the add/drop lanes.

Insert sidebar: Terms and Definitions. Auxiliary (add/drop) lanes. Auxiliary (or add/drop) lanes connect two or more highway interchanges. These lanes improve safety and reduce congestion by providing space for cars and trucks entering the highway to speed up before merging into traffic and to slow down after diverging out of traffic. 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.

Exhibit 2.2-2

LPA Columbia River Crossing Cross-section

INSERT GRAPHIC: LPA RIVER CROSSING CROSS-SECTION

The southbound (western) bridge would accommodate a two-way guideway for light rail vehicles (LRVs) beneath the highway deck. Similarly, the northbound (eastern) bridge would accommodate a bicycle and pedestrian path approximately 16 to 20 feet wide below the highway deck, located within the support structure under the highway deck. The width of the path will depend on the width of the support structure itself. The proposed bridge type of the two new main river crossing bridges is a composite deck truss design in which the "walls" are constructed of diagonal steel members (Exhibit 2.2-3). This allows for a partially open-sided, covered passage for bicyclists and pedestrians beneath the eastern bridge deck and for light rail transit beneath the western bridge deck. This bridge type would allow for natural light and ventilation as well as views to the east from the bicycle and pedestrian path and views to the west from the light rail trains.

Exhibit 2.2-3

Composite Deck Truss Bridge Type

INSERT GRAPHIC: COMPOSITE DECK TRUSS

The height of the new bridges was established to give adequate clearance for river traffic below and for air traffic above. The top of deck of the new bridge would range in elevation from approximately 100 to 140 feet over the Columbia River. The new bridges would be high enough to provide approximately 95 feet of vertical clearance for river traffic beneath, but not so high as to impede take-offs and landings by aircraft using Pearson Field and Portland International Airport (PDX) to the east. Unlike the existing bridge over the Columbia River, the new structures would not include lift spans.

Exhibit 2.2-4

Pier Locations, Sizes, and Spacing

INSERT GRAPHIC: PIER LOCATIONS, SIZES, SPACING

The existing bridges over the Columbia River have nine pier sets. Each of the new bridges would be built on six pairs of in-water piers plus two pairs of piers on land (Exhibit 2.2-4). Each of these pier sets would be supported by a foundation of approximately sixteen 10-foot-diameter drilled shafts. Each group of shafts would be tied together with a concrete cap measuring approximately 75 feet by 75 feet at the water line. Slender columns would rise from the shaft caps and connect to the superstructure of the bridges. See Exhibit 2.2-5 for an illustration of these bridge structure elements. During final design, project staff will further explore the potential for reducing the diameter of the Columbia River bridges' in-water piers.

The improvements to the Columbia River bridges would not differ between LPA Option A and Option B.

Insert Sidebar: Terms and Definitions. Drilled shafts. Drilled shafts are a type of deep foundation used to support structures such as bridges. Drilled shafts are installed by boring deep holes that are then filled with a reinforcing cage made of rebar and concrete. Drilled shafts differ from driven piles, which are forced into the substrate using a large hammer called a pile driver.

Exhibit 2.2-5

Bridge Structure Elements

INSERT GRAPHIC: BRIDGE STRUCTURE ELEMENTS

North Portland Harbor bridges

The existing highway structures over North Portland Harbor would not be replaced; instead, they would be retained and would accommodate all mainline I-5 traffic (Exhibit 2.2-6). As discussed at the beginning of this chapter, the Hayden Island and Marine Drive interchanges have been further evaluated based on public involvement and input. From this process two design options have emerged. The preferred option, which is described in this chapter as LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on a local multimodal bridge. LPA Option B does not have traffic lanes on the light rail bridge, but instead provides direct auto access between Marine Drive and the island with collector-distributor lanes on the two new bridges that would be built adjacent to I-5.

LPA Option A: Four new, narrower parallel structures would be built across the waterway, three on the west side and one on the east side of the existing North Portland Harbor bridge (see inset in Exhibit 2.2-6). Option A would not widen or seismically upgrade the existing North Portland Harbor bridge.

Three of the new structures would carry on- and off-ramps to mainline I-5. Two structures west of the existing bridge would carry traffic merging onto I-5 southbound from Hayden Island or exiting off of I-5 southbound to

Marine Drive. The new structure on the east side of I-5 would serve as an on-ramp for traffic merging onto I-5 northbound from Marine Drive and Martin Luther King Jr. Boulevard and would carry the multi-use path underneath the bridge deck.

The fourth new structure would be built slightly farther west and would include a two-lane local multimodal bridge for local traffic to and from Hayden Island, light rail transit, and would include bicycle lanes and sidewalks. The length of each new structure would be between 800 and 1,000 feet, depending on its location and the angle relative to the channel. Spans would vary by bridge, and the existing navigation channel would be preserved. All of the new structures would have at least as much vertical clearance over the river as the existing North Portland Harbor bridges.

LPA Option B: This option would build the same number of structures over North Portland Harbor as Option A, although the locations of certain functions on those bridges would differ. With Option B, the existing bridge over North Portland Harbor would be widened and would receive seismic upgrades.

LPA Option B would not have traffic lanes on the light rail/multi-use path bridge. Direct access between Marine Drive and the island would be provided with collector-distributor lanes. The two structures adjacent to the highway bridge would carry traffic merging onto or exiting off of mainline I-5 between the Marine Drive and Hayden Island interchanges. The new structure on the west side of I-5 would serve as a collector-distributor road for southbound traffic. Similarly, the new structure on the east side of I-5 would serve as a CD road for northbound traffic. The multi-use path would be located on the westernmost bridge structure that carries the light rail guideway.

Exhibit 2.2-6

North Portland Harbor Bridge Improvements

INSERT GRAPHIC: NORTH PORTLAND HARBOR BRIDGE IMPROVEMENTS – PLAN DRAWING AND CROSS SECTION

Highway, Interchange, and Local Street Improvements

- The LPA includes improvements to seven interchanges along a 5-mile segment of I-5 between N Victory Boulevard in Portland and SR 500 in Vancouver. These improvements result in some reconfiguration ofSome adjacent local streets would be reconfigured to complement the new interchange designs, and include new street extensions, added travel lanes, and new and extended turn pockets at key intersections. The new facilities increase accessibility and mobility for vehicular, bicyclist and pedestrian travel. The bicycle and pedestrian improvements are described in Section 2.2.3.

In addition to interchange improvements, a series of auxiliary (add/drop) lanes would be sequentially added and then dropped at strategic locations through the corridor (see Exhibit 2.2-7). The add/drop lanes would allow vehicles to travel between given points without merging into mainline interstate traffic, and would allow vehicles exiting or entering to minimize conflicts with through traffic. From the south end of the project area, I-5 northbound would have one added auxiliary lane starting where the Victory Boulevard/Denver Avenue on-ramp enters I-5. Another auxiliary lane would be added where the Marine Drive on-ramp enters I-5. One of these lanes would be dropped at the Mill Plain Boulevard/Fourth Plain Boulevard off-ramp. An auxiliary lane would be added where the Mill Plain on-ramp enters I-5. One auxiliary lane would be dropped at the SR 500 interchange and the second would be dropped north of the Main Street off-ramp. Lanes would be added or dropped as the various on-ramps and off-ramps enter or exit I-5 with each subsequent interchange. Southbound I-5 and the associated interchanges and ramps would have a similar series of add/drop lanes. Exhibit 2.2-8 illustrates these through and auxiliary lanes for the LPA. If highway construction is phased, construction of some auxiliary lanes would be deferred, as characterized within the corresponding description of interchange improvements. The location of auxiliary lanes would not differ between LPA Option A and Option B.

~~Exhibit 2.2-7~~

~~Auxiliary Lanes~~

~~INSERT GRAPHIC: AUXILIARY LANES~~

~~Exhibit 2.2-8~~

~~LPA Through/Auxiliary Lanes~~

~~INSERT GRAPHIC: LPA THROUGH/AUXILIARY LANES~~

~~*Victory Boulevard Interchange*~~

~~Exhibit 2.2-9~~

- ~~Victory Boulevard Interchange~~ Wider shoulders on I-5 to accommodate express bus-on-shoulder service along I-5 from SR 500 to N Victory Boulevard.
- A variety of improvements for people who walk, bike, and roll throughout the program area, including improvements to comply with the Americans with Disabilities Act (ADA).

Improvements

~~INSERT GRAPHIC: VICTORY BOULEVARD IMPROVEMENTS~~

- ~~The southern extent of the CRC highway improvements is the Victory Boulevard interchange in Portland. Improvements at this interchange would be limited~~ to ~~two of the ramps. The Marine Drive to I-5 southbound on-ramp would be braided over the I-5 southbound to Victory Boulevard/Denver Avenue off-ramp (Exhibit 2.2-9). Braiding these two movements would eliminate the existing short (substandard) weave distance and improve traffic safety. Braiding the two movements would also eliminate direct access from the Marine Drive interchange to the Victory Boulevard interchange. Motorists would instead use~~ local ~~roads to travel from Marine Drive to Victory Boulevard. Local roads would also connect the Bridgeton Neighborhood to the Kenton Neighborhood~~bus transit service to integrate the proposed new LRT service and local bus routes.

~~Insert Sidebar: When two ramps cross each other at different grades (one going over the other) this is referred to as **braiding**. This approach is used to safely accommodate different traffic movements in the same section of roadway.~~

~~Currently, the existing Victory Boulevard/Denver Avenue on-ramp merges with I-5 mainline northbound traffic; this improvement would bring this ramp on as an add lane, acting as an auxiliary lane within the project limits to provide additional capacity and a safer roadway.~~

- ~~The improvements to the~~ Variable-rate tolling for motorists using the river crossing as a demand-management and financing tool.

The transportation improvements proposed for the Modified LPA are described in the following sections from south to north. In each geographic subarea (shown in Figure 2-1 and Figure 2-2 as A through G), improvements to I-5, its interchanges, and the local roadways are described first, followed by transit and active transportation improvements. The figures show both the anticipated limit of ground disturbance, which includes disturbance from temporary construction activities, and the location of permanent infrastructure elements. Where applicable, text boxes briefly note differences between the IBR program's Modified LPA and the previously selected CRC LPA.

2.2.1 Portland Mainland (Area A)

Freeway, Interchanges, and Local Roadways

North Victory Boulevard Interchange Area

The southern extent of the proposed I-5 program improvements is two ramps associated with the N Victory Boulevard interchange ~~would not differ between LPA Option A and Option B.~~

~~Phased highway construction option:~~ ~~To reduce project construction costs, construction of the aforementioned southbound braided ramp improvements to the~~ in Portland (see Figure 2-3). The other ramp improvement would lengthen the merge distance for northbound traffic entering I-5 from N Victory Boulevard~~ interchange could be deferred. If these improvements are not included in initial project construction, then this would leave a weave section on the main highway between Marine Drive and Victory Boulevard. The braided ramp connection could be constructed separately in the future as funding becomes available. The braided ramp improvement is included in the LPA, but is assumed to be deferred if the project has to be phased.~~.

What's Changed with IBR?

The Victory Boulevard interchange design is similar to the CRC LPA, except that the IBR Modified LPA on-ramp to northbound I-5 would merge onto the highway rather than becoming an auxiliary lane that continues north across the river.

Marine Drive Interchange Area

~~Insert Sidebar: Terms and Definitions. **Diamond Interchange.** A diamond interchange is a common type of interchange used where a highway crosses a minor road. The highway is grade separated from the minor road, and the off ramps diverge gently from the main highway, intersect directly with the minor road, and continue as gently merging on ramps. The term "diamond" is used because, seen from the air, the interchange has a diamond shape.~~

~~**Single-Point Urban Interchange (SPUI).** A SPUI is an interchange that allows left turns to proceed simultaneously by compressing two diamond intersections into a single intersection over or the under the free-flowing road. The term "single-point" refers to the fact that all through traffic on the minor road and left-turning traffic is controlled by a single set of traffic signals.~~

The next interchange north of the N Victory Boulevard interchange is at Marine Drive. All movements within this interchange would be reconfigured to reduce congestion ~~and improve safety for trucks and other~~for motorists entering and exiting I~~-~~-5~~.~~ at this location. The ~~proposed~~new configuration ~~is~~would be a single-point urban interchange~~ (SPUI) with a flyover ramp serving the eastbound to northbound movement (Exhibit 2.2-10).~~. See Figure 2-3 for the Marine Drive interchange's layout and construction footprint. With this configuration, ~~three~~all four legs of the interchange would converge at a point on Marine Drive over the I~~-5 mainline. This configuration would allow the movements with the highest volumes in the interchange to move freely without being impeded by stop signs or traffic signals.~~-5 mainline.

What's Changed with IBR?

The IBR interchange design has four legs converging on Marine Drive rather than the three legs proposed in the CRC LPA, which would also have included a flyover ramp from Marine Drive eastbound to I-5 northbound. There were also two design options for connections to Hayden Island.

~~Exhibit 2.2-10~~

The Marine Drive ~~Interchange Improvements~~

~~**INSERT GRAPHIC: MARINE DRIVE IMPROVEMENTS**~~

~~Specific changes to traffic movements at this interchange include:~~

- ~~The northbound flyover~~ to I-5 southbound on-ramp would ~~allow trucks and motorists to travel from Marine Drive eastbound to I-5 northbound without stopping. Currently this movement is served by a double left turn at a signalized intersection.~~

- ~~The Marine Drive eastbound to I-~~be braided over I-5 southbound ~~ramp would also provide trucks and motorists with access to I-5 southbound without stopping. This ramp would touch down south of~~ to the N Victory Boulevard ~~and is also described as part of the Victory Boulevard southbound braided ramp.~~

- ~~Motorists traveling on~~/N Denver Avenue off-ramp. NE Martin Luther King Jr. ~~Boulevard~~Boulevard would have a new direct connection to I-5 northbound. Motorists traveling from Marine Drive eastbound to I-5 southbound and those traveling from NE Martin Luther King Jr. Boulevard westbound to I-5 northbound would access I-5 without stopping at the intersection~~. Currently this movement is served by a loop that goes under~~ unless the ~~freeway. The new configuration would have less out of direction travel for this movement.~~

~~Travel safety and mobility between~~ pedestrian signal crossing of the ~~Marine Drive interchange and Hayden Island would be improved by eliminating the local movement between interchanges from the I-5 mainline and accommodating the connection with a local multimodal bridge (Option A) or collector-distributor lanes (Option B). Additional safety and mobility improvements would occur by braiding the on- and off-ramps between Marine Drive and Hayden Island.~~ ramp entrance is activated.

- The new interchange configuration ~~changes~~would change the westbound Marine Drive ~~(east of I-5)~~ and westbound N Vancouver Way connections to NE Martin Luther King Jr. Boulevard. An improved connection ramp farther east of the interchange would provide access to westbound NE Martin Luther King Jr. ~~Boulevard and to northbound I-5. Rather than merging onto Martin Luther King Jr. Boulevard, which then loops on the west side and back to the east side of I-5 before entering northbound I-5,~~ Boulevard for these two streets ~~would instead access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard would have a new direct~~ . The improvements to this connection ~~to I-5 northbound.~~

~~In the new configuration, the connections from Vancouver Way and Marine Drive would be served, improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. The improvements to this connection would allow traffic to turn from~~ would allow traffic to turn right from N Vancouver Way and accelerate onto NE Martin Luther King Jr. Boulevard. On the south side of NE Martin Luther King Jr. Boulevard, the existing loop connection would be replaced with a new connection farther east~~, connecting to Union Court at Hayden Meadows Drive. A new undercrossing of Martin Luther King Jr. Boulevard would replace the existing one at Marine Way~~.

N Expo Road from N Victory Boulevard to the Expo Center would be reconstructed with improved active transportation facilities. North of Expo Center, N Expo Road would be extended under N Marine Drive and loop under I-5 to the east, connecting with N Vancouver Way through three roundabouts. Two of the new roundabouts would provide connections from the new local street extension to I-5 southbound and from I-5 northbound. An arterial bridge crossing the North Portland Harbor would connect to the local road extension with a third roundabout.

Transit

- ~~Improvements to the local street system around the interchange, including an extension of Vancouver Way under I-5 to connect to the new north-south street adjacent to the Expo Center.~~

- ~~Improvements and a realignment of Expo Road (with Option A only). The proposed realignment of the west end of this road may be adjusted in final design, in coordination with the Expo Center. Expo Road~~

is located largely on Expo Center property in an area where Metro is currently refining parking and access plans as part of their Master Plan process.

LPA Option A: Local traffic between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel via a local multimodal bridge over North Portland Harbor. There would be some variation in the alignment of local streets in the area of the interchange between Option A and Option B. The most prominent differences are the alignments of Vancouver Way and Union Court (Exhibit 2.2-10).

LPA Option B: With this design option, there would be no vehicle traffic lanes on the light rail transit/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel on the collector-distributor bridges that would parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.

Phased highway construction option: To reduce initial project construction costs, construction of the aforementioned eastbound to northbound flyover ramp could be deferred. If the flyover is not included in the first phase of project construction, then the eastbound Marine Drive to northbound I-5 movement would be accommodated through the signal-controlled SPUI. The flyover could be constructed separately in the future as funding becomes available. The construction of this flyover would require the reconstruction of the Martin Luther King Jr. Boulevard westbound to I-5 northbound ramp farther to the east in order for it to merge into the ramp north of where the flyover connects. In this FEIS, the flyover and related ramp improvements are included in the LPA, but are assumed to be deferred if highway construction needs to be phased.

Hayden Island Interchange

The Hayden Island interchange would be reconfigured to lengthen the ramps and improve merging speeds by building longer ramps parallel to the highway. The current Hayden Island interchange off of I-5 contains substandard features, including short on- and off- ramps. The existing short ramps do not provide ample distance for some vehicles, especially trucks, to reach mainline speed before merging onto the mainline lanes, which results in a safety hazard. The combination of short ramps and lack of add/drop lanes to the north of the interchange requires traffic entering and exiting the highway to accelerate quickly when entering and decelerate quickly when exiting, or to back up along the ramps and mainline. These conditions result in congestion and higher crash rates on the highway and local streets.

Exhibit 2.2-11

Hayden Island Interchange Improvements

INSERT GRAPHIC: HAYDEN ISLAND IMPROVEMENTS

All movements for this interchange would be reconfigured, as illustrated in Exhibit 2.2-11. The new configuration would be a split tight diamond interchange. Specific changes to traffic movements at this interchange would include:

Improvements to Jantzen Drive would include additional through, left-turn, and right-turn lanes. Currently, A new light rail alignment for northbound and southbound trains would be constructed within Area A (see Figure 2-3) to extend from the existing Expo Center MAX station over North Portland Harbor to a new station at Hayden Island (see Section 2.2.2). The existing Expo Center MAX station would be modified to remove the westernmost track and platform. The other platform and two existing tracks would remain as they currently are. Immediately north of the Expo Center, the alignment would curve eastward toward I-5, pass beneath Marine Drive, cross a proposed local street and the 40-Mile Loop Trail at grade, then rise over the existing levee onto a light rail bridge to cross North Portland Harbor.

An overnight LRV facility would be constructed on the southeast corner of the Expo Center property (see Figure 2-3) to reduce "deadheading" between Ruby Junction and the northern terminus of the MAX Yellow Line extension. Deadheading occurs when LRVs travel without passengers to make the vehicles ready for service. The facility would provide a small number of LRV storage tracks, one small building for light LRV maintenance, an operator break building, and a parking lot for reporting operators. This facility would necessitate relocation and reconstruction of the N Expo Road entrance to the Expo Center (including the parking lot gates and booths). However, it would not affect any of the existing Expo Center buildings.

The overnight facility would connect to the mainline tracks by crossing N Expo Road just south of the existing Expo Center station. The connection tracks would require relocation of one or two existing LRT facilities, including a traction power substation building and potentially the existing communication building, which are both just south of the Expo Center station.

Active Transportation

In the N Victory Boulevard interchange area (see Figure 2-3), active transportation facilities would be provided along N Expo Road between N Victory Boulevard and the Expo Center; this would provide a direct connection between the N Victory Boulevard and Marine Drive interchange areas.

New shared-use path connections throughout the Marine Drive interchange area would provide access between the Bridgeton neighborhood, Hayden Island, and the Expo Center light rail station, in addition to providing connections to the existing portions of the 40-Mile Loop Trail.

Figure 2-3. Portland Mainland (Area A)

2.2.2 Hayden Island (Area B)

Freeway, Interchanges, and Local Roadways

To the north of the Marine Drive interchange is the Hayden Island interchange area, which is shown in Figure 2-4. The existing I-5 bridge spanning North Portland Harbor between the Oregon mainland and Hayden Island would be replaced to improve seismic resiliency. Six new parallel bridges would be built across the waterway: one on the east side of the existing I-5 North Portland Harbor bridge and five on the west side or overlapping with the existing bridge. From west to east, these bridges would carry:

- The LRT guideway.
- The off-ramp from southbound I-5.
- The southbound I-5 mainline.
- The northbound I-5 mainline.
- The northbound on-ramp to I-5.
- A new arterial bridge between the Portland mainland and Hayden Island that would also include a shared-use path for pedestrians and bicyclists.

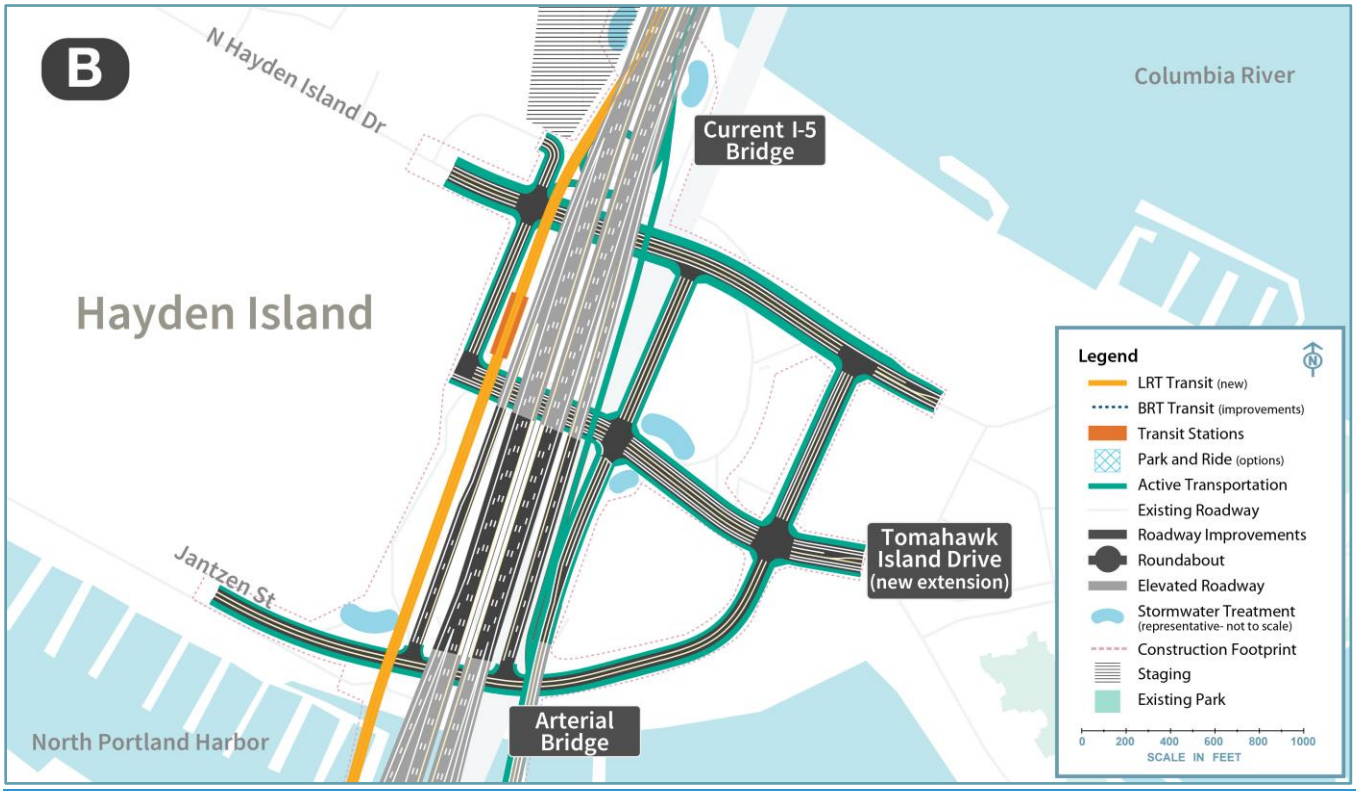
All new structures would have at least as much vertical navigation clearance over North Portland Harbor as the existing North Portland Harbor bridge.

All traffic movements for the Hayden Island interchange would be reconfigured. See Figure 2-4 for a layout and construction footprint of the Hayden Island Interchange. A half-diamond interchange would be built on Hayden Island with a northbound I-5 on-ramp from Jantzen Drive and a southbound I-5 off-ramp to Jantzen Drive. Both ramps would parallel the I-5 mainline, thus lengthening the ramps and improving merging speeds compared to the existing substandard ramps that require acceleration and deceleration in a short distance.

What's Changed with IBR?

The Modified LPA design for crossing North Portland Harbor includes six new bridges spanning the harbor. The CRC LPA would have retained the existing highway bridges to accommodate mainline I-5 traffic and added four new bridges to carry the LRT guideway, local traffic, and ramps from I-5 to and from the Marine Drive interchange.

Figure 2-4. Hayden Island (Area B)



There would not be a southbound I-5 on-ramp and northbound I-5 off-ramp on Hayden Island. Ramps for those movements (shown in Figure 2-3) would be connected to the new local street extension of Expo Road that would cross under I-5 just north of Marine Drive. Vehicles traveling northbound on I-5 wanting to access Hayden Island would exit with traffic going to the Marine Drive interchange, cross under Marine Drive to the new Expo Road local street, and use the arterial bridge to cross North Portland Harbor. Vehicles on Hayden Island looking to enter I-5 southbound would use the new arterial bridge to cross North Portland Harbor, cross under I-5 using the new Expo Road local street, cross under Marine Drive, merge with the Marine Drive southbound on-ramp, and enter I-5 southbound south of the Victory Boulevard interchange.

- Improvements to Jantzen Drive ~~does not connect to highway ramps. Ramp connections are made to Hayden Island Drive and Center Avenue. Ramps to/from southbound I-5 would connect to Jantzen Drive. Jantzen Drive would also connect to northbound I-5. Jantzen Drive would be improved from the existing two- to three-lane roadway to a three- to five-lane roadway, depending on the location. Double left-turn lanes and a right-turn lane would be provided at the northbound entrance.~~

- ~~Hayden Island Drive would be improved from a three-lane roadway to a three- to five-lane roadway, depending on the location. Ramps from I-5 northbound would connect to Hayden Island Drive. On-ramps from~~ and Hayden Island Drive would ~~connect to I-5 southbound. Right~~ include additional left- turn and right-turn lanes ~~would be provided~~ at the ~~southbound~~interchange ramp ~~entrance and at Jantzen Drive,~~terminals and ~~double left-turn lanes would be provided at the southbound entrance.~~

active transportation facilities. A new ~~local road,~~extension of Tomahawk Island Drive~~, located~~ would travel east-west through the middle of ~~the island, would provide an east-west link under the I-5 mainline for travelers to access both sides and would improve~~Hayden Island and under the I-5 interchange, thus improving connectivity ~~for local traffic, pedestrians, and bicyclists~~across I-5 on the island.

~~***LPA Option A:*** A proposed local multimodal bridge with two lanes of traffic, one in each direction, would allow vehicles to travel between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island without accessing I-5. Tomahawk Island Drive would connect to the local multimodal bridge and the local street system. There would be a slight variation in the alignment of local streets in the area of the interchange between Option A and Option B (Exhibit 2.2-11).~~

~~***LPA Option B:*** With this design option there would be no vehicle traffic lanes on the light rail bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel on the collector-distributor bridges that parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.~~

~~***SR 14 Interchange***~~

~~The basic functions of this~~ Transit

Within the Hayden Island interchange ~~would remain largely the same as the existing interchange, but safety would be improved and congestion reduced, as described in the list~~ area, proposed transit components include northbound and southbound LRT tracks over Hayden Island, which would be elevated at approximately the height of the new I-5 mainline. A new LRT station would also be built on the island immediately west of I-5. The light rail alignment would extend northward on Hayden Island along the western edge of I-5 before transitioning onto the lower level of the new western bridge over the Columbia River (see Figure 2-4).

Active Transportation

Within the Hayden Island interchange area, the new arterial bridge would include active transportation components such as a shared-use path for pedestrians and bicyclists (see Figure 2-4). On Hayden Island, pedestrian and bicycle facilities would be provided on Jantzen Drive, Hayden Island Drive, and Tomahawk Island Drive. The shared-use path on the arterial bridge would continue adjacent to I-5 across Hayden Island and connect to the shared-use path on the lower level of the new eastern bridge over the Columbia River. The shared-use path crossings of Tomahawk Island Drive and Hayden Island Drive would be grade-separated with the path crossing over the roadways.

What's Changed with IBR?

The Modified LPA includes a half-diamond interchange on Hayden Island, with an off-ramp from southbound I-5 and an on-ramp to northbound I-5. Vehicles traveling between Hayden Island and Portland mainland would use the new arterial bridge. The CRC LPA proposed a full interchange in a split tight-diamond configuration with access to and from both directions of I-5. Two design options were proposed for connections between Hayden Island and the mainland. Local roadways on Hayden Island are also configured somewhat differently in the two designs.

2.2.3 Interstate Bridge (Area C)

Freeways, Interchanges, and Local Roadways

North of Hayden Island, the I-5 mainline crosses the Columbia River (see Figure 2-5, Area C). The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges, which would be located west (downstream) of the existing bridges. The eastern bridge would accommodate northbound highway traffic on the upper level, and there would be a bicycle and pedestrian path and utilities underneath. The western bridge would carry southbound traffic on the upper level and two-way light rail tracks below. Whereas the existing bridges have only three lanes, each with virtually no shoulders, each of the two new bridges would be wide enough to accommodate three through lanes and one add/drop (auxiliary) lane. Lanes and shoulders would be built to full design standards.

Figure 2-6 shows a conceptual visualization of the two proposed parallel bridges in cross section. The existing bridges over the Columbia River have nine in-water pier sets, whereas each of the new bridges would be built on six pairs of in-water piers, plus several pairs of piers on land. Each of these pier sets would be supported by a foundation of approximately sixteen 10-foot-diameter drilled shafts; each group of shafts would be tied together with a concrete cap measuring approximately 75 by 75 feet at the water line. Columns or pier walls would rise from the shaft caps and connect to the superstructure of the bridges. As with the existing bridges, the new bridges would provide three shipping channels: a primary channel, a barge channel, and an alternate barge channel. However, the primary shipping channel in the Modified LPA would be between the two barge channels and closer to the center of the river than its current location, which is near the Vancouver shoreline where the existing lift spans are located. Each of the three navigation channels would be 300 feet wide.

The new bridges would be tall enough to provide approximately 116 feet of vertical navigation clearance for river traffic using the primary navigation channel. This height would not impede takeoffs and landings by aircraft using Pearson Field or Portland International Airport to the east. Figure 2-7 compares the profile and clearance of the Interstate Bridge under the Modified LPA with the profile of the existing Interstate Bridge (shown in the background). The new bridges over the Columbia River would not include lift spans, and each bridge would be supported by six piers in the water and two piers on land.

What's Changed with IBR?

The Modified LPA design for the Interstate Bridge is similar to the CRC LPA design. Two changes are that IBR's proposed bridges are straight while the CRC's bridges were curved, and the Modified LPA bridges would include one add/drop lane in each direction while the CRC bridges included two. In addition, the original CRC LPA design in the ROD had a vertical clearance of 95 feet above the Columbia River. The 116-foot clearance evaluated in this SDEIS was reviewed and approved through a NEPA re-evaluation in 2012.

Figure 2-5. Interstate Bridge (Area C)

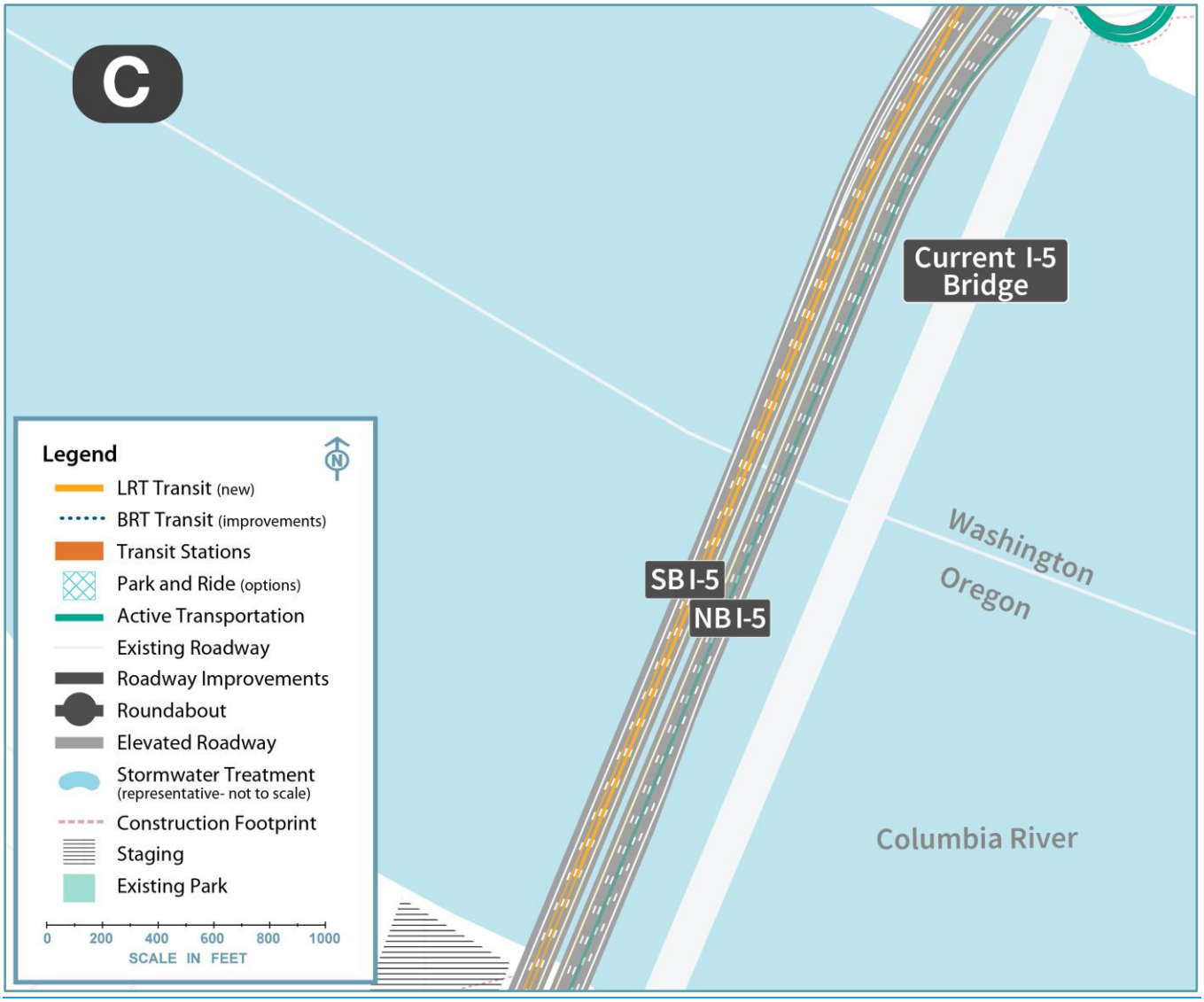


Figure 2-6. Conceptual Visualization of the Proposed Interstate Bridge Levels

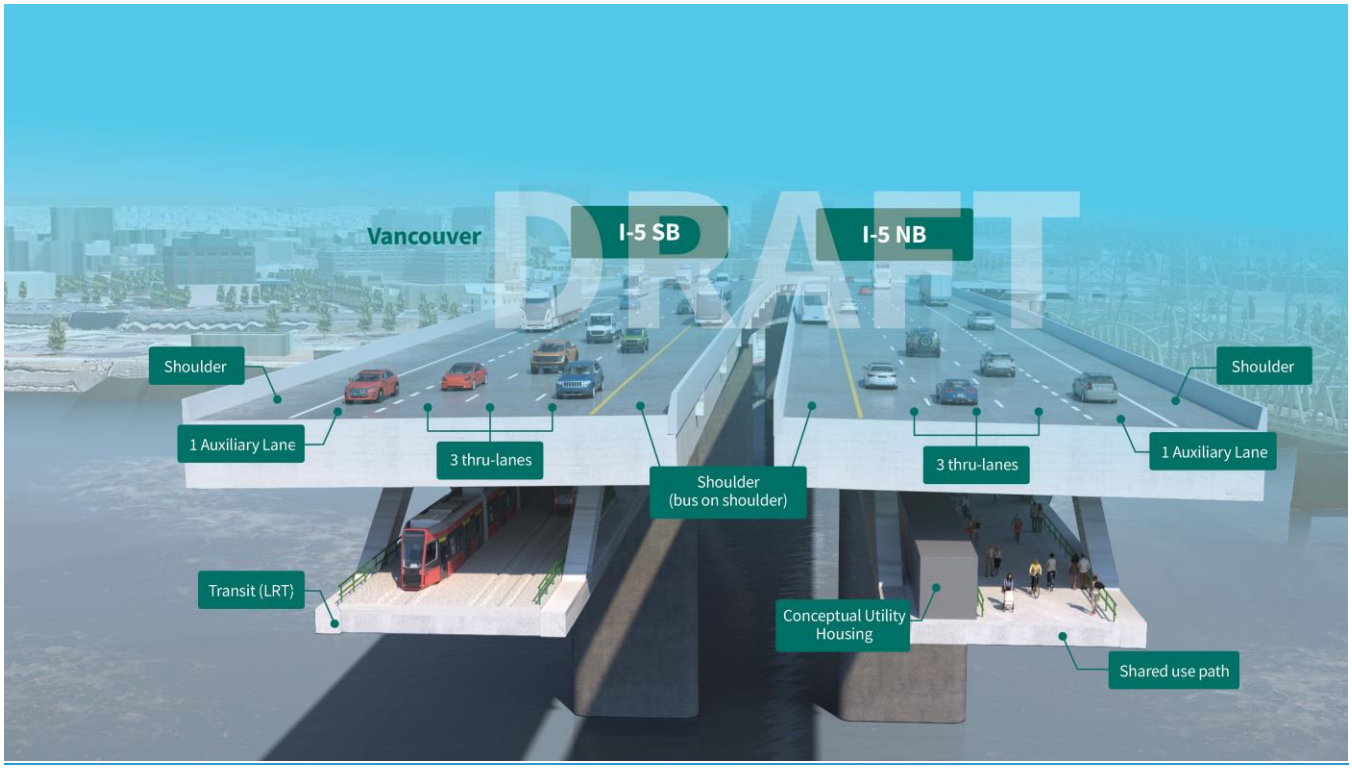
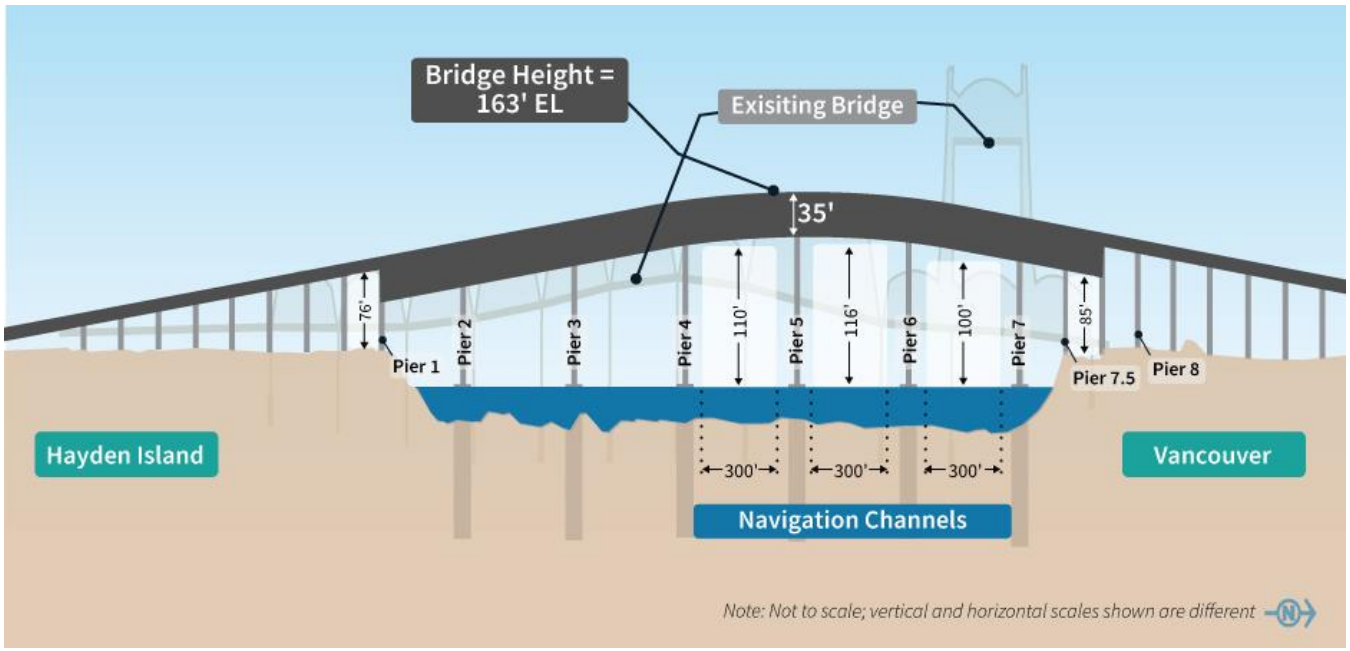


Figure 2-7. Profile and Vertical Navigation Clearance of the Proposed Interstate Bridge



Transit

As shown in Figure 2-5 and Figure 2-6, the new western bridge would carry two-way light rail tracks on its lower level.

Active Transportation

Active transportation would be located on the new eastern bridge (Figure 2-5 and Figure 2-6) and would consist of a shared-use path for pedestrians and bicyclists on the lower level.

2.2.4 Downtown Vancouver (Areas D and E)

Freeways, Interchanges, and Local Roadways

North of the Interstate Bridge in downtown Vancouver, improvements are proposed to the SR 14 and Mill Plain Boulevard interchanges (Figure 2-8 and Figure 2-9).

SR 14 Interchange (Area D)

The new Interstate Bridge would touch down just north of the SR 14 interchange (Figure 2-8). The function of the SR 14 interchange would remain essentially the same as it is now. Direct connections between I-5 and SR 14 would be rebuilt~~, as illustrated in Exhibit 2.2-12.~~. Access to and from downtown Vancouver would be provided as it is today, but the connection points would be relocated. Main Street would be extended between 5th Street and Columbia Way. Vehicles traveling from downtown Vancouver to access SR 14 eastbound would use the new extension of Main Street to the roundabout underneath I-5. If coming from the west or south (waterfront) in downtown Vancouver, vehicles would use the Phil Arnold Way/3rd Street extension to the roundabout, then continue to SR 14 eastbound.

What's Changed with IBR?

Option 1 of the Modified LPA in downtown Vancouver is similar to the CRC LPA, except that IBR's connections to and from SR 14 would be via Columbia Street at 3rd Street rather than 4th Street. Option 2, which would eliminate the C Street ramps and shift the I-5 mainline westward, was not included in the CRC LPA. In addition, the shared-use path in the Modified LPA would cross to the west side of I-5 to connect to the existing path on Columbia Street, whereas the CRC shared-use path would loop down from the Interstate Bridge to connect to Columbia Way.

~~Exhibit 2.2-12~~

~~**SR 14 Interchange Improvements**~~

~~**INSERT GRAPHIC: SR 14 INTERCHANGE IMPROVEMENTS**~~

~~Specific changes to traffic movements at this interchange include:~~

There are two options for the interchange configuration access to and from I-5, described below. Both options are shown in Figure 2-8, with a purple line depicting the C Street access ramps in Option 1.

- ~~•~~ Option 1 – Downtown Vancouver I-5 access to and from the south would be at C Street ~~rather than Washington Street.~~
- ~~Downtown~~, while downtown connections to ~~SR 14 would be via Columbia Street at 4th Street~~ and ~~Main Street. Connections~~ from SR 14 would be made ~~to Washington Street and~~ by Columbia Street at ~~4th~~3rd Street.
- ~~The distance between the northbound I-5 exit to SR 14 and the exit to City Center would be increased to improve safety.~~
- ~~The southbound I-5 connection to SR 14 would be made with a structure~~ Option 2 – Downtown Vancouver I-5 access to and from the south would be through the Mill Plain interchange rather than C Street. There would be no eastside loop ramp from I-5 northbound to C Street and no directional ramp on the west side of I-5 from C Street to I-5 southbound. The existing eastside loop ramp would be removed. Option 2 would

also shift the I-5 mainline and ramps to the west. The westward I-5 alignment shift could also be incorporated into the design of Option 1 (with the C Street ramps).

Access to and from SR 14 would be identical between Options 1 and 2.

- The existing Columbia Way roadway under I-5 and SR 14.
- The northbound I-5 connection to SR 14 would be a flatter curve, allowing trafficrealigned to travel at a higher speed than on the existing ramp.
- Both the north and southbound movements between the Mill Plain interchange and the SR 14 interchange would be separate from the highway on CD roads, eliminating the substandard weave distances on the I-5 mainline (See inset of Exhibit 2.2-12).

Insert Sidebar: Terms and Definitions. Collector-distributor. A collector-distributor (CD) is a one-way roadway adjacent toof its existing location and separated from would intersect both the freeway mainline that allows entering and exiting traffic to weave without disrupting the mainline freeway traffic. Collector-distributors are often used with cloverleaf type interchanges or between closely spaced interchanges.

- For all connections, acceleration and deceleration distances would meet highway design standards to improve safety.

Raising I-5 at this interchange would allow for an extension of new Main Street beneath the BNSF railroad crossing, from 5th Street south to Columbia Way, which supports the City of Vancouver's vision of providing greater connectivity to the waterfrontextension and Columbia Street with T-intersections.

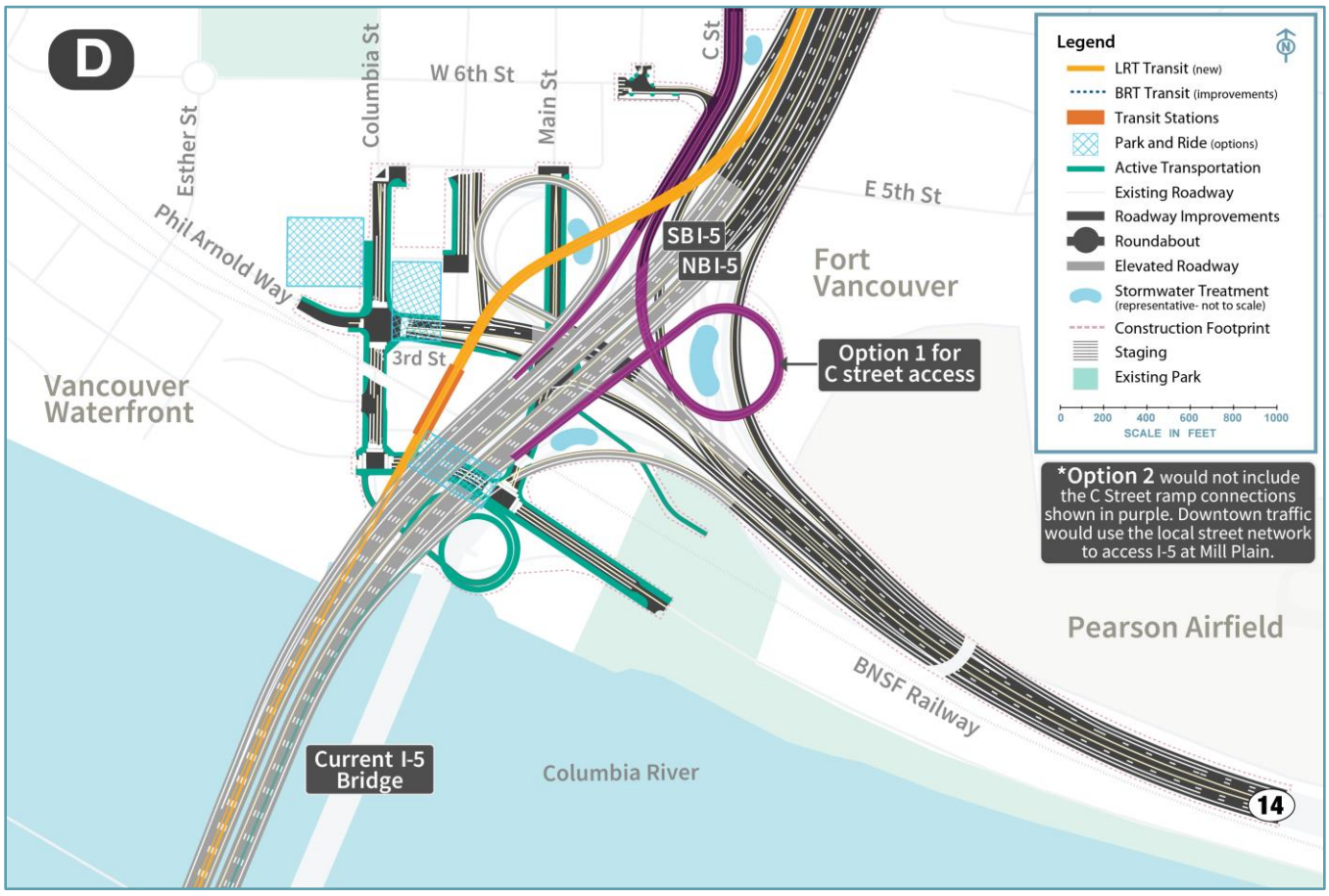
A surface parking lot would be built within the western SR 14 loop ramp (for more information see Chapter 3.1 Transportation). The improvements to the SR 14 interchange would not differ between LPA Option A and Option B.

Mill Plain Boulevard Interchange

This interchange would be reconfigured into a tight diamond, as illustrated in Exhibit 2.2-13. The existing "diamond" configuration requires two traffic signals to move vehicles through the interchange. The tight diamond has two closely spaced ramp terminals run by a single controller or two coordinated controllers improving the efficiency of the interchange. This will minimize queuing between the intersections and keeps traffic flowing through the interchange. All highway exits would be very similar to the existing interchange.

~~Exhibit 2.2-13~~

Figure 2-8. Downtown Vancouver, SR 14 Interchange (Area D)



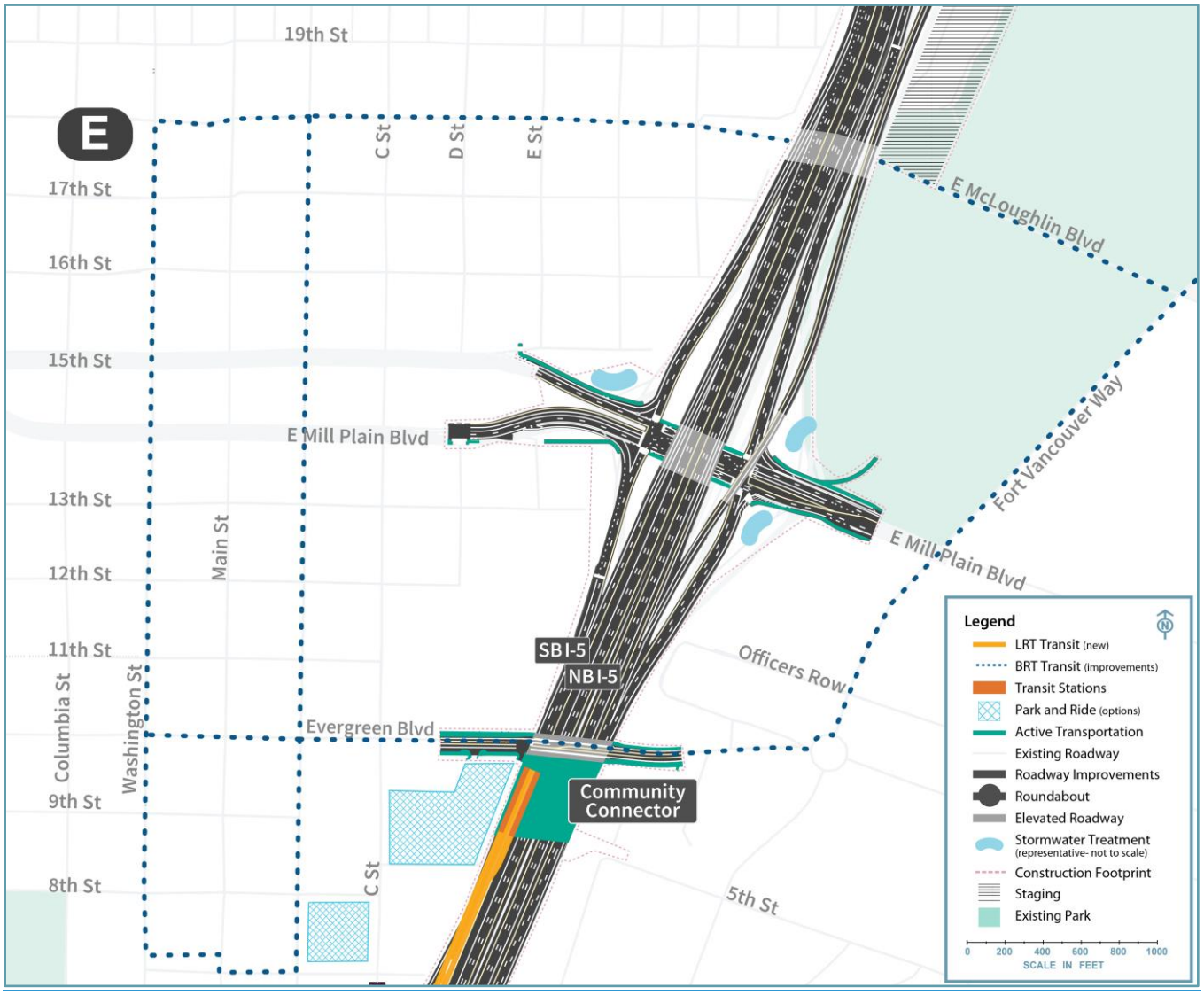
Mill Plain Boulevard Interchange ~~Improvements~~(Area E)

What's Changed with IBR?

The Modified LPA is similar to the CRC LPA at Mill Plain, but includes a tight-diamond interchange configuration rather than a single-point interchange.

~~Insert Graphic:~~The Mill Plain Boulevard interchange is north of the SR 14 interchange (see Figure 2-9). This interchange would be reconstructed as a tight-diamond configuration but would otherwise remain similar in function to the existing interchange. The intersections would be sized to accommodate the high, wide, and heavy freight vehicles that travel between the Port of Vancouver and I-5. The off-ramp from I-5 northbound to Fourth Plain Boulevard would be reconstructed and would cross over Mill Plain Boulevard east of I-5, similar to the way it functions today. The interchange would also receive several improvements for bicyclists and pedestrians, as described below. In addition, the existing overcrossing of I-5 at Evergreen Boulevard, south of Mill Plain Boulevard, would be reconstructed.

Figure 2-9. Downtown Vancouver, Mill Plain Interchange ~~Improvements~~(Area E)



Transit

Light Rail Alignment and Stations

After crossing the Columbia River, the light rail alignment would exit the highway bridge and be supported by its own smaller bridge along the west side of the I-5 mainline (see Figure 2-8). The light rail bridge would cross over the BNSF Railway tracks. An elevated station near the Vancouver waterfront would be situated near the crossing of the BNSF tracks between Columbia Way and 3rd Street. The elevated light rail alignment would continue north, cross over the westbound SR 14 on-ramp and the C Street/6th Street on-ramp to southbound I-5, and then straddle the southbound I-5 collector-distributor roadway. (The collector-distributor roadway separates freeway through-traffic from other vehicles that are exiting or entering the freeway.) Transit components in the downtown Vancouver area are similar between the two SR 14 interchange area design options.

What's Changed with IBR?

The light rail alignment proposed in the Modified LPA would remain close to the west side of I-5 in downtown Vancouver, with stations at the waterfront and at Evergreen Boulevard. In the CRC LPA, light rail would have turned west from I-5 after crossing the Interstate Bridge to run along Washington Street and Broadway, with stations in downtown Vancouver and Evergreen/15th. It would then have turned east on 17th Street to a terminus station east of I-5 at Clark College.

North of the Vancouver waterfront transit station, the light rail tracks would continue to the Evergreen Boulevard station, which would be the terminus of the IBR program light rail extension (see Figure 2-9). The light rail tracks from downtown Vancouver to the terminus would be entirely on an elevated structure supported by a single column, where feasible, or by columns on either side of the roadway where needed. The light rail tracks would be a minimum of 27 feet above the I-5 roadway surface. The Evergreen Boulevard station would be located at the same elevation as Evergreen Boulevard.

Park and Rides~~Specific changes to traffic movements at this interchange include:~~

- ~~Northbound I-5 traffic exiting at Mill Plain would travel on a CD ramp to Mill Plain. The CD would also accommodate the movements from I-5 northbound to Fourth Plain Boulevard and SR 14 to I-5 northbound.~~
- ~~Mill Plain traffic would enter southbound I-5 from a CD ramp that would also accommodate the movement from southbound I-5 to SR 14.~~
- ~~Acceleration and deceleration distances would be lengthened.~~

~~The improvements to the Mill Plain Boulevard interchange would not differ between LPA Option A and Option B.~~

Up to two park and rides could be built in Vancouver along the light rail alignment: one near the waterfront station and one near the Evergreen Boulevard station. Park-and-ride sites in the downtown Vancouver area are similar between Design Options 1 and 2 for the two SR 14 interchange areas. See Figure 2-8 for the potential park-and-ride locations.

There are three options for the park and ride near the waterfront station. Each would accommodate up to 570 parking spaces:

1. Columbia Way (below I-5) – This potential park-and-ride site would be a multilevel aboveground structure located below the I-5 bridges immediately north of a realigned Columbia Way.

2. Columbia Street/SR 14 – This potential park-and-ride site would be a multilevel aboveground structure located along the east side of Columbia Street. It could span above the SR 14 westbound off-ramp to provide parking on the north and south sides of the off-ramp.
3. Columbia Street/Phil Arnold Way (Waterfront Gateway Site) – This potential park-and-ride site would be located along the west side of Columbia Street immediately north of Phil Arnold Way. This park and ride would be developed in coordination with the City of Vancouver's Waterfront Gateway program and would be a joint use parking facility not constructed exclusively for park-and-ride users.

There are two options for the park and ride near the Evergreen Boulevard station:

1. Library Square – This potential park-and-ride site is located along the east side of C Street and south of Evergreen Boulevard. This park and ride would accommodate up to 700 parking spaces in a multilevel belowground structure developed in coordination with the privately owned Library Square development. It would be a joint use parking facility for park-and-ride users and patrons of other uses on the ground or upper levels as determined by a potential future private developer.
2. Columbia Credit Union – This potential park-and-ride site is an existing multistory garage that is located below the Columbia Credit Union office tower along the west side of C Street between 7th Street and 8th Street. The existing parking structure currently serves the office tower above it as well as the Regal City Center across the street. This would be a joint use parking facility, not for the exclusive use of park-and-ride users, that could serve as additional or overflow parking if the 700 required parking spaces cannot be accommodated elsewhere.

Active Transportation

Within the downtown Vancouver area, the shared-use bicycle and pedestrian path on the eastern bridge would exit the bridge at the SR 14 interchange, loop down on the east side of I-5, and then cross back to the west side of I-5 to connect into the Waterfront Renaissance Trail on Columbia Street and into Columbia Way (see Figure 2-8). Active transportation components in the downtown Vancouver area are similar between Design Options 1 and 2 for the SR 14 interchange area.

At Evergreen Boulevard, active transportation improvements would include an overcrossing above I-5 just south of Evergreen Boulevard, which would be constructed as a wide pedestrian connection (referred to as the Community Connector) between the east and west sides of I-5 (see Figure 2-9). The light rail terminus at the Evergreen Boulevard station would be located just south of the Community Connector. Active transportation improvements at the Mill Plain interchange include bicycle lanes and sidewalks, pavement markings, lighting, and signing.

What's Changed with IBR?

The Community Connector in the Modified LPA provides an active transportation connection across I-5 to the LRT terminus station. The connector was also included in the CRC LPA, but it was not at the terminus of the light rail line.

2.2.5 Upper Vancouver (Areas F and G)

Freeways, Interchanges, and Local Roadways

Within the Upper Vancouver area, the IBR program proposes improvements to two interchange—Fourth Plain and SR 500—as described below.

Fourth Plain Boulevard Interchange

~~The improvements to this interchange~~ At the Fourth Plain Boulevard interchange, improvements would enhance vehicle safety and better accommodate freight mobility ~~and access to the Clark Park and Ride.~~ (see

Figure 2-10). Northbound I-5 traffic exiting to Fourth Plain Road would continue to use the off-ramp just northsouth of the SR 14 interchange (Exhibit 2.2-14).

Exhibit 2.2-14

Fourth PlainN Evergreen Boulevard Interchange Improvements

INSERT GRAPHIC: FOURTH PLAIN INTERCHANGE IMPROVEMENTS

Specific changes to traffic movements at this interchange include:

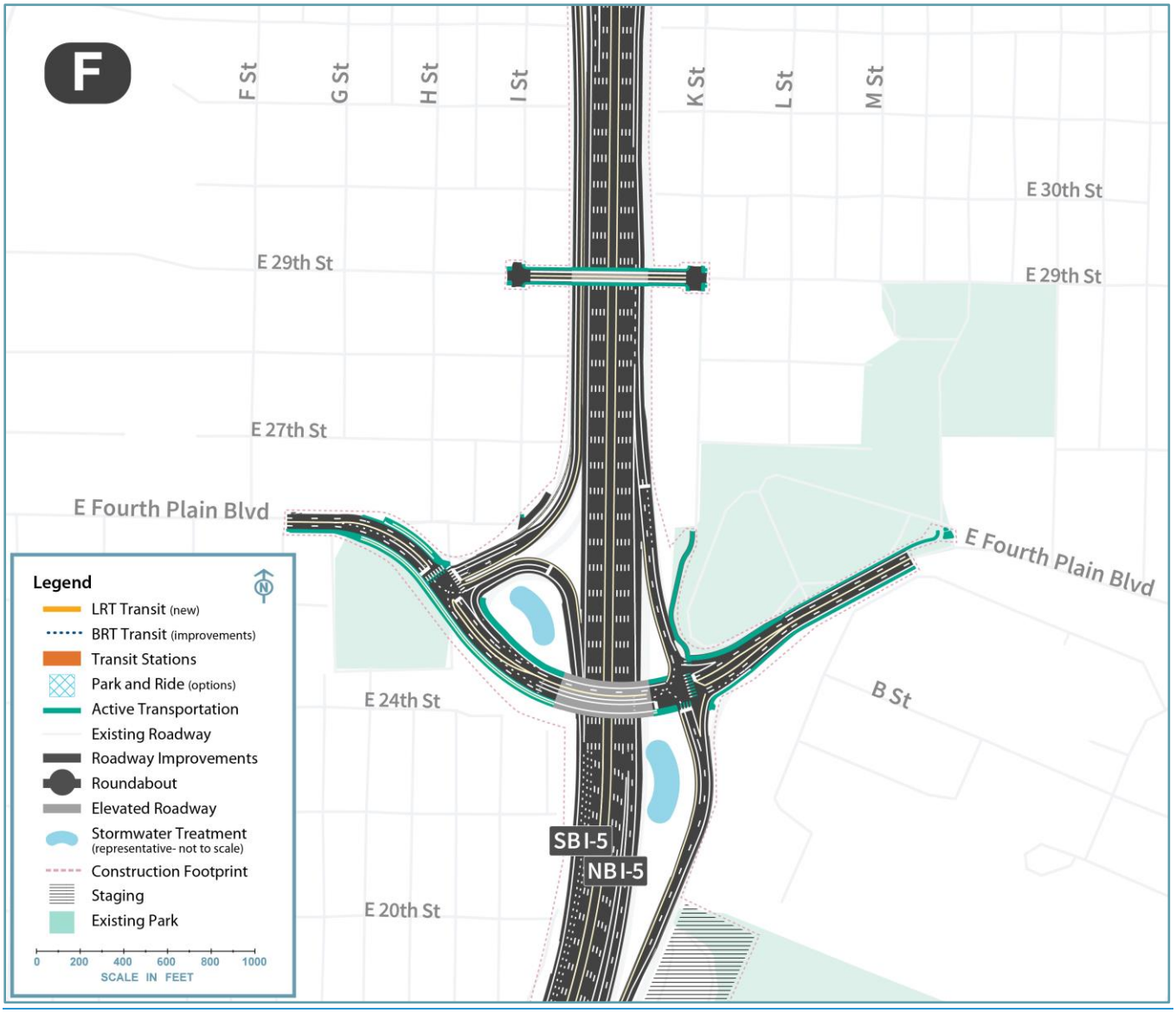
The southbound I-overpass. This off-ramp would continue to be combined with the Mill Plain exit ramp, as it is today, as well as with the on-ramp from westbound SR 14 to northbound I-5. The southbound I-5 exit to Fourth Plain would be braided underwith the 39th Streetwestbound SR 500 connection to southbound I-5, eliminating. This change would eliminate the substandardnonstandard weave between the SR-500 connection and the off-ramp to Fourth Plain. The 39th Street on-It would also eliminate the westbound SR 500 to Fourth Plain Boulevard connection would be carried by a bridge over the Fourth Plain off-ramp in the vicinity of 37th Street.

- This braided exit ramp eliminates the direct connection between westbound SR 500 and Fourth Plain. Traffic currently using this connection would instead access the area by exiting SR 500 at St. Johns Road or 15th/P Streets or by traveling south on I-5 and exiting at Mill Plain.
- A southbound road would be added to provide access to the Clark Park and Ride from Fourth Plain at the northbound ramp terminal. This is for traffic exiting I-5 at Fourth Plain or already on Fourth Plain.
- The ramp terminal intersections at the entrance to I-5 north and south would be designed to accommodate large trucks turning from Fourth Plain.
- The intersection at the exit from I-5 south would provide double left turns for south to east movements. Double left turns would be provided at the intersection at the entrance to I-5 north for the movements going east to north and west to south into the park and ride access road. Two through lanes would be added for the northbound on-ramp to facilitate traffic coming from the park and ride.

Vehicular traffic could access Clark Park and Ride from I-5 southbound via the Fourth Plain off-ramp, crossing over I-5 on Fourth Plain Boulevard and turning onto the local road leading to the park and ride. Clark Park and Ride would be accessed from I-5 northbound by an off-ramp onto Mill Plain Boulevard, then via Fort Vancouver Way and McLoughlin Boulevard. Local access to the park and ride would be via McLoughlin Boulevard or Fourth Plain Boulevard.

The improvements to the Fourth Plain Boulevard interchange would not differ between LPA Option A and Option B.

Figure 2-10. Upper Vancouver, Fourth Plain Interchange (Area F)



SR 500 Interchange

~~Improvements to the SR 500 interchange would add direct connections to and from I-5 (Exhibit 2.2-15). Currently, the connections between SR 500 and I-5 to and from the north require exiting the highway, traveling on a local street (39th Street), and then re-entering the highway. As illustrated in Exhibit 2.2-15, on- and off-ramps would be built to directly connect SR 500 and I-5 for both of these connections. I-5 southbound traffic is proposed to connect to SR 500 via a new structure underneath I-5. SR 500 westbound traffic would connect to I-5 northbound on a new ramp.~~

~~Exhibit 2.2-15~~

~~**SR 500 Interchange Improvements**~~

~~**INSERT GRAPHIC: SR 500 INTERCHANGE IMPROVEMENTS**~~

~~These improvements would eliminate the direct connections between 39th Street and I-5 to and from the north. These connections would instead be made through the I-5/Main Street interchange to the north.~~

~~The improvements to the SR 500 interchange would not differ between LPA Option A and Option B.~~

~~***Phased highway construction option:*** To reduce project construction costs, reconstruction of the northern half of the interchange could be deferred. If these improvements are not included in the first phase of project construction, then the northern half of this interchange could be retained in its existing configuration. The improvements could be constructed separately in the future as funding becomes available. In this FEIS, the north half of the interchange improvements are included in the LPA, but are assumed to be deferred if the project needs to be constructed and funded in phases.~~

~~**Transit**~~

The northern terminus of the I-5 project improvements would be in the SR 500 interchange area (Figure 2-11). The improvements would be minor and primarily connect the Modified LPA to existing ramps. The off-ramp from I-5 southbound to 39th Street would be reconstructed to establish the beginning of the braided ramp to Fourth Plain and restore the loop ramp to 39th Street. Ramps from existing I-5 northbound to SR 500 eastbound and 39th Street to I-5 northbound would be partially reconstructed. The existing bridges for 39th Street over I-5 and SR 500 westbound to I-5 southbound would be retained. A new bridge would be constructed from 39th Street to I-5 southbound over the new I-5 southbound to the Fourth Plain ramp.

The existing overcrossings of I-5 at 29th Street and 33rd Street would also be reconstructed to accommodate a widened I-5, provide adequate vertical clearance over I-5, and provide pedestrian and bicycle facilities on those cross streets.

What's Changed with IBR?

The Modified LPA proposes less extensive improvements to the SR 500 interchange than those proposed for the CRC LPA. The CRC LPA included new direct connections between I-5 and SR 500, new on- and off-ramps, and a tunnel beneath I-5. CRC's 2013 NEPA reevaluation also considered a phased construction option that would have temporarily retained the northern half of the interchange.

Figure 2-11. Upper Vancouver, SR 500 Interchange (Area G)

Transit~~The transit element of the LPA is primarily an extension of light rail to Clark College in Vancouver from the Expo Center in north Portland, where the MAX Yellow Line currently terminates. To accommodate and complement this major addition to the region's transit system, a variety of additional improvements are also included in the project. These include park and ride facilities in Vancouver, expansion of the current TriMet light rail maintenance base in Gresham, changes to C-TRAN local bus routes, and upgrades to the existing Steel Bridge light rail crossing over the Willamette River in Portland.~~

There would be no LRT facilities in Upper Vancouver. Proposed operational changes to bus service are described below in Section 2.2.7, Transit Operating Characteristics.

Active Transportation

Several improvements would be made at the Fourth Plain interchange to provide better bicycle and pedestrian mobility and accessibility; these include bicycle lanes, neighborhood connections, and a tie-in to the planned city of Vancouver road diet and two-way cycle track on Fourth Plain. The reconstructed overcrossings of I-5 at Evergreen Boulevard, 29th Street, and 33rd Street would provide pedestrian and bicycle facilities on those cross streets. No active transportation is proposed to be added in the SR 500 interchange area.

What's Changed with IBR?

The Modified LPA's active transportation improvements in North Vancouver are similar to those proposed in the CRC LPA. However, the CRC LPA did not include the tie-in to the planned city of Vancouver road diet and two-way cycle track on Fourth Plain, as these had not yet been proposed when the FEIS was being prepared.

2.2.6 Transit Support Facilities

~~Light Rail Alignment and Stations~~

~~*Operating characteristics*~~

~~The project would include a 2.9-mile extension of the existing MAX Yellow Line from the Expo Center station across the North Portland Harbor, over Hayden Island, across the Columbia River, and through downtown Vancouver, ending near Clark College (Exhibit 2.2-17). Nineteen new light rail transit vehicles (LRVs) would be purchased as part of the CRC project to operate this extension of the MAX Yellow Line. These vehicles would be similar to those currently used on the MAX light rail transit system. Trains would operate in a two-car configuration. Exhibit 2.2-16 compares the size and capacity of LRVs to typical buses.~~

~~Exhibit 2.2-16~~

~~**Transit Vehicle Characteristics**~~

~~Vehicle Type~~		~~Length~~	~~Seats~~	~~Average Vehicle Passenger Capacity[a]~~
~~Standard Local Bus~~		~~40 feet~~	~~43~~	~~61~~
~~Articulated Bus~~		~~62 feet~~	~~60~~	~~100~~
~~Light Rail Transit~~	~~Single Train~~	~~90 feet~~	~~64~~	~~133~~
	~~Two-Car Train~~	~~180 feet~~	~~128~~	~~266~~

~~a. Average vehicle capacity is the total number of seats, plus the floor area of the transit vehicle divided by 3 persons per square meter.~~

~~Exhibit 2.2-17~~

~~**Proposed LPA Transit Alignment and Street Cross Sections**~~

~~**INSERT GRAPHIC**~~

~~With the LPA, LRVs in the new guideway and in the existing Yellow Line alignment would be planned to operate with 7.5-minute headways during the "peak of the peak" (the 2-hour period within the 4-hour morning and afternoon/evening peak periods when demand for transit is the highest) and with 15-minute headways at all other times. This compares to 12-minute headways in "peak of the peak" and 15-minute headways at all other times for the existing Yellow Line (and No-Build Alternative).~~

~~*Oregon Light Rail Alignment and Station*~~

~~A double-track light rail guideway for north and southbound trains would be constructed to extend northward from the existing Expo Center MAX station. The alignment would curve eastward toward I-5 as it passes~~

beneath a newly reconstructed Marine Drive. North of Marine Drive the profile would rise as the guideway transitions onto a bridge structure to cross North Portland Harbor. The two-way guideway over Hayden Island would be elevated at approximately the height of the rebuilt mainline of I-5. A station would be constructed on Hayden Island immediately west of the reconstructed I-5/Hayden Island interchange. The alignment would extend northward on Hayden Island, along the western edge of I-5, until it transitions into the new bridge over the Columbia River. It would be located on the lower deck of the western bridge, which would service southbound highway traffic on the top deck.

Downtown Vancouver Light Rail Alignment and Stations

After crossing the Columbia River, the light rail alignment would curve slightly west, off of the highway bridge and onto its own smaller structure over the Burlington Northern Santa Fe (BNSF) rail line. The double-track guideway would descend on structure and touch down on Washington Street south of 5th Street, continuing north on Washington Street to 7th Street. The elevation of 5th Street would be raised to allow for an at-grade crossing of the tracks on Washington Street. Between 5th and 7th Streets, the two-way guideway would run down the center of the street. Traffic would not be allowed on Washington between 5th and 6th Streets and would be two-way between 6th and 7th Streets. There would be a station on each side of the street on Washington between 5th and 6th Streets.

At 7th Street, the light rail alignment would divide into a couplet. The single-track northbound guideway would turn east for two blocks, then turn north onto Broadway Street, while the single-track southbound guideway would continue on Washington Street. Seventh Street would be converted to one-way traffic eastbound between Washington and Broadway, with light rail operating on the north side of 7th Street. This couplet would extend north to 17th Street, where the two guideways would join and turn east.

The light rail guideway would run on the east side of Washington Street and the west side of Broadway Street, with one-way traffic southbound on Washington Street and one-way traffic northbound on Broadway Street. On station blocks, the station platform would be on the side of the street at the sidewalk. There would be two stations on the Washington-Broadway couplet, one pair of platforms near Evergreen Boulevard, and one pair near 15th Street.

East-west Light Rail Alignment and Terminus Station

Both north and southbound alignments of the couplet would become a two-way guideway traveling east-west on 17th Street. The double-track, center-running guideway on 17th Street would run until G Street, then curve north to McLoughlin Boulevard, and then continue east through the existing underpass beneath I-5. The underpass would be widened and the road bed lowered to accommodate the light rail trains and overhead catenary system. The guideway would end at a station and park and ride structure east of I-5, on the western boundary of Clark College and across from the Marshall Community Center, Luepke Senior Center, and Marshall Park.

Park and Rides

Three park and rides would be built in Vancouver along the light rail transit alignment (Exhibit 2.2-18).

Exhibit 2.2-18

Proposed Park and Rides Included in the LPA

Site Location	Columbia Park and Ride West side of Washington Street between 4th and 5th Streets	Mill Park and Ride East side of Washington Street from 15th to 16th Streets	Clark Park and Ride Northeast of McLoughlin Boulevard and I-5
Size (parking spaces)	570	420	1910

Number of Levels	5	4	5
Footprint (SF)	50,000	42,000	128,000
Retail Space Included Inside Structure	Yes	Yes	No

Columbia Park and Ride

A park and ride would be bounded by Washington, Columbia, and 5th Streets, and half the block between 3rd and 4th Streets. This facility would have five floors above ground and would contain approximately 570 parking spaces (Exhibit 2.2-19). Active uses would be included on the ground floor.

Exhibit 2.2-19
Columbia Park and Ride

INSERT GRAPHIC: INSERT PLAN/PROFILE GRAPHIC OF PARK AND RIDE AT COLUMBIA

Mill Park and Ride

A smaller park and ride would be built in the block surrounded by Washington and Main Streets and 15th and 16th Streets (Exhibit 2.2-20). This facility would have four floors, with active use space (which could include retail) on the ground floor. The current design includes 420 parking spaces.

Exhibit 2.2-20
Mill Park and Ride

INSERT GRAPHIC: INSERT PLAN/PROFILE GRAPHIC OF PARK AND RIDE AT BROADWAY AND MAIN STREET

Clark Park and Ride

The largest park and ride would be built at the Clark College terminus. This facility would have five floors, and contain approximately 1,910 parking spaces (Exhibit 2.2-21).

Exhibit 2.2-21
Clark Park and Ride

INSERT GRAPHIC: INSERT PLAN/PROFILE GRAPHIC OF PARK AND RIDE AT CLARK COLLEGE

Ruby Junction Operations and Maintenance Facility Expansion

Exhibit 2.2-22
The Ruby Junction Operations and Maintenance Base Facility Expansion

INSERT GRAPHIC: INSERT PLAN VIEW FOR MAINTENANCE BASE EXPANSION

The CRC project would expand the existing Ruby Junction Maintenance Facility in Gresham, Oregon, would need to be expanded to accommodate the additional LRVs associated with the operations of the CRC project (Exhibit 2.2-22). The proposed expansion of the Ruby Junction facility would also accommodate the additional LRVs associated with the separately proposed Portland-Milwaukie Light Rail Project.IBR program (the vicinity relative to the study area is shown in Figure 2-1). Improvements would include additional storage for LRVs, and maintenance equipment and materials, an and supplies, expansion of LRV maintenance bays, and expanded parking for additional personnel. The Portland-Milwaukie Light Rail Project is considering phasing the maintenance facility expansion to first build only the capacity required for their initial operations,

~~as described in the Portland-Milwaukie Final EIS (FTA 2010). Their initial phase would expand the facility to the west but defer the development of some track, internal roadway, parking facilities, and other structures. If the Portland-Milwaukie project implements phased construction, that would not change the total impacts at the site, but it would change the timing of some of the impacts. Phasing will be determined by the Portland-Milwaukie Light Rail Project and its timing relative to the CRC project construction. A new operations command center would be located at the existing TriMet Center Street location. This would not require any new building construction or expansion of the existing Center Street facility~~, and a third track at the northern entrance to Ruby Junction. Figure 2-12 shows the proposed footprint of the expansion.

The existing main building would be expanded west to provide additional maintenance bays. To make space for the building expansion, NW Eleven Mile Avenue would be vacated and would terminate in a new cul-de-sac west of the main building. New access roads would be constructed to maintain access to TriMet buildings south of the cul-de-sac. Vacating NW Eleven Mile Avenue would require acquiring properties not currently owned by TriMet near the south end of NW Eleven Mile Avenue.

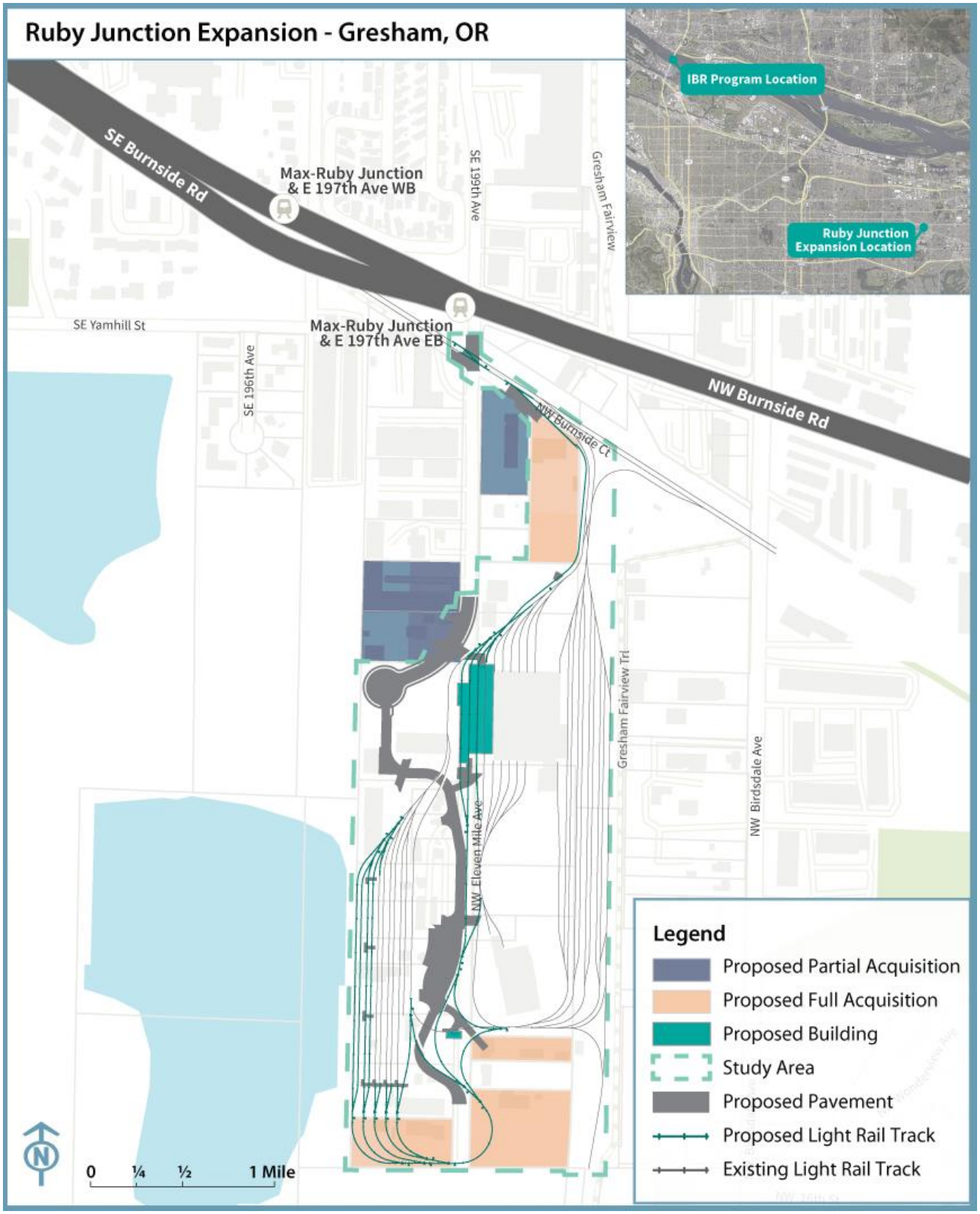
The existing LRV storage yard, west of NW Eleven Mile Avenue, would be expanded to the west to accommodate additional storage tracks and a runaround track (a track constructed to bypass congestion in the maintenance yard). This expansion would require partial demolition of an existing TriMet building (just north of the LRV storage) and would impact the existing material storage yard. The material storage yard would be relocated to the properties just south of the south building.

All tracks in the west LRV storage yard would also be extended southward to connect to the proposed runaround track. The runaround track would connect to existing tracks near the existing south building. The connections to the runaround track would require partial demolition of an existing TriMet building plus full demolition of one existing building and partial demolition of another existing building on the private property west of the south end of NW Eleven Mile Avenue. The function of the existing TriMet building would either be transferred to existing modified buildings or to new replacement buildings.

The existing parking lot west of NW Eleven Mile Avenue would be expanded toward the south to provide more parking for TriMet personnel.

A third throat track would be needed at the north entrance to Ruby Junction to accommodate increased train volumes without decreasing service. Adding the throat track would require the full acquisition of one private property, partial acquisition of another private property, and reconstruction of NW Burnside Court east of NW Eleven Mile Avenue. An additional crossover would also be needed on the mainline track where it crosses NW Eleven Mile Avenue; it would require reconstruction of the existing track crossings for vehicles, bicycles, and pedestrians.

Figure 2-12. Ruby Junction Study Area



2.2.7 Transit Operating Characteristics

LRT Operations

Nineteen new LRVs would be purchased to operate the extension of the MAX Yellow Line. These vehicles would be similar to those currently used for the TriMet MAX system. With the Modified LPA, LRT service in the new and existing portions of the Yellow Line would operate with 5.4-minute average headways (defined as gaps between arriving transit vehicles) during the peak hour and 6.3-minute average headways in the 2-hour peak period. Mid-day and evening headways would be 15 minutes, with late-night headways of 30 minutes.

Bus on Shoulder

Buses are currently permitted to use the existing southbound median shoulder of I-5 from 99th Street to the Interstate Bridge in Vancouver. However, existing shoulders are too narrow for bus-on-shoulder use on the rest of I-5 in the study area. The IBR program improvements would include median (inside) shoulders on I-5 wide enough for northbound and southbound bus on shoulder (11.5 to 12 feet), except where I-5 must taper to match existing I-5 median shoulder widths at the north and south ends of the I-5 improvements. Figure 2-6 shows the potential bus-on-shoulder use over the Interstate Bridge.

For express bus service in the IBR corridor, two routes (C-TRAN Routes 105 and 190) would operate on the shoulder for the full extent of the program area. These two routes would operate only in the AM and PM peak periods and have a combined frequency of every 3 minutes.

Express Bus Service

Two additional express bus routes would provide service in the I-5 corridor. One of these routes (C-TRAN Route 164) provides only PM peak northbound service with 10-minute headways between downtown Portland and Vancouver, exiting I-5 at SR 14 to continue service to Fisher's Landing. This route would not be expected to include bus-on-shoulder operations. The other route (C-TRAN Route 105) provides service between downtown Vancouver and downtown Portland all day with 6-minute peak headways and 30-minute off-peak headways. With Option 1 for the SR 14 interchange, which includes a C Street ramp, Route 105 would not be likely to use bus-on-shoulder operations because of the distance needed to merge from the inside shoulder lane through traffic to access the off-ramp for downtown. Under Option 2, in which the C Street ramp would not be included and access to downtown would occur via Mill Plain Boulevard, Route 105 would likely be able to use bus-on-shoulder operations to cross the Columbia River.

Local Bus Route Changes~~Local Bus Route Changes~~

As part of the IBR program, the TriMet Line 6 bus route would be changed to terminate at the Expo Center transit station, allowing passengers to access Hayden Island via the new LRT connection. The route is anticipated to travel from NE Martin Luther King Jr. Boulevard through the newly configured area providing local connections to Marine Drive. It would continue west to connect on the west side of I-5 with the Expo Center transit station. Table 2-1 shows anticipated future changes to TriMet bus routes.

As part of the ~~CRC project~~IBR program, several C-TRAN ~~local~~ bus routes would be changed~~ in order~~ to better complement the new light rail ~~transit~~ system~~ and reduce redundancies~~. Most of these changes ~~truncate~~would re-route bus lines ~~in downtown Vancouver where riders could~~to provide a transfer ~~to light rail transit.~~opportunity near the new Evergreen Boulevard station. Express routes~~, other than those listed below,~~ are expected to continue service between Clark County and downtown Portland. ~~The following exhibit~~Table

2-1 shows the anticipated future changes to C-TRAN bus routes. In addition to the changes to future bus routes compared to the No-Build Alternative (Exhibit 2.2-23).

Exhibit 2.2-23

Proposed C-TRAN Bus Routes Comparison

C-TRAN Bus Route	Route Changes
#4 - Fourth Plain	Route truncated in downtown Vancouver
#41 - Camas / Washougal Limited	Route truncated in downtown Vancouver
#44 - Fourth Plain Limited	Route truncated in downtown Vancouver
#47 - Battle Ground Limited	Route truncated in downtown Vancouver
#105 - I-5 Express	Route truncated in downtown Vancouver
#105S - I-5 Express Shortline	Route eliminated with LPA (No-Build runs articulated buses between downtown Portland and downtown Vancouver on this route)

Steel Bridge Improvements

In addition to extending the MAX Yellow line, the CRC project would include minor noted in Table 2-1 below, other potential route modifications to a critical element of the existing MAX light rail transit system located outside the main project area. These modifications would improve the existing light rail transit track and electrical system on the Steel Bridge, which is located approximately 4 miles south of the crossing of the Columbia River. These improvements would allow the Yellow Line trains, as well as all other MAX line trains that would use these tracks, to increase their travel speed over the Steel Bridgefrom Broadway to C Street are being considered.

Since the publication of the DEIS, a Documented Categorical Exclusion (DCE) from the NEPA process was requested for the work on Steel Bridge. The DCE evaluation determined that there would be minimal environmental impacts from improvements to the bridge trackway and controls. A determination that the work would be excluded from the NEPA process was made by FTA in February 2011. The Steel Bridge improvements were included in the CRC 2008 Federal New Starts application.

Currently, all light rail transit lines within the regional MAX system cross the Willamette River in downtown Portland via the Steel Bridge. The Steel Bridge was built in 1912 and was retrofitted in 1984 to receive LRVs. When the first light rail line opened in 1986, 40 LRVs crossed the bridge during the 4-hour PM peak period; in 2007, with the Red and Yellow Lines opened, 116 LRVs crossed the bridge during the 4-hour PM peak period. In 2009, TriMet opened the I-205 South Corridor Project, increasing the number of vehicles that cross the Steel Bridge to 152 during the 4-hour PM peak period. With a "peak of the peak" headway of 7.5 minutes, the CRC project would increase the number of LRVs that cross the Steel Bridge in 2030 during the 4-hour PM peak period to 176 trains. To accommodate these additional trains, the CRC project would retrofit the existing rails on the Steel Bridge to increase the allowed light rail transit speed over the bridge, increasing the LRV throughput of the bridge.

The Steel Bridge has a lift span that requires lift joints in the MAX rails within the track bed. These lift joints limit the crossing speed of LRVs to no more than 10 miles per hour (mph). This limitation is because the vibrations at these joints disrupt the signaling and electrification system. Modifications to reduce the wheel rise from the lift joint would decrease the bridge vibration, allowing MAX trains a maximum speed of 15 mph on the Steel Bridge, thus improving the speed of all MAX lines crossing the bridge. There is also an existing signal case on the lift span that cannot withstand high levels of vibration. The overhead catenary system (OCS) that supplies electrical power to the trains is also not designed to withstand the high levels of vibration

that are generated with speeds above 10 mph. The work needed to increase the speed limits from 10 mph to 15 mph over the Steel Bridge lift spans would include the following:

1. Grind the transit rails within the track bed to remove the lift joint bumps, rail corrugation, and any rough field welds.
2. Install a vibration pad under the signal case to dissipate vibration.
3. Stiffen the OCS brackets to allow for greater impact as the catenary transfers from the fixed to movable span.
4. Make light rail transit and traffic signal adjustments for NW Everett Street and N Interstate Avenue to accommodate the higher speeds.

2.1.2 Pedestrian and Bicycle Improvements

Many bicycle and pedestrian improvements are included in the CRC project. These include new facilities such as the multi-use pathway across the Columbia River and connections to existing and future pathways, street improvements around the rebuilt interchanges, and new facilities for bicyclists and pedestrians around the new light rail stations and park and rides. The proposed improvements are described below from the south end of the project to the north end.

Exhibit 2.2-24

North Portland Bicycle and Pedestrian Improvements

INSERT GRAPHIC: NORTH PORTLAND BICYCLE AND PEDESTRIAN IMPROVEMENTS

North Portland

With the LPA Option A, the proposed Marine Drive interchange area would be entirely grade-separated, with the local road network and multi-use paths running below the interchange. Pedestrian and bicycle improvements at the Marine Drive interchange would include a multi-use path constructed from the Marine Drive interchange, over North Portland Harbor and Hayden Island and the Columbia River, to SE Columbia Way in downtown Vancouver. The path would be a minimum of 16 feet wide when on structure and would direct users with pavement markings and signage. Horizontal and vertical curves would be built to provide improved sight distance and flow, and path components would meet Americans with Disabilities Act (ADA) accessibility standards.

As illustrated in Exhibit 2.2-24, the multi-use path in north Portland would begin at Delta Park with a connection to Whitaker Road. Heading northeast, the path would cross below Martin Luther King Jr. Boulevard at the existing Marine Way location. Marine Way would be removed, along with the loop ramps connecting to Martin Luther King Jr. Boulevard, in this area. After crossing below Martin Luther King Jr. Boulevard, the multi-use path continues on to the intersection of Marine Drive and Vancouver Way. The path would then continue west along the north side of the new local road extension of Vancouver Way. After the pathway crosses the intersection of Anchor Way and the Vancouver Way extension, there would be a pathway intersection. To the east, a spur would be built to connect to the future Bridgeton Trail. To the west, a path would continue under I-5 to a connection to the 40mile loop trail-Mile Loop Trail. The multi-use path would continue north underneath the new eastern bridge crossing of the North Portland Harbor, to Hayden Island.

The connection to the west crosses below I-5, and would provide an off-street route for pedestrian and bicycle traffic through the Marine Drive interchange. After crossing underneath I-5, the path continues west to an at-grade crossing of the light rail tracks and local multimodal bridge roadway, and connects to the existing west leg of the 40-Mile Loop Trail along North Portland Harbor. The connection to the Expo Center light rail station

would be made via on-street bicycle lanes and sidewalks along a new roadway running north/south along the eastern edge of the Expo Center. Bicycle lanes and a sidewalk on the local multimodal bridge would provide a second connection to Hayden Island and would also carry the light rail transit guideway over North Portland Harbor.

Sidewalks would be constructed along the southern side of the new Vancouver Way road extension. All elements would meet ADA accessibility standards.

For the LPA Option B, the configuration of the Marine Drive interchange area would be very much the same as the LPA Option A, described above, with two notable exceptions. The multi-use path would extend north on the light rail transit guideway bridge on the west side of I-5 instead of on the east side of I-5, under the ramp bridge. In addition, the multi-use pathway on the west side of I-5 would follow a slightly different roadway alignment towards the Expo Center.

Hayden Island

With the LPA Option A, from North Portland Harbor, the new multi-use path would continue on the new local multimodal bridge located parallel to and west of I-5 (Exhibit 2.2-25). The multi-use path across Hayden Island would be entirely grade-separated from vehicle traffic. This elevated path would connect the North Portland Harbor bridges and the Columbia River bridges. Pedestrians and bicyclists could access the multi-use path at the North Hayden Island Drive ramp; at the stairs or ramp at the Hayden Island light rail transit station; or at the stairs at Jantzen Drive. The multi-use pathway across Hayden Island would be entirely grade-separated from vehicle traffic, and would enter the easternmost cell below the bridge deck in the northbound bridge over the Columbia River at the north end of the island.

To improve east-west connections on Hayden Island, a 6- to 8-foot-wide sidewalk would be provided along Jantzen Drive and Hayden Island Drive. A 6-foot minimum width sidewalk would be provided along Tomahawk Island Drive. Several island streets would also include bicycle lanes where improvements are made.

Under the LPA Option B, the multi-use path would enter Hayden Island on the east side of the light rail transit guideway bridge located parallel to and west of I-5 (Exhibit 2.2-25) The pathway would continue on a grade separated facility north across the island, ultimately entering the easternmost cell below the bridge deck in the northbound bridge over the Columbia River. Pedestrians and bicyclists could access the multi-use path at the North Hayden Island Drive ramp or at the stairs or ramp at the Hayden Island light rail transit station.

Exhibit 2.2-25

Hayden Island Bicycle and Pedestrian Improvements

INSERT GRAPHIC: NEW HAYDEN ISLAND BICYCLE AND PEDESTRIAN IMPROVEMENTS

River Crossing

The new northbound bridge over the Columbia River would also accommodate a multi-use pathway under the highway deck (Exhibit 2.2-26). This path would be 16 to 20 feet wide, located within the superstructure above the bridge columns and below the bridge deck. The multi-use path would separate pedestrians and bicyclists from vehicle noise and avoid proximity to moving vehicles. The path would also separate pedestrians and casual bicyclists from higher speed bicyclists through pavement markings and possibly different colored pavement. All bicycle and pedestrian improvements would meet ADA accessibility standards.

Exhibit 2.2-26

River Crossing Bicycle and Pedestrian Improvements

INSERT GRAPHIC: NEW RIVER CROSSING BICYCLE AND PEDESTRIAN IMPROVEMENTS

The composite deck truss bridge would use a series of discrete, steel diagonal members, instead of solid walls, on the sides of the superstructure (Exhibit 2.2-3). This bridge type would afford a partially open-sided, covered pathway for bicyclists and pedestrians.

Ramps would connect the multi-use path to Columbia Way and Columbia Street in Vancouver and to Hayden Island Drive on Hayden Island. Having the multi-use path beneath the highway deck would shorten connections, as the pathway's elevation would be lower than the roadway deck. Separating the multi-use path from highway traffic would reduce exposure to motor vehicle noise. The wide multi-use path would also reduce conflicts between pedestrians and bicyclists by affording enough space to accommodate two-way travel for both.

safety and security

A maintenance and security program for the multi-use pathway would be established. It could include some or all of the following, as well as additional elements:

- Identification of reliable funding sources and responsible parties for maintenance and security
- Commitment of reliable funding sources and responsible parties for maintenance and security
- Demand responsive and prompt facility management and maintenance
- Opportunities to "program the space" and support activity (e.g., kiosks, overlooks, vendor opportunities) to provide "eyes on the pathway"
- Ensure 24-hour, 7-days-a-week pedestrian and bicycle access to and across the bridge and its connecting pathways
- Visible and regular on-site monitoring by law enforcement officers or security staff
- Security cameras monitored by law enforcement officers or security staff
- Call boxes to enable bridge users to report immediate maintenance needs and security concerns
- Efficient, sufficient, vandal-proof, no glare and dark skies compliant clear, crisp, white LED lighting
- Clearly posted laws and ordinances
- Advance notification and posting of maintenance closures and detours
- Citizen and volunteer participation shall be encouraged for future maintenance, operations and programming

For more information, please see Appendix Q, Bicycle/Pedestrian Maintenance and Security Program.

Downtown Vancouver

The multi-use path off the Columbia River bridge would provide access to downtown Vancouver via a ramp to the intersection of SE Columbia Way and Columbia Street (Exhibit 2.2-27).

The multi-use path would provide connections to regional pedestrian and bicycle facilities that exist throughout Vancouver. These include the Waterfront Renaissance Trail on the north bank of the Columbia

River, which provides vehicle-separated access to the Confluence Land Bridge, Vancouver National Historic Reserve, and points farther east. The existing bicycle route along Columbia Street enables access through downtown Vancouver and northwest along 15th Street toward Vancouver Lake. There are a number of east-west streets with bicycle lanes that cross I-5, providing access to the Burnt Bridge Creek Greenway Trail and to the larger system of regional trails in Clark County.

Sidewalks 12 to 18 feet wide would be provided along both sides of Washington Street and Broadway Street along the new light rail alignments, with ADA-compliant crosswalks at all intersections to 17th Street. In some areas, the sidewalk width includes planter strips.

Exhibit 2.2-27

Vancouver Bicycle and Pedestrian Improvements

INSERT GRAPHIC: VANCOUVER BICYCLE AND PEDESTRIAN IMPROVEMENTS

Evergreen Boulevard and Community Connector

The existing I-5 overpass for Evergreen Boulevard would be rebuilt (see Exhibits 2.2-27 and 3.8-38). The overpass would have bicycle lanes and sidewalks with clear delineation and signing. The new pedestrian and bicycle facilities would connect to existing routes along these streets. All improvements would meet the ADA accessibility standards.

The new community connector would be built to the south and separate from the existing Evergreen overpass. It would be approximately 400 feet wide and would include landscaping, pathways and other public space. It would function as a lid over I-5 and as a "community connection" between downtown Vancouver and the Vancouver National Historic Reserve. In addition to improved pedestrian and bicycle connections, the facility would improve visual and cultural landscape connectivity. This new public space is proposed as part of the project and provides space for historic waysides, pedestrian amenities and other mitigation.

Mill Plain Boulevard Interchange

The Mill Plain Boulevard interchange would receive several improvements for bicyclists and pedestrians (Exhibit 2.2-27). These include bicycle lanes, 12-foot sidewalks, clear delineation and signage, short perpendicular crossings at the ramp terminals, ramp orientations to encourage high pedestrian visibility, and new connections to F Street and to Marshall Park. The ramp crossings would be signalized; however, under both the existing condition and the LPA, pedestrians are not/would not be permitted to cross Mill Plain.

McLoughlin Boulevard and 17th Street

McLoughlin Boulevard currently has designated bicycle lanes which would be retained. The impacted portion of McLoughlin would have bicycle lanes and 12-foot sidewalks rebuilt. Crosswalks and 12-foot sidewalks would be built along the alignment on 17th Street. All improvements would meet ADA accessibility standards (Exhibit 2.2-27).

Fourth Plain Boulevard Interchange

The proposed Fourth Plain interchange improvements would increase bicycle and pedestrian safety by adding eastbound and westbound bicycle lanes, with a 6-foot sidewalk on the south side. Near where the ramp to northbound I-5 connects with Fourth Plain, there would be a 14-foot multi-use path running south and north to increase cycling and walking access to adjacent neighborhoods on the east side and to the proposed Clark Park and Ride. Bicycle storage would be provided for cyclists at the park and ride. Clearly marked ADA-compliant crossings would be placed at each intersection approaching the park and ride (Exhibit 2.2-27).

~~29th Street and 33rd Street Overpasses~~

~~New I-5 overpasses would be built for 29th Street and 33rd Street (Exhibit 2.2-14). Each overpass would have bicycle lanes and 6-foot minimum width sidewalks on both sides, with clear delineation and signing. The new pedestrian and bicycle facilities would connect to existing routes along these streets. All improvements would meet ADA accessibility standards.~~

~~SR 500 Interchange~~

~~39th Street would have 6-foot sidewalks and 6-foot bicycle lanes on both the north and south sides from H Street to 15th Avenue, where today, sidewalks exist only on the north side (Exhibit 2.2-15). Also, connections would be made to an existing neighborhood path at N Street in the southeast quadrant of the interchange and to two existing paths at I street in the northwest quadrant of the interchange. With the LPA with highway phasing option, bicycle and pedestrian improvements associated with phased highway improvements would also be phased.~~

Table 2-1. Proposed TriMet and C-TRAN Bus Route Changes

Bus Route	Route Changes
TriMet Line 6	Route would be revised to terminate at the Expo Center transit station. Route anticipated to travel from NE Martin Luther King Jr. Boulevard through the newly configured Marine Drive area, then continue west to connect to west side of I-5 with the Expo Center transit station.
C-TRAN Fourth Plain and Mill Plain bus rapid transit (The Vine) [1]	Route would be revised to begin/end near the Evergreen Boulevard station in downtown Vancouver and provide service along Evergreen to Fort Vancouver Way where it would travel to or from Mill Plain or Fourth Plain depending on clockwise/counterclockwise operations. The Fourth Plain route would continue to serve existing Vine stations beyond Evergreen Boulevard.
C-TRAN #2 Lincoln	Route would be modified to begin/end near C Street and 9th Street in downtown Vancouver.
C-TRAN #25 Fruit Valley	Route would be modified to begin/end near C Street and 9th Street in downtown Vancouver.
C-TRAN #30 Burton	Route would be modified to begin/end near C Street and 9th Street in downtown Vancouver.
C-TRAN #60 Delta Park Regional	Route would be discontinued.

1 Mill Plain bus rapid transit is currently under construction with operation anticipated to start in 2023.

~~2.1.1~~2.2.8 Tolling

Tolling ~~of~~ cars and trucks that use the I-5 river crossing is proposed as a method to help fund the ~~CRC project~~IBR program and ~~to~~ encourage ~~the use of~~ alternative modes of transportation. ~~Tolls would be collected using an electronic toll collection system, so that toll collection booths would not be required. Instead, motorists could obtain a transponder that would sense each time the vehicle crosses the bridge; the vehicle owner would be billed automatically. 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; a processing fee would be charged for cars without transponders.~~

~~The LPA proposes to apply a variable toll on vehicles using the I-5 crossing. Tolls would vary by time of day, with higher rates during peak travel periods and lower rates during off-peak periods.~~ Federal ~~Medium and heavy trucks would be charged a higher toll than passenger vehicles.~~ ~~The traffic-related impact analysis in this FEIS is based on tolling in both directions, and on toll rates that, for passenger cars with transponders, would range from $1.00 during off-peak times to $2.00 during peak travel times (in 2006 dollars); see Exhibit 2.2-28.~~

~~Exhibit 2.2-28~~

~~**Toll Rate Structure for Passenger Cars with Transponders**~~

~~**INSERT GRAPHIC: TOLL RATE STRUCTURE FOR PASSENGER CARS (WITH TRANSPONDERS)**~~

~~The DEIS evaluated four tolling scenarios: no toll; a standard variable rate toll on the I-5 crossing (ranging from $1.00 to $2.00 throughout the day, as described above); a higher variable rate toll on the I-5 crossing (ranging from $1.00 to $2.50 throughout the day); and a standard variable rate on both the I-5 and I-205 crossings.~~

~~The authority to toll the I-5 crossing is set by federal~~ and state laws set the authority to toll the I-5 crossing. 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 ~~(USC 129(a)(1)(C)); the CRC project would meet these conditions. Prior to tolling I-5,~~. State legislation in Washington permits WSDOT ~~and ODOT would have to enter into a~~ to toll ~~agreement with the U.S. Department of Transportation (DOT). In 2008, the Washington legislature passed enabling language for tolling on I-5,~~I-5 provided that ~~each~~ the Washington Legislature first authorizes the tolling of the facility ~~is later authorized under specific legislation (HB 1773, 2008 Regular Session).~~ Once authorized by the legislature, the Washington State Transportation Commission has the authority to set the toll rates. In Oregon, the Oregon Transportation Commission has the authority to toll a facility and to set the toll ~~rates (ORS 383).~~rate. 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 ~~implementing tolls,~~ setting toll rates~~,~~ and guiding the use of toll revenues. WSDOT and ODOT would then enter into an agreement addressing implementation logistics for tolling the bi-state facility.

Tolls would be collected using an electronic toll collection system; toll collection booths would not be required. Instead, motorists could obtain a transponder and set up a payment account that would automatically bill the account holder associated with the transponder each time the vehicle crossed the bridge. 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.

The Modified LPA proposes to apply a variable toll on vehicles using the I-5 crossing, to be collected electronically in both directions. Tolls would vary by time of day with higher rates during peak travel periods and lower rates during off-peak periods. Currently, there are two scenarios for the tolling assessment. For purposes of this NEPA analysis, tolls are assumed to range between $1.40 and $2.90 (in 2022 dollars) for passenger vehicles with a registered toll payment account. Medium and heavy trucks would be charged a higher toll than passenger vehicles. ~~With few exceptions, federal statutes do not permit tolling of an existing interstate highway without associated improvements. FHWA does have pilot programs that allow state departments of transportation to apply for the approval to toll a facility. The project sponsors are not proposing to toll the I-205 crossing as part of the CRC project. It is possible that a toll could be placed on the I-205 crossing in the future separate from the CRC project.~~

~~In addition, tolling prior to or during construction can be used to manage demand and begin collecting revenue. This is not currently proposed but could be implemented if approved.~~

Vehicles without a registered toll payment account are assumed to pay an additional $2.00 per trip to cover the cost of identifying the vehicle owner from the license plate and invoicing the toll by mail.

~~2.1.2~~2.2.9 Transportation System and Demand~~-~~ Management Measures

Many well-coordinated transportation demand management (TDM) and transportation system management (TSM) programs are already in place in the Portland-Vancouver metropolitan region and are supported by ~~various~~ agencies and adopted plans. In ~~some~~most cases, the impetus for the programs ~~is~~are from ~~two~~ state-mandated programs: Oregon's Employee Commute Options ~~(ECO)~~ rule~~,~~ and Washington's Commute Trip Reduction ~~(CTR)~~ law. ~~However, TDM and TSM projects, by themselves, would not solve the many problems identified in the CRC project's purpose and need, including seismic vulnerability, poor bicycle and pedestrian facilities and connections, poor transit mobility, and safety issues because of substandard highway design features.~~

~~Insert sidebar: Terms and Definitions. TDM & TSM. Transportation demand management (TDM) seeks to reduce the number of vehicles using the road system, especially single-occupant vehicles, while providing alternative options to auto travel. Transportation system management (TSM) 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 CRC Project Sponsors Council (PSC) supports creation of a local advisory Mobility Council to provide recommendations and advise the WSDOT, ODOT, and transit districts on the optimal long-term performance of all modes of transportation on the Columbia River Crossing and the adjoining city streets and highways. The PSC supports practical and measureable performance standards to maintain long-term system performance.~~

~~Insert Sidebar: The Governors of Oregon and Washington formed the Project Sponsors Council (PSC) to advise the departments of transportation on project development. PSC is comprised of executive or elected officials (plus two citizen co-chairs) from the following local and state agencies involved in the planning and decision making for the CRC project:~~

~~Oregon Department of Transportation~~

~~Washington Department of Transportation~~

~~City of Portland~~

~~City of Vancouver~~

~~Metro~~

~~SW Washington Regional Transportation Council~~

~~TriMet~~

~~C-TRAN~~

~~The intended purpose of the Mobility Council would be to help maximize the long-term benefits of the new multimodal crossing for all users and affected stakeholders in an equitable manner by recommending actions on the part of WSDOT, ODOT, transit agencies, and cities in support of the agreed upon goals. For more information on how the performance of the corridor could be monitored and how TDM and TSM measures might be implemented by the Mobility Council in support of corridor performance goals, see the Performance Measures Advisory Group Interim Report and Recommendation available on the CRC web site.~~

The physical and operational elements of the ~~CRC project~~IBR program provide the greatest TDM opportunities by promoting other modes to fulfill more of the travel needs in the project corridor. These include:

- ~~A~~Major new light rail line ~~with connections to~~ in exclusive right of way, as well as express bus ~~and feeder~~ routes ~~operated by C-TRAN and TriMet~~and bus routes that connect to new light rail stations.

- I-5 median shoulders that accommodate express buses.
- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians~~,~~ and improve connectivity, safety, and travel time.
- Park-and-ride facilities.
- A variable toll on the highway crossing.

In addition to these fundamental elements of the project, facilities and equipment would be implemented that could help existing or expanded TSM programs maximize the capacity and efficiency of the system. These ~~could~~ include:

- Replacement or expanded variable message signs or other traveler information systems in the ~~CRC project~~IBR program area.
- ~~Continued~~Expanded incident response capabilities.
- Queue jumps or bypass lanes for transit vehicles where ~~multi-lane~~multilane approaches are provided at ramp signals for ~~entrance~~ on-ramps.
- Expanded traveler information systems with additional traffic monitoring equipment and cameras.

~~A TDM Committee was convened specifically to address TDM as a solution to the possible loss of capacity during the construction phase of the project. The TDM Committee met 14 times, beginning in December 2008, and presented its recommendation to the PSC in March 2010.~~

~~The TDM Committee's work focused on developing specific strategies that could be employed to offset the possible loss of capacity associated with construction in the corridor. The Committee's recommendations focused on reducing vehicle trips during the southbound, 4-hour morning peak period and the northbound, 4-hour afternoon peak period. Focusing mostly on work trips, the TDM program is expected to result in trips saved in the peak travel direction during both peak periods. Congestion reduction strategies would be utilized during construction. The measures employed at various times will vary depending upon their ability to achieve the desired results and their effectiveness in achieving measurable success in previous stages. Congestion reduction measures identified include:~~

- ~~Providing alternatives to single-occupancy vehicle (SOV) trips, for example, vanpools and/or increased transit service, such as:~~
  - ~~Providing funding for the acquisition or lease of transit buses for operation by C-TRAN on existing or modified routes connecting with the Parkrose or Delta Park/Vanport MAX stations.~~
  - ~~If not available through Washington's Vanpool Investment Program, providing funding for acquisition or lease of vans to be operated by C-TRAN's existing vanpool program.~~
- ~~Undertaking or providing funding for minor transit station or passenger loading area improvements for C-TRAN routes providing connecting service to TriMet's MAX stations and park and ride facilities.~~
- ~~Providing funding for operational purposes consisting of:~~
  - ~~General employer outreach programs~~
  - ~~Individualized employer marketing programs~~
  - ~~Residential individualized marketing programs~~
  - ~~Public awareness campaigns~~
  - ~~Vanpool/carpool marketing programs~~

- Vanpool participant subsidies (short-term)
- Operating funding to support C-TRAN high-frequency transit service connecting to MAX

- ManagingActive traffic and lane closures to avoid congestion and delaymanagement.
  - Providing traveler information at key junctions to encourage traffic diversion from the I-5 corridor and crossing routes.
  - Promoting continuous information campaigns to alert motorists of delay times within the corridor and of upcoming traffic pattern changes and detours.
  - Incorporating transit priority measures where feasible.
  - Instituting contractor incentives to shorten construction durations and encourage the use of lower-emitting construction equipment.

For more information, please see the TDM/TSM Technical Report, included as an electronic appendix to this document.

2.1.3 Mitigation

This FEIS includes mitigation measures to address the adverse impacts that the LPA would cause. These mitigation measures are described in each section of Chapter 3 of this FEIS and are summarized in Appendix L, Impacts and Mitigation. In addition to mitigation, measures to minimize impacts have been incorporated into the project design and construction approach.

2.2 Construction Methods

The CRC project encompasses the reconstruction of interstate highway and interchanges, construction of over-land and over-water bridges, new pedestrian and bicycle facilities, and light rail. The precise character of construction impacts depends on design details and methods that are not likely to be finalized until final design, construction contracting, or construction itself. However, it is possible to identify key aspects of construction that allow this FEIS to evaluate potential impacts and identify appropriate mitigation. This section explains the anticipated sequencing and duration of construction and the types of activities involved in building the major elements of this project.

2.2.1 Construction Sequence and Duration

The construction timeline is estimated at 6 to 7 years. The construction of the river crossing sets the sequencing for other project components. The first construction activities would be associated with building the Columbia River bridges, although other elements of the project would be started well before these bridges are finished. Construction of the Columbia River bridges is estimated to last approximately 4 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; install temporary piles to support work and anchor barge platforms.
- Installation of drilled shafts – Install drilled shafts to support the bridge pier columns.
- Shaft caps – Construct and anchor concrete foundations on top of the drilled shafts to support pier columns.
- Pier columns – Construct or install pier columns on the shaft caps.

- Bridge superstructure – Build or install the horizontal structure of the bridge spans across the piers; the superstructure would be steel or reinforced concrete; concrete could be cast-in-place or precast off site and assembled on site (Section 2.3.3).

This sequence would be staggered, with pier construction generally expected to occur at two pier locations at once. The bridge deck would be constructed in sequence as well, once adjacent pier sets are completed.

Interchanges on each end of the bridge would first be partially constructed so that all I-5 traffic could be temporarily re-routed onto the new southbound (western) Columbia River bridge. Constructing the southbound approaches for both the SR 14 and Hayden Island interchanges would require approximately 3 years. Certain portions of both the SR 14 and Hayden Island interchanges must be completed before traffic can be moved onto the new southbound lanes and construction of the remaining northbound lanes and interchange ramps can proceed. Once I-5 traffic in both directions is rerouted to the new western I-5 bridge, the new northbound segments of the Hayden Island and SR 14 interchanges would be constructed. Road closures and detours are addressed in Chapter 3 (Section 3.1).

Similarly, the Marine Drive interchange construction would need to be coordinated with construction of the southbound lanes coming from Vancouver. While this interchange can be constructed independently from the work described above, the completion and utilization of the ramp system between Hayden Island and Marine Drive requires the work to occur in the same period. Early construction of the local multimodal bridge between Marine Drive and Hayden Island, so that it can be used as an alternate access route during the remaining construction period, will be analyzed during final design. The interchange reconstruction also needs to occur so that Marine Drive can be elevated, allowing the light rail extension to cross under Marine Drive. The Marine Drive interchange is expected to take a little more than 3 years to construct, including work at the Victory Boulevard interchange.

The northbound bridge and the northbound off-ramp to SR 14 must be completed and opened before traffic can be routed to the new bridges. Removal of the existing bridges is expected to take about 1.5 years. It can commence after traffic is rerouted to the new Columbia River bridges near the completion of the SR 14 and Hayden Island interchanges. During removal of the bridges, there would likely be weekend closures of I-5. Traffic would be encouraged to take I-205 during these periods rather than navigate around the closed I-5 section. Detour routes would be signed. Extensive outreach would be made prior to any closure, and traffic advisories and updates would be made available to the public to inform travel choices.

Exhibit 2.3-1

Construction Sequence and Duration

INSERT GRAPHIC: CONSTRUCTION SEQUENCE AND DURATION

The three interchanges north of SR 14 – Mill Plain, Fourth Plain, and SR 500/39th Street – could be constructed independently of the southern half of the project, and independently of each other. It would be most efficient to complete all highway construction north of SR 14 at once. Detours of I-5 around the SR 500/39th Street interchange would facilitate efficient construction in this area. During removal of overpasses over I-5, closures of I-5 will likely be necessary. These I-5 closures would be at night and/or on weekends only. All three interchanges could be constructed in 4 years. More aggressive and costly staging could shorten this timeframe.

Construction of the light rail component would require about 5 years for completion. A shorter construction period is possible if work on either side of the river precedes the completion of the Columbia River bridges. Any bridge structure work would be separate from the actual light rail construction activities on the bridge and must be completed first.

~~The shortest total project construction timeline is approximately 6 years if the project sequencing is staged as efficiently as possible (Exhibit 2.3-1). This would require construction of all interchanges before the completion of the Columbia River bridges. Funding will be a major factor in determining the overall sequencing and construction duration. Contractor schedules, weather, materials, and equipment could also influence construction duration. Approximately 6 years is also the time required to complete the smallest usable segment of roadway, which is the Hayden Island through SR 14 interchanges. Timelines are in part dependent on how much work can be funded and commenced at any given time. Estimation of timelines may be revisited once funding and other factors are more fully defined. The overall construction timeline is not expected to significantly change with the LPA with highway phasing, or change based on LPA Option A or Option B.~~

~~Road Closures and Detours~~

~~Constructing the project would entail many different activities, some of which would disrupt traffic. Typical construction methods would require shifting I-5 traffic onto temporary alignments, narrowing lanes and shoulders to accommodate equipment and workers, shortening merge and exit distances, reducing posted speed limits, and closing or detouring some traffic movements. For I-5, it is anticipated that three southbound and three northbound lanes would be maintained during all weekdays, except when the final changeover occurs between the old bridges and the new bridges. When temporary lane closures are needed to accommodate construction and ensure safety, they would typically occur at night and on weekends. It is expected that all of the current movements at each interchange would remain open during construction, with the exception of those movements that would be permanently changed. For a discussion of road closures and detours, see the Temporary Effects section of Chapter 3.1 Transportation.~~

2.3 Modified LPA Construction

The following information on the program's construction activities and sequence follows the information prepared for the CRC LPA. Construction durations have been updated for the Modified LPA. Since the main elements of the IBR Modified LPA are similar to those in the CRC LPA (i.e., multimodal river crossings and interchange improvements), this information provides a reasonable assumption of the construction that would be required. As the design progresses, the information will be updated for the Modified LPA.

The construction of bridges over the Columbia River is the most substantial element of the program, and this element sets the sequencing for other program components. The main river crossing and immediately adjacent highway improvement elements would account for the majority of the construction activity necessary to complete this program.

2.3.1 Construction Components and Duration

Table 2-2 provides the expected duration and additional information on each element of the program. These estimates are preliminary and are subject to change as project design and planning progress.

Table 2-2. Construction Activities and Estimated Duration

~~Over-water Bridge Construction~~

~~The following describes the types of activities anticipated to construct the bridges over the Columbia River and North Portland Harbor.~~

~~Temporary piles ranging from 24 to 48 inches in diameter and driven to depths of 80 feet or more beneath the riverbed would be required to support work platforms and/or to stabilize work and material barges during construction of the Columbia River and new North Portland Harbor bridges. In addition, temporary~~

cofferdams consisting of interlocking sections of sheet piles would be used during construction of the piers closest to the shorelines (Exhibit 2.3-2).

Exhibit 2.3-2

Cofferdam

INSERT PHOTO: COFFERDAM

The in-water bridge piers would be founded on drilled shafts installed deep into the riverbed. Large diameter (approximately 10 feet) steel casing would be installed to a specified depth, likely into the top of a competent geological layer known as the Troutdale Formation, which varies in depth from approximately 80 feet to 240 feet beneath the riverbed (Exhibit 2.3-3). For drilled shafts, a vibratory hammer, oscillator, or rotator, rather than an impact hammer (pile driver), would be used to advance the casing. Once the casing has been installed to the required depth, all soil would be removed from the inside of the casing and transferred onto a barge. Excavation inside the casing would continue past the lower end of the casing into the Troutdale Formation to a specified elevation. After the excavation phase, reinforcing steel would be installed into the shaft and then the shaft would be filled with concrete. The steel casing may be removed, depending on the installation method. Approximately 16 of these shafts would be needed for each of the six in-water pier sets.

Exhibit 2.3-3

Soil Profile across the Columbia River

INSERT GRAPHIC: TROUTDALE FORMATION

Concrete drilled shaft caps would either be cast-in-place or precast concrete. Both methods would require cranes, work barges, and material barges in the river to place or set the caps on the shafts. The concrete would tie all the piles together and provide a base of support for each bridge column.

The superstructure would be constructed of structural steel, cast-in-place concrete, or precast concrete. This would require cranes, work barges, and material barges in the river to place or set the structures spanning the piers.

The final stage of the Columbia River bridge construction would include finishing the bridge decks for freeway traffic, installing signage and lighting, installing trackwork and electrification for the light rail transit, and other activities completed either on or under the bridge decks.

Over-water Bridge Demolition of the I-5 Bridges

The components of the existing I-5 bridges would be dismantled and removed. The main components include the bridge decks, the counterweights for the lift span, towers, deck, trusses, piers, and piles.

Removal of the counterweights would likely occur first, and would involve dismantling the counterweights and removing them from the tower structure by trucks and/or barges. The lift towers would be removed by cutting them into manageable pieces and loading these pieces onto barges. Deck removal would be done by cutting the deck into manageable pieces and removing these pieces by barge or truck; a second option would be to demolish the deck in sections using a breaker, in which case debris would be caught on a barge or other containment system below the work area.

After demolition of the concrete decks, the trusses could be cut into manageable pieces and loaded onto barges to be transported to and dismantled at an appropriate upland site accessible to the river. Alternately, the trusses could be lifted whole off the piers and transported via barge to another location for reuse, if a new use can be found for them.

Reinforced concrete approach spans connect each end of each bridge to the highway on either side of the river. There is one overland span on the Washington shore and four overland spans on Hayden Island. Two different methods could be used to remove the existing bridges' piers:

- After removing the trusses, the piers could be broken up and removed. Timber piles could then be extracted or cut off below the mud line. If it is deemed necessary for water quality purposes, cofferdams could be installed around the piers and the piers removed from within the cofferdam. If cofferdams are not deemed necessary, the piers could be removed without cofferdams.
- After removing the trusses, a diamond wire/wire saw could be used to cut the piers into manageable chunks that would be transported offsite. Timber piles could then be extracted or cut off below the riverbed.

Factors that would be considered in final pier removal include site-specific considerations (such as depth), safety, phasing constraints, and impacts to aquatic species.

Temporary piles would be required to support work and material barges necessary to install and remove cofferdams and move equipment during bridge demolition.

The existing Columbia River bridge piers are supported on timber piles driven into the river bottom. Approximately 200 existing timber piles at each of nine piers means there would be approximately 1,800 total piles to be removed or cut off below the mudline. It is unknown whether these timber piles have been treated with creosote. Depending on whether piles have been treated and/or whether they pose hazards to navigation, there may be options to leave piles in place. If piles are extracted, methods could include use of a vibratory extractor, direct pull, or a clam shell dredge. To minimize stirring up sediment, cofferdams may be installed around the existing piers once the superstructure (trusses) are removed. With either method, the pieces of the piers and piles would be removed by barge.

Over-water Bridge Renovation of the Existing North Portland Harbor Bridge

The highway bridge crossing North Portland Harbor was constructed in the 1980s, primarily of pre-stressed concrete girders and reinforced concrete piers. The longest span over the navigation channel is 230 feet long; the remaining eight spans range in length from 115 feet to 185 feet. The piers are supported by driven steel piling.

LPA Option A: This option would not widen the existing bridge. The bridge would accommodate mainline I-5 traffic, but would not require the widening of the existing structure.

LPA Option B: As part of Option B, the existing bridge would be widened primarily on the west side of the existing bridge, although some widening on the east side near the Hayden Island shore may be required. New construction is anticipated to require additional columns next to each of the existing piers to support widening. Columns would likely be supported on single drilled shafts. Widened piers would support girders that are similar to the existing bridge. In-water construction would require cranes, work barges, and material barges in North Portland Harbor.

Highway and Over-land Bridge Construction

The reconstruction of mainline I-5 and associated interchanges would involve a sequence of activities that would be repeated several times, including on-land bridge and retaining wall construction, the excavation of embankments, and laying the pavement driving surface. Over-land bridges would be built throughout the project area. Most bridges would be constructed on pile or drilled shaft foundations, though some would be built on spread footings. In the sensitive areas around the SR 14 interchange, either drilled shafts or spread footings could be used. Spread footings distribute the weight of the bridge over a larger surface area and do not require deep drilling. Drilled shaft installation on land would be similar to that in the Columbia River, as

described above. Large cranes would support drilling equipment that would drill large diameter holes in the ground, followed by placement of reinforcing steel and concrete. Columns would then be constructed on the shafts to support the new superstructure.

The superstructures of the over-land bridges would either be steel cast-in-place or precast. For cast-in-place techniques, temporary falsework would be erected and concrete forms built on top of them. Reinforcing steel and concrete would be placed in the forms to construct the superstructure. Precast beams would be cast off site at existing facilities or casting yards constructed for the project, then driven to the site in special vehicles that can accommodate the long loads. The beams would be lifted in place by cranes. Concrete for the roadway deck would then be poured on top of the beams, with temporary formwork between the beams to support the deck with reinforcing bars placed in the forms to construct the superstructure.

Insert Sidebar: Terms and Definitions: Retaining walls. Retaining walls are used to hold back earth from encroaching on the roadway. Mechanically Stabilized Earth (MSE) walls are fill walls built up from the existing ground. Cantilever soldier pile walls are cut walls that do not need additional reinforcement. Tieback soldier pile walls are similar to cantilever walls and are used when a higher wall is needed. An anchor is installed into the soil behind the wall. Subterranean easements are required. Secant pile walls are used when a high wall is needed but limited right-of-way is available.

Construction of the LPA would require the use of at least four types of retaining walls: Mechanically Stabilized Earth (MSE) walls, tieback soldier pile walls, cantilever soldier pile walls, and secant pile walls. As for over-land bridges, many of the walls would have to be constructed in sections to accommodate shifting of traffic in its various stages. Noise walls, either cast-in-place or precast, would be built on top of the finished walls, or at grade.

Where walls are not necessary, earthwork equipment would build embankments. Embankments must be built in layers with thorough compaction to ensure stability. Because of the lack of space to construct these embankments in the narrow corridor, large earthmoving equipment is not envisioned for use in this work. Wheel type loaders, back hoes and similar type equipment would be used.

In some locations, especially Hayden Island, it is likely that ground improvements would be necessary. Ground improvements are utilized where soil has the possibility of liquefying during an earthquake. Below-ground sediment is mechanically stabilized in order to decrease the seismic vulnerability of the structures. Various techniques could be employed, including excavating land around a structure and burying stone columns into the ground, or boring into the ground and inserting a stabilizing material, such as a concrete slurry, into the bored holes.

A pavement driving surface would be laid to connect each interchange. This driving surface would be constructed on top of a base layer of material called the subgrade. Dump trucks would be used to transport material to and from the project to construct the subgrade. Rock would be placed by dump trucks on the subgrade and compacted with rollers, followed by several lifts of asphalt or concrete pavement and compaction. Illumination, intelligent transportation systems, and signal conduits are generally placed prior to final surfacing operations. Final drainage fixtures would be placed during final surfacing. Placement of concrete barriers, guardrails and other safety devices is done following the surfacing work, as is landscaping the exposed earthen slopes.

Construction would require staging areas to store construction material, to load and unload trucks, and for other construction support activities. Multiple staging areas would be needed, given the linear nature of the project and that much of it could be under construction at the same time. The existing I-5 right-of-way would 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 would likely be needed outside the existing right-of-way, and temporary property easements from adjacent or nearby property owners may be required as identified in Section 3.3, Property Acquisitions and Displacements.

Light Rail Construction

Construction of the light rail alignment over North Portland Harbor and Hayden Island is described with the river crossing and highway improvements, since these elements are so closely tied to the adjacent highway structures. Following is a description of construction activities necessary to build the light rail alignment through Vancouver.

Roadway reconstruction for the light rail alignment would include restriping or rebuilding the road surface, rebuilding sidewalks in some sections, and constructing station platforms. Streetscape improvements would include removing, replacing, or adding street trees and landscaping, 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 roadway along the light rail alignment would need to be rebuilt to include the trackway. It also generally requires that any utilities located beneath the guideway be relocated. Light rail would also require installation of catenary wires directly over the guideway to provide electrical power to the trains. Additionally, it would be necessary to seek temporary construction easements or small permanent easements on some properties adjacent to the light rail alignment 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 behind the sidewalk.

Construction of the light rail guideway in Vancouver streets would need to be sensitive to the area's active urban environment. Maintaining access for motorists, delivery and service vehicles, cyclists, and pedestrians during business hours is a key component of construction plans. Streets would be open to traffic and pedestrians when possible, but would need to close during some construction activities (pedestrian access would always be maintained except for brief disruptions). Rather than partially closing lanes through the entire segment for long periods of time, it is currently assumed there would instead be full traffic closures of short segments to allow construction to be completed in a much shorter time frame in any given block. Crews typically work within a three- to five-block area before moving to the next construction zone. Light rail transit construction on existing streets would be staged and managed so as not to disrupt any single area for an extended period of time.

Transit construction would also require staging areas along the guideway to store construction equipment and to store and assemble materials. Many of the staging activities would 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. One large vacant site has been identified for light rail transit construction staging, located between Washington and Columbia Streets and 8th and 9th Streets.

Haul Routes

Existing transportation corridors consisting of highways and arterials would be the major routes into and out of the construction areas. Trucks would be the primary and predominant carrier of goods and services. I-5, SR 14, SR 500, Martin Luther King Jr. Boulevard, and Marine Drive would serve as the major corridors into and out of the construction areas (Exhibit 2.2-1). Fourth Plain and Mill Plain Boulevards will serve important roles, but they are not expected to be as heavily used east of I-5. Materials source sites and the Port of Vancouver are west of the project site in Washington. Fourth Plain and Mill Plain Boulevards to the west of I-5 could experience higher use depending on material source sites and the potential use of Port property for staging or casting yards (see Section 3.17.3 Geology and Soils Long-term Effects for discussion of material source sites). Road networks in Vancouver and on Hayden Island would provide access to individual work areas and provide circulation for construction vehicles. Columbia Way parallels SR 14 and becomes the main access into the industrial area that could be used for various staging purposes. As such, it could become a heavier used haul route than envisioned for the other local road networks. However, Columbia Way may be used as a detour route, which may compound issues surrounding its use.

~~Bicycle and Pedestrian Mobility~~

~~Bicycle and pedestrian movements through the project area would remain during construction, although rerouting would be necessary. Detours would lengthen the distance of some bicycle and pedestrian routes. Temporary routes may be narrower in some places than exist today. There would be the occasional need for enclosures to protect users from debris. Bicycle and pedestrian traffic that is currently separated northbound from southbound on the bridge crossing would be shifted for extended periods to one pathway accommodating traffic in both directions.~~

~~East-west connections over I-5 in Vancouver at SR 14, Evergreen Boulevard, Mill Plain Boulevard, McLoughlin Boulevard, Fourth Plain Boulevard, 29th Street, and 33rd Street would be temporarily closed at times throughout project construction. When full closure of a connection is required, users would be detoured to a nearby intersection. For a more detailed description, see the Temporary Effects discussion in Chapter 3.1, Transportation.~~

Element	Estimated Duration	Notes
Interstate Bridge	4 to 7 years	• Construction is likely to begin with the main river bridges. • General sequence would include initial preparation and installation of foundation piles, shaft caps, pier columns, superstructure, and deck.
North Portland Harbor Bridges	4 to 10 years	• Construction duration for North Portland Harbor Bridges is expected to be similar to the duration for Hayden Island Interchange construction.
Hayden Island Interchange	4 to 10 years	• Interchange construction duration would not necessarily entail continuous active construction. Hayden Island work could be broken into several contracts, which could spread work over a longer duration.
Marine Drive Interchange	4 to 6 years	• Construction would need to be coordinated with construction of the North Portland Harbor bridges.
SR 14 Interchange	4 to 6 years	• Interchange would be partially constructed before any traffic could be transferred to the new structure.
Demolition of the Existing Bridges	1.5 to 2 years	• Demolition of the existing bridges could begin only after traffic is rerouted to the new bridges.
Three Interchanges North of SR 14	3 to 4 years for all three	• Construction of these interchanges could be independent from each other or from the southern half of the project. • More aggressive and costly staging could shorten this timeframe.
Light Rail	4 to 6 years	• The Columbia River crossing for light rail would be built with the main river bridges.
Total Construction Timeline	7 to 13 years	• Funding, as well as contractor schedules, regulatory restrictions on in-water work, permits and approvals, weather, materials, and equipment, could all influence construction duration.

~~2.1.3~~2.3.2 Potential Major Staging Sites and Casting ~~Yard~~Yards

~~Most~~Staging of ~~the staging of construction~~ equipment and materials would occur in many areas along the program corridor throughout construction, generally within existing or newly ~~acquired~~purchased right-of-way, on land vacated by existing transportation facilities (i.e., I-5 on Hayden Island), or ~~other~~on nearby vacant parcels ~~located along the project corridor. In addition, river crossing construction and some of the other construction activities described above would require~~. However, at least one large site would be required for construction offices to stage the larger equipment, such as cranes, and to store materials~~. In addition, if the bridge is constructed using precast techniques, then a~~ , such as rebar and aggregate. Criteria for suitable sites include large ~~casting yard for fabricating elements of the bridges would also be needed. These possible staging~~ and ~~casting sites have had a preliminary evaluation based on potential use of each site. After a contractor determines the exact activities that will occur on any of these sites, or any other site to be used for staging or casting, the contractor will need to ensure compliance with NEPA, Section 106 of the NHPA, and any other applicable federal, state and local regulations.~~

~~The major staging site would be as close as possible to the construction zone but would likely not be within the public right-of-way, and would thus require temporary use of a nearby parcel. If bridge construction uses cast-in-place techniques, then the bridge staging site would likely include a concrete batch plant, or the batch plant could be located on a barge. Suitable site characteristics include:~~

- ~~A large~~ open ~~site suitable~~ areas to provide for heavy machinery and material storage~~.~~

~~Waterfront property with~~, waterfront access for barges (either a slip or a dock capable of handling heavy equipment and material) to convey material to the construction zone~~.~~, and roadway or rail access for landside transportation of materials by truck or train.

- ~~Roadway or rail access for landside transportation of materials by truck or train.~~

~~Exhibit 2.3-4~~

~~Staging Sites and Casting Yards in Relation to Project Area~~

~~INSERT GRAPHIC: STAGING SITES AND CASTING YARDS IN RELATION TO PROJECT AREA~~

~~Three~~ Two potential major staging sites have been ~~evaluated as major staging areas (Exhibit 2.3-4):~~

~~5. Port of Vancouver Parcel 1A site: This 52-acre~~identified (see Figure 2-1). One site is located ~~along SR 501, near the Port of Vancouver's Terminal 3 North facility. Most of the property has an asphalt concrete surface. For staging purposes, any improvements would most likely be on top of this surface. Activities could consist of material storage, material fabrication, equipment storage and repair, and temporary buildings. This site is currently used as a staging area for windmill components. An application for development of a portion of this site has been submitted by Farwest Steel. If the site is developed according to the application, it would reduce the area available for staging by approximately 30 acres.~~

~~6. Red Lion at the Quay Hotel site: This 2.6-acre site would be partially acquired as a result of the CRC project, requiring the demolition of most of the building on this site. As such, it could make an ideal staging area due to its proximity to bridge construction, large size, and access to the river and because the project would already need to acquire at least part of this parcel. This site could be used for staging materials and equipment, and some small fabrication. Temporary buildings such as trailers or other mobile units would be used as construction offices.~~

~~Vacant Thunderbird Hotel site~~ on Hayden Island~~: Like the Red Lion hotel site, a large portion of this~~ on the west side of I-5.~~6-acre~~ A large portion of this parcel is already required for new right-of-way ~~necessary~~ for the Modified LPA. ~~It is also a relatively large parcel and is adjacent to the river and the construction zone.~~ The

same types of activities could occur on this site as on the Red Lion hotel sitesecond site is located in Vancouver on the east side of I-5, west of Clark College. Other staging sites may be identified during the design process or by the contractor.

A casting or staging yard could also be required for construction of the over-wateroverwater bridges. If if a precast bridge elements are used, portions of the bridge would be cast on an upland site (casting yard), transferred to a barge, shipped to the bridge construction site, and then lifted into place (Exhibit 2.3-5).concrete segmental bridge design is used. A casting yard would require similar characteristics as the major staging area, specifically, access to the river for barges (either, including a slip or a dock capable of handling heavy equipment and material),; a large area suitable for a concrete batch plant and associated heavy machinery and equipment,; and access to a highway and/or railway for delivery of materials. If a concrete batch plant is needed, it would likely be located on the casting yard site rather than on a separate staging site or on a barge. In addition to casting activities at the casting yard, staging and assembly of materials, including steel members, could occur on the site.

Construction of a casting yard may require some earthwork including minor excavation and grading. The purpose of any excavation is generally to remove loose or unstable material down to a substrate that is adequate to support construction activities. Additionally, gradingAs with the staging sites, casting or staging yard sites may also be required to establish level work surfaces and storage areas. After any excavation and/or grading, a firm working surface, usually consisting of crushed rock, may be installed.

Exhibit 2.3-5

Precast Bridge Segment Being Loaded onto Barge in Barge Slip

INSERT PHOTO: PRECAST BRIDGE SEGMENT BEING LOADED ONTO BARGE IN BARGE SLIP

Two sites have been evaluated as possible casting/staging yards (Exhibit 2.3-4):

Port of Vancouver Alcoa/Evergreen West site: This 95-acre site was previously used as an aluminum smelter and is currently undergoingbe identified as the design progresses or by the contractor and would be evaluated for potential environmental remediation, which should be completed before construction of the CRC project begins. The western portion of this site, which is best suited for a casting yard, currently contains two large settling ponds. However, the Port's long-term plans call for acquiring nearby land and relocating these ponds. A barge slip would need to be constructed into the existing bank for loading of precast sections. In addition, the property would require grading, drainage, and surfacing work to support the materials and equipment needed for a casting yardimpacts at that time.

7. Sundial site: This 50-acre site is located between Fairview and Troutdale, just north of the Troutdale Airport, and has direct access to the Columbia River. It has been used by Gresham Sand and Gravel as an aggregate quarry in recent years. The site already has a barge docking facility, but this would require improvements to accommodate the ability to load barges for hauling precast bridge sections.

If the construction contractor intends to use a staging site other than those evaluated in this environmental review process, prior to active use of that site, the contractor will seek and obtain permission from the state departments of transportation or project owner. The project owner will obtain concurrence from the Federal NEPA lead agencies prior to giving concurrence to the contractor and will assist the contractor in permitting the site.

2.22.4 The No-Build Alternative

The No-Build Alternative illustrates how transportation and environmental conditions would likely change by the year 20302045 if the CRC projectIBR program is not built (Exhibit 2.4-1).. This alternative makes the same

assumptions as the ~~build alternatives~~Modified LPA regarding population and employment growth through ~~2030~~2045, and it also assumes that the same transportation and land use projects in the region would occur as planned. ~~The No-Build Alternative also includes several major land use changes that are planned within the project area, such as the Riverwest development just south of Evergreen Boulevard and west of I-5, the Columbia West Renaissance project along the western waterfront in downtown Vancouver, and redevelopment of the Jantzen Beach shopping center on Hayden Island.~~ All traffic and transit projects within or near the ~~CRC project~~IBR study area that are anticipated to be built by ~~2030~~2045 separately from this ~~project~~program are included in the No-Build ~~and build alternatives. For a list of these traffic and transit projects, please see Appendix A of the CRC Cumulative Effects Technical Report, included as an electronic appendix to this FEIS.~~

Alternative and the Modified LPA. Additionally, the No-Build Alternative assumes bridge repair and continuing maintenance costs to the existing bridge that are not anticipated with the replacement bridge option ~~(CRC 2007a).~~.

~~Exhibit 2.4-1~~
~~**No-Build Alternative**~~

~~**INSERT GRAPHIC: NO-BUILD ALTERNATIVE**~~

~~2.3 Alternatives Evaluated in~~ Development of the ~~Draft EIS~~

~~2.3~~2.5 ~~The DEIS evaluated a No-Build Alternative and four build alternatives. The build alternatives also included a variety of options for light rail alignments, park and rides, intersection designs, and other options. Each build alternative was a combination of highway, transit, river crossing, bicycle/pedestrian, and tolling choices. The LPA is a refined version of one of the DEIS alternatives (referred to as Alternative 3 in the DEIS).~~Modified LPA

~~The No-Build Alternative was referred to as Alternative 1 in the DEIS (Exhibit 2.4-1). The build alternatives were Alternatives 2, 3, 4 and 5. Alternatives 2 and 3 were similar in highway, bicycle/pedestrian, river crossing and tolling components, but different in high-capacity transit mode. Alternatives 2 and 3 included a full replacement crossing. Alternatives 4 and 5 were similar to each other (and differed from Alternatives 2 and 3) in highway, bicycle/pedestrian, river crossing, and tolling components, but differed from each other in transit mode. Alternatives 4 and 5 included a supplemental river crossing (rather than full replacement crossing), fewer highway add/drop lanes, a higher toll on highway users, and more frequent headways for the new high-capacity transit line.~~

~~Two high-capacity transit modes were evaluated in the DEIS: bus rapid transit and light rail transit. Alternatives 2 and 4 were packaged with bus rapid transit while Alternatives 3 and 5 included light rail transit. The bus rapid transit system would include dedicated right-of-way for buses through the project area. The same alignments and terminus options were evaluated for bus rapid transit and light rail transit.~~

~~The DEIS evaluated four different high-capacity transit terminus options: Kiggins Bowl, Lincoln, Clark College, and Mill Plain. 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. The DEIS also evaluated several transit alignment options, including two options across North Portland Harbor and Hayden Island, two options running north-south through downtown Vancouver, two options for connecting downtown Vancouver to the proposed Clark Park and Ride, and two options for continuing north of downtown Vancouver to either the Lincoln or Kiggins Bowl terminus park and rides.~~

~~Exhibits 2.5-1 through 2.5-4 illustrate each of the alternatives evaluated in the DEIS, including the transit alignment and terminus options included in each of the build alternatives. Both a three-bridge design and a Stacked~~ As described earlier in this chapter, the 2011 ROD for the CRC Project included a Selected Alternative (also referred to in this document as the CRC LPA) that was modified through NEPA re-evaluations in 2012 and 2013. The project was discontinued in 2014. In 2019, a bi-state legislative committee requested that ODOT and WSDOT reinitiate the CRC Project, renaming it the IBR program. This section provides information on the 2011 Selected Alternative cleared through the CRC NEPA process, changes that have occurred since that NEPA process was completed, and the screening of new design options for the IBR program.

2.5.1 Selected Alternative in the 2011 ROD and Subsequent Modifications in 2012–2013

Substantial technical work was completed to support the development of the CRC Project. Multiple build alternatives were evaluated in the EIS documentation prepared for the project, and the results of these analyses were used to inform project planning, design, and preconstruction activities. FHWA and FTA issued a ROD for the project on December 7, 2011. The Selected Alternative identified in the ROD included the following primary components:

- A new river crossing over the Columbia River and I-5 highway improvements. Improvements to seven interchanges, from south to north: N Victory Boulevard, Marine Drive, Hayden Island, SR 14, Mill Plain, Fourth Plain and SR 500. Related enhancements to the local street network.
- Improvements to the existing I-5 mainline bridge over North Portland Harbor; three new bridges over this waterway associated with I-5; and one new multimodal bridge carrying LRT, local traffic, pedestrians and bicyclists.
- A variety of bicycle and pedestrian improvements throughout the project corridor, including a multiuse path connecting to the existing active transportation system. The path would allow users to travel between North Portland and downtown Vancouver over Hayden Island and the Columbia River.
- Extension of LRT from the Expo Center in Portland to Clark College in Vancouver and associated transit improvements. Three transit stations were proposed: one on Hayden Island, one in downtown Vancouver, and a terminus station near Clark College. Three park and rides were included: Columbia (near the SR 14 interchange), Mill Plain (in uptown Vancouver) and Clark (near Clark College). Improvements would be made to retrofit the existing rails and electrical system on the Steel Bridge to allow trains to travel at a higher speed. The Selected Alternative also included bus route changes and the expansion of the Ruby Junction LRT maintenance facility.
- Transportation demand and system management measures to be implemented with the project, including the use of tolls, subject to the authority of the Washington and Oregon Transportation Commissions.
- After the ROD was issued in 2011, the project design was further refined, affecting the impacts associated with the project. With each potentially significant change, the CRC Project team completed a NEPA re-evaluation. Two re-evaluations were completed:

- The Bridge Height NEPA Re-evaluation was signed by FHWA and FTA in December 2012. This re-evaluation considered an increase in the bridge's maximum vertical navigation clearance height from 95 feet to 116 feet; no significant additional impacts were identified.
- The Phased Construction NEPA Re-evaluation was signed by FHWA and FTA in September 2013. This re-evaluation considered the effects of phasing the construction of the Selected Alternative, which was disclosed as an option in the FEIS and ROD. The re-evaluation also included design refinements to the full Selected Alternative as described in the ROD to make the first phase operate better. Some of the design refinements included modifying the Hayden Island interchange in the Selected Alternative first phase to reduce the number of new bridges over North Portland Harbor and to reduce cost while still improving interchange performance. The September 2013 re-evaluation found that the impacts associated with the full Selected Alternative and the Selected Alternative first phase were similar and within the range of impacts reported in the FEIS and ROD.

2.5.2 Changes in Environmental Conditions since 2013

Since the issuance of the CRC ROD and subsequent re-evaluations, there have been changes in existing environmental conditions ranging from physical changes in development within the program footprint to regulatory changes to societal changes in community priorities and interests. This section briefly summarizes some of those changes.

- **Demographic changes –** The region added more than a quarter of a million residents between 2010 and 2020, with the majority being Black, Indigenous or People of Color (BIPOC) and/or Hispanic/Latino.
- **Housing costs –** The cost of housing has increased significantly, forcing many households with lower incomes to move to neighborhoods where housing is more affordable, but that may be farther from job and activity centers. The combination of longer distances traveled and limited public transit service in these areas places an added transportation cost burden on these community members, including many who moved from Portland to Clark County but still need to travel to Portland for work, medical appointments, family or other needs. Related to rising housing costs is a growing houseless population throughout the region. The number of encampments has increased, including in the highway right of way and throughout the program area.
- **Climate change –** In the past decade, there has been growing awareness and acceptance of the implications and impacts of climate change. Many communities, agencies and businesses are reassessing their behavior and operations to identify how they might be contributing to global warming and resultant climate change and examining how their environment is changing due to climate change. Both Washington and Oregon, as well as local governments in the project area, have established new climate policies since 2011. Additionally, recent exceptional weather events are driving changes in considerations and assumptions about climatic conditions and related community needs.
- **Traffic –** Changes have occurred since 2013 in traffic volumes and activities; the IBR program has updated traffic models to extend the forecast to 2045 (CRC used 2035).
- **Transit service –** Changes in existing transit services and activities include C-TRAN's Fourth Plain Vine bus rapid transit route, which began service in 2017, and bus-on-shoulder operations on I-5 north of the Interstate Bridge, which began in 2020. TriMet has also expanded operations and planning for additional bus rapid transit service in the region.
- **Tolling –** Tolling programs are being studied and planned in Oregon. Tolling on the I-5 bridge was included in the CRC analysis and will also be included in the IBR analysis.

- **Land use –** Localized development includes limited construction or building permit applications in the CRC Project construction boundary; these include buildings developed since issuance of the CRC Project's ROD.
- **Historic resources –** Multiple new, historic-aged structures potentially eligible for listing in the National Register of Historic Places have been identified since the previous historic period survey, which considered structures dating back to 1967. Assuming that construction of the IBR program will begin in 2025, the historic resources period has been extended 15 years to consider buildings built in or prior to 1982.
- **Endangered Species Act –** ESA listings and critical habitat designations have changed since the 2013 consultations with the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS). The IBR program has consulted with NOAA Fisheries and USFWS to determine the Section 7 consultation approach and bring the consultations up to date with current species listings and critical habitat designations and to reflect changes in best available science.
- **Changes in other regulations –** Many environmental regulations, procedures, and permits have changed or been updated since the issuance of the CRC ROD and re-evaluations. The technical reports prepared to support this Supplemental Draft EIS (Attachments A through X) include additional detail on regulations specific to each technical discipline that have changed since 2013.

To evaluate the effect of changes in conditions and regulations since 2013, as well as potential design changes, the IBR program prepared a NEPA re-evaluation in 2021. Based on the information presented in the re-evaluation, FHWA and FTA concluded that the IBR program could include project design changes or refinements to the CRC Selected Alternative that would result in new or changed significant adverse impacts that were not evaluated in the CRC Project's FEIS and ROD. In addition, they concluded that new information or circumstances (due to changes in the physical environment, community priorities, and regulations) since the CRC Project's ROD could result in new or changed significant adverse impacts not previously evaluated. Therefore, in compliance with 23 CFR 771.130(a), FHWA and FTA determined that a supplemental EIS would be necessary to identify and disclose new adverse impacts and mitigation associated with the IBR program.

2.5.3 IBR Design Option Development and Screening

During the early planning phase for the IBR program, feedback from stakeholders (partner agencies, tribes, organizations, and the public) identified changes within the study area that had occurred since the selection of the CRC LPA. In response, the IBR program identified several components of the CRC LPA that could benefit from design modifications. Potential options for each of these components went through a multitiered screening process that included input from program partners, tribes, and community members. The components evaluated were:

- Hayden Island and Marine Drive
- Main Columbia River crossing
- Transit mode, general alignment, and termini
- Auxiliary lanes

The evaluation of each component is described briefly below. For more detailed information on the design options development and screening process, see the Design Options Development, Screening and Evaluation Technical Report (Appendix D to this Supplemental Draft EIS).

Hayden Island and Marine Drive

The primary design considerations for Hayden Island and Marine Drive were the interchange type on Hayden Island and the resulting multimodal connections with Marine Drive and I-5. The IBR program evaluated multiple concepts, ultimately advancing five full, partial, and no-interchange options for Hayden Island into the screening process. All design options included a full interchange at I-5/Marine Drive; an arterial bridge across North Portland Harbor to serve local traffic; a shared-use path for active transportation connecting North Portland, Hayden Island, and the 40-mile loop; and the extension of N Tomahawk Island Drive under I-5 to provide an additional east-west local street connection on Hayden Island.

The Hayden Island/Marine Drive task force[1] identified the following five design options to advance for screening (refer to the Design Options Development, Screening and Evaluation Technical Report [Appendix D] for a complete description of each design option):

- Design Option 1 – Full Interchange
- Design Option 2 – Partial Interchange 1
- Design Option 3 – Partial Interchange 2
- Design Option 4 – No Interchange
- Design Option 5 – Partial Interchange 3

During screening, the task force collected data for approximately 90 metrics and scored each design option against the others for a given metric. Screening metrics were categorized as climate impacts/adaptation, natural environmental, built environment, active transportation, transit access, vehicles, freight, cost, and seismic. Design Options 1 and 5 performed best out of all design options. They had a similar freight/vehicle traffic performance on Marine Drive, including at ramp terminal intersections, and were both compatible with all transit investments currently under consideration.

Tradeoffs and benefits between Design Options 1 and 5 are listed in Table 2-3 to further differentiate between the two options.

Table 2-3. Tradeoffs and Benefits Between Hayden Island/Marine Drive Design Options 1 and 5

~~Transit~~/Highway Bridge (two-bridge) design were studied in the DEIS for the full replacement options. Exhibit 2.5-5 compares the various transportation components of these DEIS alternatives with those included in the LPA.

As noted above, the LPA is a refined version of Alternative 3 with a Clark College light rail terminus. Some elements of the design have been refined or modified to reduce impacts, increase benefits, reduce costs, or in response to other input from stakeholders and project sponsors. The LPA is described above in Section 2.2, and the process that led to the refinements is discussed below in Section 2.7. The evaluation and screening of alternatives prior to the DEIS are also discussed in Section 2.7.

[1] The Hayden Island/Marine Drive Task Force met 18 times between late spring 2021 and early winter 2022. There was an average of 50 participants per meeting, with staff from 10 local partner agencies and technical staff from the IBR program

~~Exhibit 2.5-1~~

~~Alternative 2: Replacement Crossing with Bus Rapid Transit~~

~~INSERT GRAPHIC: ALTERNATIVE 2: REPLACEMENT CROSSING WITH BUS RAPID TRANSIT~~

~~Exhibit 2.5-2~~

~~Alternative 3: Replacement Crossing with Light Rail~~

~~INSERT GRAPHIC: ALTERNATIVE 3: REPLACEMENT CROSSING WITH LIGHT RAIL~~

~~Exhibit 2.5-3~~

~~Alternative 4: Supplemental Crossing with Bus Rapid Transit~~

~~INSERT GRAPHIC: ALTERNATIVE 4: SUPPLEMENTAL CROSSING WITH BUS RAPID TRANSIT~~

~~Exhibit 2.5-4~~

~~Alternative 5: Supplemental Crossing with Light Rail Transit~~

~~INSERT GRAPHIC: ALTERNATIVE 5: SUPPLEMENTAL CROSSING WITH LIGHT RAIL~~

Exhibit 2.5-5

Comparison of the LPA and Draft EIS Alternatives (Alternatives 2-5)

Components Design Option 1 – Full Interchange	Alternative 5 Design Option 5 – Partial Interchange
Larger footprint over North Portland Harbor.	Smaller footprint over North Portland Harbor.
More floating home impacts.	Fewer floating home impacts.
Multimodal River Crossing and Highway Larger scale/complexity of I-5 over Hayden Island provides lower-quality experience for active transportation and transit access on east-west streets.	Existing Smaller scale/complexity of I-5 over Hayden Island provides higher-quality experience for active transportation and transit access on east-west streets.

Transit Mode[a]	None	Light Rail	Bus Rapid Transit	Light Rail	Bus Rapid Transit	Light Rail
Transit Terminus	N/A	Clark College	Kiggins Bowl, Lincoln, Clark College MOS, or Mill Plain MOS	Kiggins Bowl, Lincoln, Clark College MOS, or Mill Plain MOS	Kiggins Bowl, Lincoln, Clark College MOS, or Mill Plain MOS	Kiggins Bowl, Lincoln, Clark College MOS, or Mill Plain MOS

TDM/TSM Measures[c] Hayden Island vehicle/freight access to/from Portland via Hayden Island Drive I-5 ramps.	Similar to DEIS Hayden Island vehicle/freight access to/from Portland via local roads and I-5 ramps that cross under Marine Drive.
I-5 Bridges Toll Hayden Island vehicle/freight access to/from Vancouver via Jantzen Drive I-5 ramps.	None Hayden Island vehicle/freight access to/from Vancouver via Jantzen Drive I-5 ramps.
Transit Operations Scores medium-high from a climate perspective.	Existing Scores high from a climate perspective.
Scores medium from an equity perspective.	Scores medium from an equity perspective.

a Transit Mode also dictated the location of a maintenance base expansion. Bus rapid transit would have entailed expanding a bus maintenance facility in eastern Vancouver. Light rail transit would entail expanding the Ruby Junction Maintenance Facility in Gresham. See Section 2.2.2.

b Alternative 3 was also evaluated without a toll to quantify the traffic effects of tolling the I-5 crossing.

c See Section 2.2.5 for a description of the TSM/TDM measures.

d Standard rate is based on toll rates that, for passenger cars with transponders, would range from $1.00 during off-peak times to $2.00 during peak travel times

2.4 Key Findings Supporting Selection of the LPA

Following is a brief summary of the key DEIS findings that helped inform the discussion and decision regarding an LPA.

2.4.1 Key Findings Regarding the Replacement and Supplemental River Crossings

The DEIS analysis showed that a replacement river crossing with two bridges (referred to as the Stacked Transit/Highway Bridge Design) would provide a more efficient and safer movement of cars, trucks, transit, bicyclists and pedestrians and would best meet the purpose and need (as described in Chapter 1). This river crossing offers greater congestion relief, more traffic capacity, safer highway features, greater improvements for bicyclists and pedestrians, and safer river navigation, and would better support the City of Portland's Hayden Island Plan and the City of Vancouver's vision for downtown redevelopment and connectivity. The "Stacked Transit/Highway Bridge Design" for the replacement crossing would require two, rather than three, new parallel bridge structures. This design would include transit beneath the highway deck of the I-5 southbound bridge, eliminating the need for a third bridge and reducing the amount of in-water structure and size of the river crossing.

The LPA includes a replacement river crossing consisting of two parallel composite deck truss bridges. The structures would accommodate 10 lanes with full shoulders.

Traffic Performance

A replacement river crossing would provide more congestion relief than the supplemental river crossing or No-Build Alternative. As shown in Exhibit 2.6-1, the No-Build Alternative would accommodate about 56,000 people (person trips) during the southbound morning and northbound evening peak periods, and under this alternative, congestion is predicted to increase to 15 hours a day by the year 2030. The replacement crossing would accommodate more than 78,000 people during peak commute periods and congestion would last for approximately 5 hours each day. The supplemental crossing would allow approximately 66,000 people to cross the river during peak periods, but 11 hours of congestion would remain each day.

Exhibit 2.6-1

Number of People Crossing the River during Peak Commute Periods

INSERT GRAPHIC: PERSON TRIPS AND HOURS OF CONGESTION

Local streets would experience more traffic with a supplemental crossing than with a replacement crossing, especially in lower downtown Vancouver and near the Marine Drive interchange. The intersection at Sixth and Washington in downtown Vancouver would have to be closed with the supplemental crossing, which would cause increased traffic congestion on lower downtown streets. The replacement crossing would not require this closure; it would also allow the City of Vancouver to realize their planned extension of Main Street to the waterfront, reducing congestion in lower downtown Vancouver and increasing connectivity to the waterfront. The supplemental crossing would preclude the City from extending Main Street.

The supplemental crossing would split northbound traffic across both existing bridges. By splitting northbound traffic on two separate structures, northbound motorists exiting at Hayden Island, SR 14, downtown Vancouver, Mill Plain, or Fourth Plain would have to get into the right two lanes around the Marine Drive area. Additionally, northbound motorists accessing I-5 from Marine Drive or Hayden Island toward destinations north of Fourth Plain would enter these right two lanes and then either weave quickly left to

access the through lanes or cross on the eastern bridge, which is expected to be more congested with traffic exiting the freeway at the various Vancouver interchanges. The multiple weaving, merging, and diverging sections along this two-lane segment of I-5 would result in substantial congestion, and cause traffic to back up on on-ramps and local streets around Marine Drive and on Hayden Island. In contrast, the replacement crossing would not require splitting northbound I-5 traffic onto two structures and would avoid these problems.

The replacement river crossing would include direct connections between Hayden Island and Marine Drive that would allow cars to travel between these locations without merging with I-5 traffic. The replacement crossing would include separate structures over North Portland Harbor (separating Marine Drive and Hayden Island interchanges) for through traffic and for traffic merging on or off the freeway or traveling the freeway for short distances. These separate structures would afford a direct connection between Marine Drive and Hayden Island that would allow cars to cross North Portland Harbor without merging with I-5 traffic. Since selection of the LPA, two design options have emerged to provide direct connection between Marine Drive and Hayden Island, one with direct ramp connections as part of the interchange design, and one with a local multimodal bridge (as described in Section 2.2).

Traffic Safety

The existing traffic safety hazards on I-5 in the project area include lack of shoulders, narrow lanes, poor sight distances, short merge lanes, and bridge lifts. These hazards would be corrected with a replacement river crossing. None of these safety problems would be solved with the No-Build Alternative. A supplemental river crossing would improve safety for southbound I-5 traffic and transit because those vehicles would be placed on a new bridge built to current safety standards, but would only provide partial safety improvements for northbound I-5 traffic. Northbound traffic would remain on the existing bridges, and would still be subjected to bridge lifts and poor sight distances due to the "hump" in the current crossing. A supplemental crossing would create a new safety issue between Marine Drive and Fourth Plain Boulevard by dividing and separating northbound lanes approaching the crossing. As explained earlier, northbound traffic exiting the highway at Hayden Island, SR 14, Mill Plain, or Fourth Plain would need to merge into the two right lanes as the highway crosses Hayden Island. The need to make this choice so early could cause last-minute weaving between lanes and would likely increase collision rates. Fewer on-off lanes with the supplemental alternative would provide fewer safety improvements than the replacement alternative.

Bicycle and Pedestrian Facilities

The bicycle and pedestrian connection between Portland and Vancouver would differ between replacement and supplemental river crossings. Both river crossings would provide a wide, well-marked path separated from vehicles, but the replacement crossing would provide better connections and safety for bicyclists and pedestrians on Hayden Island and over North Portland Harbor. With a replacement river crossing, the multi-use path would be a continuous pathway, separated from cars and trucks, between downtown Vancouver and the Marine Drive interchange area. The supplemental river crossing would require pedestrians and bicyclists to leave the multi-use trail on Hayden Island and navigate several busy streets to complete the crossing between Vancouver and Marine Drive.

Marine Navigation Safety

Marine vessels traveling this section of the Columbia River must navigate under one of the fixed spans or through the lift span of the I-5 bridges, and must also navigate through the swing span of the Burlington Northern Santa Fe (BNSF) railroad bridge 1 mile downstream. Navigation safety for these vessels, especially when traveling downstream (with the current), would be substantially improved with a replacement river crossing but worsened by a supplemental river crossing. Currently, vessels making this trip must make a

difficult "S" curve maneuver to navigate between the high span of the existing bridges and the swing span of the BNSF rail bridge, because these channels are not in alignment—the existing I-5 crossing high span is roughly in the center of the river, but the BNSF swing span is closer to the north bank. When the river runs high, this maneuver is especially difficult, frequently forcing vessels to wait to use the I-5 lift span that is closer to the north bank and better aligned with the swing span of the BNSF railroad bridge.

A supplemental crossing would make the current situation worse by adding more piers between the existing I-5 crossing and the BNSF railroad bridge. A supplemental crossing would also narrow the high-span and lift span channels by 40 to 60 feet because the existing bridge piers would need to be widened to improve seismic safety.

Effects to the Natural Environment

Both river crossing options would have adverse as well as beneficial impacts to the natural environment. Currently, much of the precipitation that falls on I-5 in the project area flows into the Columbia River without being treated to remove pollutants and sediments that can be harmful to aquatic species. Both the supplemental and replacement crossing options would add new stormwater management facilities that would remove most of the pollutants in the stormwater runoff from the I-5 roadway. The main difference between the crossing options with regard to stormwater runoff is that with the supplemental river crossing, runoff from portions of the existing bridges would not be treated.

Air quality is predicted to improve for all alternatives, including the No-Build Alternative, by 2030. Analysis of vehicle emissions for each full alternative indicates that even with an increased population and volume of vehicles, emissions would be lower in the future than they are today. This is because of projected improvements (emission reductions) in fuels and vehicles. Differences in emissions among the project alternatives, including the No-Build Alternative, are minimal. Emissions would be lower or higher in different sub-areas of the corridor, depending on the pollutant and alternative. However, in the context of the large overall reductions in many pollutants by 2030 relative to existing conditions, these differences are minor.

Short-term construction impacts to the surrounding environment are a concern for any of the build alternatives. In particular, pile driving and other construction activities in the Columbia River would adversely impact salmon and other aquatic species. Any of the build alternatives would require measures to minimize impacts as well as conservation measures to offset impacts.

Accommodating Future Waterfront Development

Plans for waterfront development in downtown Vancouver would be better supported by a replacement river crossing. A replacement crossing would open up the waterfront underneath the existing bridges. A replacement crossing would vacate the existing I-5 right-of-way underneath the BNSF railroad berm, thus allowing Vancouver's planned extension of Main Street south to Columbia Way. The supplemental river crossing would leave the existing highway in place, which would not afford space for extending Main Street or provide the opportunity to open up the waterfront area beneath the existing bridges. Extending Main Street would strengthen the connection between downtown Vancouver and the riverfront, and is important for traffic circulation needed by planned development along the Columbia River.

Capital and Maintenance Costs

According to cost estimating prepared for the DEIS, the supplemental river crossing would be less expensive to construct, but would be more expensive to maintain and operate. Reusing the existing bridges would reduce capital costs, but would require repairs to these structures, such as resurfacing the bridge decks and repairing the lift span equipment. These repairs are the primary contributor to the substantially higher

maintenance and operation cost of a supplemental river crossing. The existing bridges also require staffing 24 hours per day to operate the lift spans, adding to their operating cost.

2.4.2 Key Findings Regarding Bus Rapid Transit and Light Rail Transit

Light rail would provide quicker and more direct access to key destinations and provide greater capacity, which would help attract more daily and peak period transit riders than bus rapid transit. Bus rapid transit would cost less to construct, but would cost more to operate each year. Although light rail would be more expensive to build initially, it would attract more riders and would have lower operating costs over the project lifetime, and would therefore be more cost-effective than bus rapid transit. Additionally, research suggests that light rail is likely to attract more investment around transit stations, which would better allow the cities of Vancouver and Portland to attain locally and regionally adopted land use goals for managing growth and promoting compact, transit-oriented development.

Travel Times and Reliability

Light rail would provide better travel times and reliability than bus rapid transit. Bus rapid transit buses would travel in exclusive lanes in the project area but would be mixed with general traffic outside the project area, and therefore would be subject to congestion-induced delays. Such delays would increase travel times and reduce reliability. Light rail would also travel faster than bus rapid transit within the project area (averaging 17 mph versus 14.5 mph, including stops) because it would have signal priority, shorter wait times at stations, and quicker acceleration.

Transit Ridership

Either transit mode would at least double transit ridership across the Columbia River compared to the No-Build Alternative. Light rail would attract more riders than bus rapid transit. According to DEIS analysis, light rail would carry 6,100 to 6,700 riders over the Columbia River during the PM peak, while bus rapid transit would carry 4,900 to 5,600. Integration with the existing MAX system would allow transit users to travel between Vancouver and Portland without a transfer. Transfers add travel time, unreliability, and inconvenience to potential transit users' trips.

Capital and Maintenance and Operation Costs

Relative to bus rapid transit, light rail costs more to build, but has lower operating and maintenance costs, and attracts more transit riders. The transit cost-effectiveness of light rail was calculated to be $11.55 compared to $15.09 for bus rapid transit.[2] Transit cost-effectiveness is generally described as the overall cost for construction, maintenance, and operation of the transit system, divided by the number of transit passengers served. Increasing transit ridership or reducing costs can improve cost-effectiveness. Overall, the cost to construct and operate per transit rider for light rail is lower than for bus rapid transit. Therefore, light rail would be more cost-effective than bus rapid transit.

Land Use

Both bus rapid transit and light rail have the potential to attract development around transit stations (often referred to as transit-oriented development) that is generally sought after by many local and regional land use plans. However, light rail is likely to attract more transit-oriented development than bus rapid transit. Rail lines have greater visibility and appeal than buses, and studies have shown that because of this, some riders

[2] These costs are for the Lincoln terminus from the DEIS. The Clark MOS would have different costs, but the relationship between bus rapid transit and light rail would be the same.

prefer trains over buses (Henry and Litman 2006). These factors, in addition to the perception that rail infrastructure is a more permanent and fixed public investment than bus routes, indicate that developers are more likely to invest around light rail stations than around bus rapid transit stations. Transit-oriented development is generally pedestrian-oriented. Medium- and high-density commercial and residential mixed uses that support the nearby transit service also help advance community goals of managing growth and reducing reliance on automobiles.

2.4.3 Key Findings Regarding the Transit Terminus

The City of Vancouver, C-TRAN, and RTC adopted Clark College as the preferred light rail terminus in Vancouver. This terminus location provides the best balance between construction cost, benefit to transit patrons, and impacts to local properties and traffic, while affording the flexibility to later extend or connect high-capacity transit through Clark County as envisioned in regional plans. Furthermore, this terminus provides a cost-effective solution that should be competitive for federal funding. See Appendix D to the CRC Transit Technical Report (included as an electronic appendix to this FEIS)for more detailed reasoning regarding the selection of the Clark College terminus.

2.5 Alternatives Development and Screening Process

The following outlines the alternatives development, screening, evaluation and refinement process that led to the current LPA. This process included developing and screening alternatives prior to the DEIS, the selection of an LPA after the DEIS, and the on-going refinement of the LPA since then.

2.5.1 Alternatives Considered but Rejected

A wide range of transportation alternatives and improvements were considered during screening and subsequent evaluation. Exhibit 2.7-1 summarizes the alternatives, options and components that were considered but rejected.

Exhibit 2.7-1
Alternatives Considered but Rejected

Based on the findings in Table 2-3, Design Option 5 (Partial Interchange) was advanced for further study and refinement and inclusion in the Modified LPA. Design Option 5 would construct a partial interchange at Hayden Island and a full interchange at Marine Drive, and would be designed to minimize impacts while making improvements to freight and workforce traffic and active transportation on Hayden Island and Marine Drive. Refer to the Design Options Development, Screening and Evaluation Technical Report (Appendix D) for additional detail.

Main River Crossing

The river crossing area covers the main span of the Interstate Bridge over the Columbia River. This component extends from where the bridge begins on Hayden Island to where the bridge touches down in Vancouver. The design options considered ways to move all modes across the river, as well as the configuration of these modes in relation to each other (e.g., the location of the shared-use path in relation to vehicle lanes and transit lines). The design options included variations designed for a two-bridge or one-bridge river crossing option, and they assumed a mid-level fixed span bridge that provides 116 feet of vertical clearance.[3]

[3] Additional analysis regarding the consideration of a tunnel and movable span bridge is included in Attachment C-1 of the Design Options Development, Screening and Evaluation Technical Report (Appendix D).

Following agency and public input, the main River Crossing task force[4] identified three design options to advance for screening (refer to the Design Options Development, Screening and Evaluation Technical Report [Appendix D] for a complete description of each design option):

- Design Option 1 – Two Straight Bridges (Refined 2013 Design)
- Design Option 2 – One Bridge (Double Stacked)
- Design Option 3 – One Bridge (Hybrid Stacked)

During screening, the task force collected data for approximately 90 metrics and scored each design option against the others for a given metric. Screening metrics were categorized as climate impacts/adaptation, natural environment, built environment, active transportation, vehicles/freight, and cost. Design Options 1 and 3 performed the best of the design options during the screening.

Tradeoffs and benefits between Design Options 1 and 3 are listed in Table 2-4 to further differentiate between the two options.

Table 2-4. Tradeoffs and Benefits Between River Crossing Design Options 1 and 3

~~Transit~~	~~River Crossing~~
~~Express Bus in general purpose lanes~~Design Option 1 – Two Straight Bridges	~~Replacement~~Design Option 3 – One Bridge ~~Downstream/Low-level/Movable~~ (Hybrid Stacked)
Reduces shared-use path users' exposure to noise and elements.	**Increases** shared-use path users' exposure to noise and elements.
~~Express Bus in managed lanes~~Creates **visually uncluttered** structures on Hayden Island and scales them to surroundings.	~~Replacement Bridge Upstream/Low-level/Movable~~Results in **complex** bridge approaches on Hayden Island and in Vancouver.
~~Bus Rapid Transit (BRT) – Lite[a]~~	~~Replacement Bridge Upstream/Mid-level~~
~~Bus Rapid Transit (BRT) – Full[b]~~	~~Replacement Bridge Downstream/High-level~~
~~Streetcar~~	~~Replacement Bridge Upstream/High-level~~
~~High Speed Rail~~	~~Supplemental Bridge Downstream/Low-level/Movable~~
~~Ferry Service~~	~~Supplemental Bridge Upstream/Low-level/Movable~~
~~Monorail System~~	~~Supplemental Bridge Downstream/Mid-level~~
~~Magnetic Levitation Railway~~	~~Supplemental Bridge Upstream/Mid-level~~
~~Commuter Rail~~	~~Supplemental Bridge Downstream/High-level~~
~~Heavy Rail~~	~~Supplemental Bridge Upstream/High-level~~
~~Personal Rapid Transit~~Easier to fund river crossing bridge because I-5 could be constructed and operational between Hayden Island and Evergreen Boulevard.	~~Tunnel to supplement I-5~~Harder to fund river crossing bridge because I-5 must be constructed and operational between Marine Drive and Evergreen Boulevard.
~~People Mover/Automated Guideway Transit~~**No undesignated** space on upper deck.	~~New Corridor Crossing~~**Creates undesignated** space on upper deck.

[4] The River Crossing task force met 11 times between summer 2021 and winter 2022. There was an average of 50 participants per meeting, with staff from nine partner agencies and technical staff from the IBR program.

~~Personal Rapid Transit~~Easier to fund river crossing bridge because I-5 could be constructed and operational between Hayden Island and Evergreen Boulevard.	~~Tunnel to supplement I-5~~Harder to fund river crossing bridge because I-5 must be constructed and operational between Marine Drive and Evergreen Boulevard.
Fewer right-of-way acquisitions and impacts to Fort Vancouver.	**More** right-of-way acquisitions and impacts to Fort Vancouver.
Smaller footprint over land.	**Larger** footprint over land.
Simpler wayfinding on northbound I-5.	Overhead structure **complicates** wayfinding on northbound I-5 (requires approvals for signage smaller than standards).
Can maintain traffic on existing Interstate Bridge during construction.	~~New Corridor Crossing plus widen existing I-5 Bridges~~**Cannot maintain** traffic on existing Interstate Bridge during construction.
Scores **medium-high** from an **equity** perspective.	~~New Western Highway (I-605)~~Scores **medium** from an **equity** perspective.
Scores **medium-high** from a **climate** perspective.	~~New Eastern Columbia River Crossing~~Scores **medium-high** from a **climate** perspective.
Longer construction period.	~~I-205 Improvements~~**Shorter** construction period.
Emergency vehicles access shared-use path via **shared-use path ramps** on Hayden Island and downtown Vancouver.	~~Arterial Crossing to supplement I-5~~Emergency vehicles access shared-use path via **northbound I-5 or shared-use path ramps** on Hayden Island and downtown Vancouver.
Likely uses **more** construction materials (based on the footprint, not expected tailpipe emissions)..	~~Replacement Tunnel~~Uses marginally **fewer** construction materials (based on the footprint, not expected tailpipe emissions).
More in-water piers/obstructions: • 12 in-water piers (each pair of piers measures ~200 feet combined in direction of river channel).	~~33rd Avenue Crossing~~**Fewer** in-water piers/obstructions: • 6 in-water piers (each pier measures ~175 feet in direction of river channel).
Larger footprint over aquatic habitat (~12 acres).	~~Non-Freeway Multimodal Columbia River Crossing~~**Smaller** footprint over aquatic habitat (~10 acres).
Lower deck shared-use path **not visible** to vehicular traffic, does not benefit from "eyes on the path" (a safety concern for active transportation users).	~~Arterial Crossing with I-5 Improvements~~**Allows some visibility** between shared-use path and vehicular traffic on lower deck.

~~a Bus rapid transit-lite is an all-day bus rapid transit service that operates in exclusive, managed or general purpose lanes, which may or may not have in-line stations and special vehicles.~~

~~b Bus rapid transit-full is an all-day bus rapid transit service with an exclusive right-of-way, in-line stations, special vehicles, and a unique branded identity.~~

~~Other Components Considered but Rejected~~

Based on the findings in Table 2-4, Design Option 1 (Two Straight Bridges) was advanced for further study and refinement. Design Option 1 would construct two bridges from Hayden Island to Vancouver on a straight alignment. The eastern bridge would accommodate northbound highway traffic on the upper bridge deck, with a bicycle and pedestrian path underneath; the western bridge would carry southbound traffic on the upper bridge deck, with two-way transit below. Refer to the Design Options Development, Screening and Evaluation Technical Report (Appendix D) for additional information.

Transit – Mode, General Alignment, and Termini

The IBR program and the partner agency transit technical teams developed 13 representative transit investments (listed in Table 2-5) to better understand how different combinations of mode (bus rapid transit [BRT], LRT), alignment, station locations, termini (end points), and park-and-ride locations could perform relative to each other. Each of the representative transit investments was modeled through the Metro/RTC[5] regional travel demand model to arrive at forecasts for the year 2045. Program partners and the IBR team developed measures to better understand how the representative transit investments would perform relative to each other.

The IBR program ultimately advanced the extension of LRT from the Expo Center in Portland north to a new station on Hayden Island, continuing across the Columbia River on the new I-5 bridge, following I-5 to multiple stations in the city of Vancouver with a northern terminus at Evergreen Station in Vancouver. The subsections below describe how the transit mode, general alignment, and termini were selected. Also refer to the Design Options Development, Screening and Evaluation Technical Report (Appendix D) for additional information.

Table 2-5. Representative Transit Investment Descriptions

Representative Transit Investment	~~River Crossing/Highway~~General Description
~~Increased Transit Operations~~No-Build	~~Three-bridge Design over the Columbia, Replacement~~The No-Build scenario reflects planned systemwide increases in background transit service by both TriMet and C-TRAN as adopted by both Metro and RTC in their regional transportation plans but reflects no replacement of the current I-5 bridge, no reconstructed interchanges, no tolls on the I-5 bridge, and no extension of additional high-capacity transit service north from the existing MAX Yellow Line alignment into Vancouver.
~~Kiggins Bowl Terminus~~ ~~Lincoln Terminus~~ ~~Mill Plain MOS~~ ~~16th Street Alignment~~	~~12 Lanes on River Crossing~~ ~~8 Lanes on River Crossing~~ ~~Marine Drive Southern Realignment~~ ~~Marine Drive Diagonal Realignment~~
~~McLoughlin Boulevard Alignment~~2045 CRC ROD	~~Replacing North Portland Harbor Bridge~~2013 CRC LPA assuming fully dedicated LRT guideway extending from the Expo Center station to a terminus near McLoughlin/I-5 via the Vancouver central business district. Includes five new stations and three park and rides.
~~Two-way on Broadway Street~~ ~~Two-way on Washington Street~~ ~~Washington Street/Main Street Couplet~~	~~SR 14 to I-5 Northbound Second Collector-Distributor Lane~~ ~~SR 14 Left Loop Interchange design~~

[5] Southwest Washington Regional Transportation Council

~~Washington Street/Columbia Street Couplet~~

~~Offset Hayden Island Alignment~~Bus on Shoulder	Express bus operates as bus on shoulder in program area (both directions). Route 60 operates in auxiliary lanes between the Vancouver central business district and Hayden Island, Delta Park. No new stations or park and rides.
~~Ross Park and Ride~~BRT Turtle Place to Expo Center	Dedicated BRT guideway between the Expo Center station and a terminus at Turtle Place in downtown Vancouver. Includes three initial stations: Expo Center, Hayden Island, and Turtle Place.
BRT I-5 to Kiggins Bowl ~~Park and Ride~~	Fully dedicated BRT guideway between the Expo Center station and a terminus near McLoughlin Blvd./I-5. Dedicated guideway on Vancouver segment assumed to be adjacent to I-5 with a dedicated connection to Hayden Island and the Expo Center Station similar to the 2013 LPA. Includes six initial stations: Kiggins Bowl, E 33rd Street, McLoughlin Blvd., Evergreen Blvd., Hayden Island, and Expo Center.

~~SR 14 Park and Ride~~

~~Mill Plain Park and Ride Bounded by Broadway, Main, 16th and 17th~~BRT in ROD Alignment	Fully dedicated BRT guideway between Expo Center station and a terminus near McLoughlin Blvd./I-5 to Expo Center station with alignment and station locations similar to 2013 ROD project. Includes six initial stations: I-5/McLoughlin, McLoughlin and Washington St. (southbound)/16th and Broadway (northbound), 12th and Washington (southbound)/13th and Broadway (northbound), Turtle Place, Hayden Island, and Expo Center.
~~Surface Park and Ride Lots~~Hybrid	Fully dedicated LRT guideway between Expo Center station and a new station at Hayden Island and fully dedicated BRT guideway between Hayden Island and Turtle Place. Includes two initial stations: Hayden Island and Expo Center.
LRT One Station in Vancouver	Fully dedicated LRT guideway between the Expo Center Station and a terminus near Turtle Place in downtown Vancouver. Includes two initial stations: Hayden Island and Turtle Place.
LRT I-5 to McLoughlin	Fully dedicated LRT guideway between the Expo Center station and a terminus near McLoughlin Blvd./I-5. Dedicated guideway on Vancouver segment assumed to be adjacent to I-5 with a dedicated connection to Hayden Island and Expo Center station similar to 2013 LPA. Includes three initial stations: I-5/McLoughlin, Evergreen, and Hayden Island.
LRT I-5 to Kiggins Bowl	Fully dedicated LRT guideway from the Expo Center station to a terminus near I-5/Kiggins Bowl. Dedicated guideway on Vancouver segment assumed to be adjacent to I-5 with a dedicated connection to Hayden Island and Expo Center station similar to 2013 LPA. Includes five initial stations: Kiggins Bowl, 33rd Street, I-5/McLoughlin, Evergreen, and Hayden Island.
~~39th and Main~~LRT Delta Park ~~and Ride~~to McLoughlin	Fully dedicated LRT Extension from Delta Park (joint Hayden Island/Expo Center station) to a terminus near McLoughlin/I-5 on an I-5 adjacent alignment (Center/West Side of I-5). This option was infeasible and removed from consideration early in the decision process.
LRT I-5 to McLoughlin with Columbia	Fully dedicated LRT guideway between Expo Center station to a terminus near McLoughlin Blvd./I-5. Dedicated guideway on Vancouver segment assumed to be adjacent to I-5 with a dedicated connection to Hayden Island and Expo Center station similar to 2013 LPA. Includes four initial stations: I-5/McLoughlin, Evergreen, Waterfront, and Hayden Island.

~~Mill Plain Park and Ride Bounded by Broadway, Main, 16th and 17th~~BRT in ROD Alignment	Fully dedicated BRT guideway between Expo Center station and a terminus near McLoughlin Blvd./I-5 to Expo Center station with alignment and station locations similar to 2013 ROD project. Includes six initial stations: I-5/McLoughlin, McLoughlin and Washington St. (southbound)/16th and Broadway (northbound), 12th and Washington (southbound)/13th and Broadway (northbound), Turtle Place, Hayden Island, and Expo Center.
LRT I-5 to Evergreen with Columbia	Fully dedicated LRT guideway between Expo Center station to a terminus near I-5/Evergreen. Dedicated guideway on Vancouver segment assumed to be adjacent to I-5 with a dedicated connection to Hayden Island and Expo Center station similar to 2013 LPA. Includes three initial stations: Evergreen, Waterfront, and Hayden Island.

BRT = bus rapid transit; LRT = light rail transit; RTC = Southwest Washington Regional Transportation Council

Mode

The program considered three transit modes to meet transit demand: express bus operating on the shoulder, BRT, and LRT. A transit investment that serves the identified markets and attempts to serve demand would need to include a combination of modes. Bus-on-shoulder capability in the program area was included in all representative transit investments and was removed from consideration as a standalone transit option.

Based on analysis and coordination with partner agencies, the advantages and disadvantages listed in Table 2-6 were identified for BRT and LRT. Based on these findings, and when considering the specific needs of the high-capacity transit investment for the IBR program, LRT was advanced as the preferred transit mode.

Table 2-6. Summary of Transit Mode Evaluation

Light Rail Transit	Bus Rapid Transit
• Higher vehicle capacity allows the program to carry more people across the river. (MA, ME) • Compared to existing conditions and BRT, would improve access to jobs and services for many residents, including BIPOC and low-income populations. (MA, EO) • Allows for preservation of the current and future C-TRAN Vine and express bus system while providing convenient connections to new LRT stations. (MA, ME) • Offers a more competitive travel time compared with trips that require a transfer at the Expo Center. (MA, ME) • Extension of the MAX Yellow Line from the Expo Center into Vancouver best integrates existing transit investment in the region in a manner that maintains both C-TRAN's and TriMet's approaches to operations of their transit systems. • Based on initial estimates of how investments might perform if submitted to the FTA CIG	• Lower vehicle capacity than LRT and would require a transfer. • Less competitive travel time compared to LRT due to a required transfer at Expo Center. • Compared to existing conditions, would improve access to jobs for many residents, including BIPOC and low-income populations. (MA, EO) • Allows for preservation of the current and future C-TRAN Vine and express bus system. (ME) • Less competitive for FTA discretionary funding than LRT.

Light Rail Transit	Bus Rapid Transit
program, LRT is more competitive for FTA discretionary funding.	

Equity Objectives – EO = Economic opportunity; MA = Mobility and accessibility
Climate Objectives – ME = Multimodal environmental
BIPOC = Black, Indigenous or People of Color; BRT = bus rapid transit; CIG = capital investment grant; FTA = Federal Transit Administration

Alignment

Twelve potential transit alignments were evaluated by the program and partner agencies. These potential alignments fell into two categories: accessing downtown Vancouver or aligning with the existing I-5 corridor. Detailed conceptual design work on the potential alignments (and their impacts) was brought to the advisory groups, community groups, and partner agencies.

When selecting an alignment, a key consideration for the program was the need to integrate new transit investments while considering the existing and planned transit networks of TriMet and C-TRAN. Since 2013, C-TRAN has developed a BRT system, The Vine, with one BRT line in operation, one under construction, and one in planning. The Vine and C-TRAN express bus service provide frequent and reliable service within Clark County and to downtown Portland, respectively. Any transit investment should be made with a desire to complement The Vine system, including existing and planned service.

The City of Vancouver has worked with C-TRAN to design station environments for The Vine system on Broadway and Washington Streets in the Central Business District. With these investments in mind, it is desirable to coordinate design elements of the alignment to provide more efficient functionality within the larger transit network and respective operating environments. The downtown Vancouver alignment would impact C-TRAN's BRT alignments in the downtown area. In addition to the existing and planned transit networks, there is existing development in the program area that potential alignments could impact. In comparison to the I-5 alignment, the downtown Vancouver alignment would require additional property and streetscape impacts.

Based on conversations with the community and partners, the I-5 general alignment was advanced for further study.

Terminus

~~2.5.2 Developing and Screening Alternatives Prior to the Draft EIS~~

~~Many alternatives and options were eliminated prior to the DEIS because of significant engineering problems, environmental impacts, cost, and/or failure to meet the project's purpose and need. These transportation improvements included 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 various transit modes. The process followed to identify and screen alternatives to develop the range of alternatives that were evaluated in the DEIS complied with DOT guidance on linking planning and the National Environmental Policy Act (NEPA).~~

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

~~2.5.3 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. A "Notice of Intent" to prepare an environmental impact statement was issued by The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) in September 2005.

2.5.4 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. The statement of purpose and need was drafted by FHWA, FTA, and the project's local sponsoring agencies in January 2006. Based on these documents, 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 (CRC 2006a).

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 at that time. Other elements that have since been included in the alternatives evaluated in the DEIS, such as pedestrian, bicycle, and roadway improvements, were advanced without screening. In April 2006, the initial screening evaluated 37 transit and crossing components. Components were evaluated on whether they met the six goals of the purpose and need. The following pass/fail questions were asked about each component:

- Increase vehicular capacity or decrease vehicular demand?
- Improve transit performance?
- Improve freight mobility?
- Improve safety and decrease vulnerability to incidents?
- Improve bicycle and pedestrian mobility?
- Reduce seismic risk of the I-5 Columbia River Crossing?

Components were eliminated if they failed any of the six questions. Transit components were only evaluated on the first, second and fourth questions. The screening eliminated 22 river crossing types and transit modes that did not meet the project's purpose and need (CRC 2007a), including:

- A replacement tunnel, which would fail to serve many of the projected vehicle trips. A tunnel would surface south and north of much of the project area, thereby not serving most of the access needs of traffic using this section of I-5.
- High-level bridges (such as cable stay or suspension bridges) that would encroach on protected airspace for Pearson Airfield and would not improve safety or decrease vulnerability to incidents compared to a mid-level bridge.
- Transit modes that would not effectively serve the projected transit demand outlined in the purpose and need or address this region's specific transit needs in the I-5 corridor. This included high-speed

rail, ferry service, monorail, magnetic levitation railway, commuter rail in a freight rail corridor, and heavy rail, personal rapid transit and people-mover/automated guideway transit.

- A third corridor for crossing the Columbia River, which would fail to improve safety and mobility in the existing I-5 corridor and would fail to substantially reduce congestion on I-5 because it would not shift a sufficient level of traffic out of the I-5 corridor.
- Non-freeway crossings, including an arterial crossing to supplement I-5 and a non-freeway multimodal crossing, both of which would not improve freight mobility and safety, or reduce seismic risk.

Exhibit 2.7-2

Alternative Corridors Evaluated during Initial Screening Process

INSERT GRAPHIC: ALTERNATIVE CORRIDORS EVALUATED DURING INITIAL SCREENING PROCESS

As shown on Exhibit 2.7-2, five alternative corridors were evaluated during this screening process, located both west and east of the existing I-5 corridor:

- A Western Highway, crossing 2 to 3 miles west of I-5, that would connect suburban Clark and Multnomah Counties.
- A Bi-State Industrial Corridor crossing near the BNSF railroad bridge, 1 mile west of I-5.
- A new crossing at 33rd Avenue in Portland, 2 to 3 miles east of I-5.
- Improvements to I-205 only.
- A new 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 new crossings in these locations would meet the purpose and need of the proposed CRC action by improving congestion, transit performance, freight mobility, safety, and bicycle and pedestrian mobility within the I-5 corridor, and the seismic stability of the Columbia River Crossing. While most of these alternatives would provide some degree of transportation benefit, they did little to address all elements of the purpose and need of the proposed action.

The Bi-State Industrial Corridor is the only alternative corridor that had the potential for improving I-5-related freight mobility, as it would connect 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 the potential to provide some congestion relief compared to 2030 No-Build conditions. However, this crossing would not adequately meet the project's purpose and need. The potential highway transportation benefits of these two alternate corridors would be limited, and are outweighed by the fact that they, like 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 project needs regarding safety deficiencies and high crash rates in the CRC project area.

Appendix D 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 the DEIS.

2.5.5 Further Narrowing of Components Prior to Alternative Packaging

In a second round of screening in June 2006, the project team evaluated the performance of the remaining 15 crossing and transit components in relation to criteria specified in the Evaluation Framework (CRC 2006a). 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 a supplemental tunnel river crossing option.

Streetcar

Further analysis revealed that a streetcar (rather than light rail transit or bus rapid transit) line would not operate at sufficient speeds or provide enough capacity to effectively pass the test posed during the 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 LRVs, and would be severely damaged in a crash with an LRV. 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 over the Columbia River would have required a moveable span to allow passage of tall vessels, 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 highway 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 would be subject to the same performance and safety problems—bridge lifts, substandard shoulders, and poor sight distances.

2.5.6 Packaging the Most Promising Components into Alternatives

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.

In July 2006, 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 are listed in Appendix D and represented the range of the possible combinations of river crossing and transit components, and the analysis reflected the range of impacts and transportation performance these components could produce. The 12 alternative packages did not include streetcar, low-level bridge, or supplemental tunnel components because of the reasons listed above.

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 in a way that would meet the CRC purpose and need.

The project team, working with Task Force members and input from other stakeholders, developed an additional alternative that reused 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 evaluated in the DEIS:

8. Alternative 1: No-Build

9. Alternative 2: Replacement crossing with bus rapid transit

10. Alternative 3: Replacement crossing with light rail

11. Alternative 4: Supplemental crossing with bus rapid transit

12. 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 (CRC 2007a).

2.5.7 Refining Alternatives for Evaluation in the Draft EIS

This section describes how ongoing evaluation and screening of alternatives led to dropping certain options from further consideration prior to publication of the DEIS.

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 upstream alignment would require approximately 4 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 FEIS would cross 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 new bridges (northbound I-5, southbound I-5, and high-capacity transit and bicycle/pedestrian bridges) to be constructed simultaneously. An upstream alignment would overlap the existing bridges, requiring each of the new bridges to be built sequentially (Ficco and Osborn 2007).

Transit Alignment Options

Screening analysis identified important problems with three of the transit alignment options being considered for downtown Vancouver (CRC 2007b):

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

Two-way Broadway street

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 6th and 7th 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. Ultimately, the two-way Broadway alignment was dropped because it performed no better than the other options, but would cause more adverse 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.

Washington Street/Columbia Street couplet

This alignment would have had greater impacts on traffic circulation through downtown Vancouver. 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, one of the oldest buildings in downtown Vancouver, and protected by both Section 4(f) and Section 106 regulations.

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; specifically, a creek located on the property that is protected by City of Vancouver's Critical Areas Ordinance. This ordinance, combined with local zoning restrictions, would only allow a small part of the property to be used for parking. These restrictions substantially reduce the cost-effectiveness of this site as a park and ride location.

2.5.8 Adopting the LPA After the Draft EIS

Project staff continually sought public input during the preparation of the DEIS. Following the publication of the DEIS on May 2, 2008, the project actively solicited public and stakeholder feedback on the DEIS during a 60-day comment period. Public comment was submitted via several methods, including email, postal mail, and public meetings that included two open houses. During this time, the project received over 1,600 written public comments.

Insert Sidebar: See Chapter 6 for a full description of the public comment process that followed the publication of the DEIS, and a summary of the comments received.

In addition, during and following the public comment period on the DEIS, the elected and appointed boards/councils of the local agencies sponsoring the CRC project held hearings and workshops to gather public input on and discuss the alternatives, as part of their efforts to determine and adopt a locally preferred alternative. The LPA represents the alternative preferred by the local, regional, and federal agencies sponsoring the CRC project. Local agency elected boards and councils determined their preferences based on the results of the evaluation in the DEIS (see Chapter 3) and on the public and agency comments received before and following its publication (see overview of public comments in Chapter 6).

Insert Sidebar: Local agencies sponsoring the CRC project include:

City of Vancouver

Regional Transportation Council (RTC)

C-TRAN

City of Portland

Metro

TriMet

The following three elements of the LPA were adopted at that time:

- A replacement bridge as the preferred river crossing.
- Light rail transit as the preferred high-capacity transit mode.

- ~~Clark College as the preferred northern terminus for the light rail extension.~~

~~The preferences for a replacement crossing and for light rail transit were identified by all six local agencies. Only the agencies in Vancouver—C-TRAN, the City of Vancouver, and RTC—specified a preferred Vancouver light rail terminus. As part of this process, the two regional transportation planning agencies, Metro and RTC, adopted the LPA into their Regional Transportation Plan and Metropolitan Transportation Plan, respectively, in late summer 2008 (Metro 08-3960B; RTC 07-08-10). The CRC project is in the Oregon 2010-2013 Statewide Transportation Improvement Program (STIP), the draft 2012-2015 Oregon STIP, and the Washington 2011-2014 STIP. The adoption of the LPA by these local agencies does not represent a formal decision by the federal agencies leading the NEPA process or any federal funding commitment. The resolutions by the local agencies included conditions to be resolved during the planning and design of the project. (For more information on the local agency resolutions, and an update on the status of the conditions, see Appendix F of this FEIS.) FHWA and FTA will select an alternative following this FEIS in the ROD. FTA and FHWA may select the LPA, as described in this FEIS, in the ROD. Alternatively, they may select any of the DEIS alternatives or the No-Build Alternative. If a build alternative is selected, the ROD will include the project commitments for mitigating adverse impacts and incorporating these measures into the project design. The ROD is anticipated to be issued by FTA and FHWA in 2011.~~

~~2.5.9 Further Defining the LPA~~

~~Following the adoption of the LPA in July 2008, the project team continued to evaluate and solicit input from the public, other stakeholders, project sponsors, an independent review panel (IRP), and a bridge review panel (BRP) on other elements of the project that would help further refine and develop the LPA.~~

~~Independent Review Panel~~

~~The IRP was assembled by the Governors of Oregon and Washington and tasked to do the following:~~

- ~~Review the project implementation plan~~
- ~~Review the project finance plan~~
- ~~Review project performance measures~~

~~The IRP solicited information from project stakeholders, held public meetings, and extensively researched the project issues. The IRP developed findings which identified areas on which project staff should concentrate. To address the findings, the IRP provided 30 recommendations to allow the project to move forward and achieve the purpose and need. These recommendations fell into six general categories. The IRP recommendations, and the measures that were taken to address them, are outlined below:~~

1. ~~**Review project phasing.** The CRC team, in consultation with the project stakeholders, developed construction phasing options for the project. These options will be based on potential funding scenarios that could result from either a delay or a reduced amount of funding that is being sought from the different funding sources.~~

2. ~~**Re-invigorate public involvement.** The CRC team provided additional updates to project working groups and the general public, and received further input from them on many of the topics these groups addressed.~~

3. ~~**Resolve the interchange design at Marine Drive and Hayden Island.** The CRC team used the Integrated Project Staff team, working closely with representatives of the community, to develop and review various options for the Hayden Island and Marine Drive interchanges. This has resulted in a unanimous recommendation from the CRC Project Sponsors Council to advance the revised Hayden Island~~

interchange design (referred to as LPA Option A) and the widespread acceptance by the public and both Ports of this design.

4. **Review the bridge type selection.** The CRC team assembled a review panel of national and international bridge experts, which led to the eventual selection of the composite deck truss as the preferred bridge type. The Bridge Review Panel is discussed in further detail in the next section.

5. **Establish a long-term project management/governance plan.** The CRC team expects the PSC to continue through completion of the Record of Decision. In the future, a new (or modified) oversight body composed of leaders from the entities noted above [FHWA, FTA, WSDOT, ODOT] and charged with the responsibilities to support project funding efforts, will coordinate tolling policy (initial and on-going) and hold accountable the various agencies responsible for project delivery could serve the project well.

6. **Update the cost estimate.** The overall cost estimate for the project was updated following the Bridge Review Panel in Spring 2011. The results of this analysis were used to update the financial plan and cost estimate that is included in this FEIS.

The full IRP findings and recommendations can be found in the I-5 Columbia River Crossing Project Independent Review Panel Final Report, published July 2010.

Bridge Review Panel

The IRP recommendation to review the bridge type selection led to the formation of the Bridge Review Panel (BRP). The BRP was comprised of individuals with national and international experience designing, managing and constructing large bridge projects. The BRP delivered a report to the governors of Oregon and Washington in February 2011. The full BRP findings and recommendations can be found in the Columbia River Crossing Project Bridge Review Panel Final Report, published February 2011 (BRP 2011).

The BRP's primary recommendations focused on bridge type. The panel offered three bridge types for consideration that panel members believed would have less construction risk and be potentially less expensive to construct than the open web bridge type that was being considered at the time. The three options were: composite deck truss, cable stayed and tied arch.

As a result of the BRP's recommendation, the Oregon and Washington governors directed the CRC project to discontinue further design work on the open web bridge type and begin an expedited review of the panel's three bridge type options. The governors stated that the analysis must consider cost, schedule, environmental impact, commitments made to communities and stakeholders in both states, and overall risk.

Later in February 2011, ODOT and WSDOT responded to the governors by recommending proceeding with the composite deck truss bridge type. The ODOT and WSDOT recommendation found that the composite deck truss is the most affordable, maintains the project schedule, minimizes environmental impacts, honors commitments to communities and stakeholders, would attract the largest pool of contractors thus allowing for the most competitive prices, and provides the least risk. More information on the review process and findings by ODOT and WSDOT can be found in the memo Columbia River Crossing: Key Findings and Recommendation related to Bridge Type, February 2011 (WSDOT and ODOT 2011).

A NEPA reevaluation was also completed comparing the impacts from the composite truss bridge design to the impacts from the bridge designs evaluated in the DEIS (the DEIS did not specify a bridge type but instead defined the bridge based on a size, height, and width envelope). The reevaluation found that impacts from the composit truss bridge design would be similar, and FTA and FHWA determined that no additional NEPA documentation was necessary beyond this FEIS.

The governors considered many factors to make the decision on bridge type. The public, stakeholders, project advisory committees, project sponsors staff, and local elected officials commented on the bridge type

options. Listening sessions were held to receive public comment. On April 25, 2011, the governors announced the selection of the composite deck truss as the preferred bridge type. Reducing and eliminating risks to project schedule and budget, affordability, impacts, and securing funding were all factors considered in the decision. For more information on the governors' decision factors, please see the memo from the governors' offices, Moving Forward: Columbia River Crossing Background, Bridge-type Major Factors, Next Steps dated April 2011 (Offices of the Governors 2011).

Refining and Defining the LPA

In addition to the LPA refinements resulting from the IRP and BRP input, other elements of the LPA have been refined and defined since the July 2008 LPA adoption. These changes were the result of on-going evaluation of design issues, costs, impacts, benefits and constructability, and have been determined through ongoing public and other stakeholder input. The list of elements that have been further defined or refined includes:

- Marine Drive interchange design
- Hayden Island interchange design
- Number of add/drop lanes on the river crossing and in other highway sections
- Number of separate bridge structures over the Columbia River
- Light rail alignment over Hayden Island
- Light rail alignment in downtown Vancouver
- Light rail alignment east-west to Clark College
- Station and park and ride locations
- Cost reduction measures

Below is a description of how the design refinements were identified. These descriptions provide further refinement and definition to the LPA.

Marine Drive Interchange Design

The DEIS evaluated three designs for the Marine Drive interchange that differed in the alignment of Marine Drive west of I-5. These designs included an option for retaining most of the existing alignment, and two designs that realigned the roadway south of its current location. Following the selection of the LPA, the CRC project team established the Marine Drive Stakeholder Group to provide feedback on the function and design of the Marine Drive interchange. This advisory group was comprised of a range of stakeholders with strong interests in the design and operation of this interchange, including TriMet, the Oregon Department of Transportation, the City of Portland, the Port of Portland, trucking and distributions companies, the Audubon Society, nearby property owners such as Diversified Marine and the Metropolitan Exposition Recreation Commission, and community members from the surrounding Bridgeton, Kenton, and East Columbia neighborhoods.

Working with this advisory group, the CRC project team analyzed the traffic operations, property impacts, and potential environmental effects for a range of interchange designs. The Marine Drive interchange design included in the LPA and analyzed in this FEIS was developed in collaboration with this stakeholder advisory group to balance many competing interests, including freight mobility, property impacts to the Expo Center and other nearby properties, financial considerations, and environmental effects. The design included in the LPA is within the range of impacts of the options analyzed in the DEIS. More information is available in the

Marine Drive Interchange Alignment Recommendation Process: Final Summary Report and Stakeholder Recommendation (CRC 2009a).

Hayden Island Interchange Design

The DEIS evaluated options for the Hayden Island interchange which could accommodate a replacement or supplemental bridge. Since publication of the DEIS, the City of Portland adopted the Hayden Island Plan (City of Portland 2009), which calls for access to and from the island without using I-5.

The CRC Project Sponsors Council (PSC) convened a committee, called the Integrated Project Staff (IPS), to create recommendations to refine the Hayden Island interchange. The IPS worked with local stakeholders and the CRC project team to develop a design for the interchange which includes a local multimodal bridge to carry traffic to/from the island and Marine Drive. The interchange design allows all movements to and from the island and I-5, but also provides a local route to the island without accessing I-5. This design would allow for the elimination of direct ramps between Hayden Island and the Marine Drive interchange, thereby simplifying traffic operations and reducing the Hayden Island interchange footprint. On August 9, 2010, the PSC voted unanimously to recommend the refined Hayden Island interchange to be included as the preferred design in the LPA. This design, with a local multimodal bridge, is referred to as LPA Option A. In this FEIS, both the LPA Options A and B (as described in Section 2.2) are included for the Hayden Island interchange.

Number of Lanes on the River Crossing

The DEIS evaluated highway alternatives with cross-sections ranging from 8 to 12 lanes at the river crossing. Following the July 2008 adoption of the LPA, the PSC met several times to discuss the number of lanes, noting concerns and interests about this design element of the project. The discussion included how the number of add/drop lanes relates to safety and mobility, traffic diversion, greenhouse gases, and congestion; how they might indirectly affect traffic demand and land use; and the need to build this bridge to meet long-term regional needs.

On August 9, 2010, the PSC voted unanimously to recommend that the replacement bridges be constructed with 10 lanes and full shoulders to provide for safe operations between interchanges and efficient movement of people and goods. Three lanes on each bridge would be through lanes for traffic traveling through the project area, while the additional lanes on each bridge would be add/drop lanes that would accommodate traffic entering or exiting I-5 at one of the several closely spaced interchanges immediately north and south of the river.

Number of Bridges over the Columbia River

The DEIS evaluated a two-bridge design (Stacked Transit/Highway Bridge) and a three-bridge design over the Columbia River for the replacement crossing. The three-bridge design included (from east to west) a bridge for northbound I-5 traffic, a bridge for southbound I-5 traffic, and a third bridge for light rail with a separated pathway for bicyclists and pedestrians. A two-bridge design included the two bridges for north and southbound I-5 traffic, with light rail, bicyclists, and pedestrians traveling underneath the decks of these bridges.

Insert Sidebar: See Section 2.2.1 for a detailed description of the two-bridge river crossing design being evaluated in this document.

Several advantages of the two-bridge design were identified in the DEIS, including fewer piers with less in-water structure, smaller surface area generating less stormwater runoff, and a more compact crossing with less imposing visual obstruction of the river. Additionally, advisory groups and the PSC recommended preference for a two-bridge design. However, the nature of this bridge configuration – operating light rail beneath one highway bridge deck and providing a pedestrian and bicycle path under the other deck, both within the bridge's support structures – is an uncommon design, and required further engineering and evaluation of this design to determine its feasibility. Since the publication of the DEIS, the agencies

sponsoring the project have worked with the project's federal lead agencies, FTA and FHWA, and determined that the two-bridge design is feasible (CRC 2009e). Therefore, the two-bridge design is being carried forward for analysis in this FEIS.

Light Rail Alignment over Hayden Island

The DEIS evaluated two transit alignments over Hayden Island, both on the west side of I-5. One option aligned transit adjacent to the I-5 interchange, and another offset it approximately 450 feet west of the I-5 interchange. Since the publication of the DEIS, the City of Portland completed a separate planning and outreach process that yielded a Hayden Island Plan (City of Portland 2009), which includes a vision for how the incorporated portion of this island should develop and/or redevelop. This plan includes a preference for the light rail transit alignment adjacent to the I-5 interchange. The LPA design includes the adjacent transit alignment on Hayden Island.

Light Rail Alignment in Downtown Vancouver

The DEIS evaluated two transit alignment options through downtown Vancouver – two-way travel on Washington Street, or a couplet with northbound travel on Broadway Street and southbound travel on Washington Street. Following the adoption of the LPA in the summer of 2008, the project formed the Vancouver Working Group (VWG), composed of residents, business owners, transit-dependent populations, and commuters in the Vancouver area. This group met regularly to provide feedback, invite public input, and develop recommendations to the CRC project team, City of Vancouver, and C-TRAN on preferred transit alignments and proposed station locations. Project staff, working with the VWG, identified several advantages of the couplet, including better support for development potential in downtown and the ability to accommodate more uses on these streets than could be afforded with a two-way transit guideway on Washington Street. On March 19, 2009, the VWG voted to recommend that light rail run on the couplet on Washington and Broadway Streets through downtown Vancouver (City of Vancouver and C-TRAN 2009).

Light Rail Alignment East-west to Clark College

The DEIS evaluated two east-west transit alignment options to connect the north-south downtown Vancouver alignment to the light rail transit terminus at the Clark Park and Ride: two-way travel on McLoughlin Boulevard, and two-way travel on 16th Street. The VWG explored McLoughlin Boulevard, 16th Street, and 17th Street as possible alternative east/west connections. The 17th Street alignment was not analyzed in the DEIS, but a NEPA reevaluation was completed in which FTA and FHWA determined that impacts from the 17th Street alignment were within the range of impacts from the 16th Street and McLoughlin alignments. Following approximately 5 months of coordination, in addition to public open houses and walking tours, the VWG was nearly evenly split between the 17th Street and McLoughlin alignments as the east/west connection to the Clark Park and Ride. The 16th Street alignment was dropped from considerations due to cost, speed, and safety considerations.

Upon learning about the VWG's split vote of the east-west alignment, members of City of Vancouver Council and C-TRAN's Board of Directors advised the CRC staff to more thoroughly investigate both the McLoughlin Boulevard and 17th Street alignments. From November 2009 until February 2010, CRC project staff conducted extensive technical work and public outreach regarding these alignment options. Based on this additional research and public input, the City of Vancouver Council (March 22, 2010) and C-TRAN Board of Directors (April 13, 2010) voted to adopt the 17th Street alignment.

Station and park and ride locations

The DEIS evaluated station locations associated with multiple light rail alignments. In Vancouver, the Broadway-Washington couplet alignment in the DEIS included a pair of stations near 6th Street, a pair of stations between 11th and 12th Streets, a pair of stations between 15th and 16th Streets, and a station near

the Clark Park and Ride. Additional investigation completed since the FEIS found design constraints that required the relocation of two pairs of stations. The stations near 6th Street were combined into one station between 5th and 6th Streets. This move was made so the stations would not need to be placed on a curve, which requires closing traffic, and so the combined station could be placed as close as possible to the Columbia Park and Ride. The stations between 11th and 12th Streets in the DEIS were moved to between 9th and Evergreen Streets. This move was based on proximity to planned development in Downtown Vancouver, including the Riverwest development, much of which is expected to occur in the southern part of downtown.

On Hayden Island, transit station location was determined after meetings with the City of Portland, TriMet, and discussions with the Portland Working Group.

The DEIS also evaluated multiple park and ride locations associated with the transit alignments. Since publication of the DEIS, the light rail alignment has been defined and three park and ride locations (Clark, Mill and Columbia, as described in Section 2.2.2) selected from the DEIS options. These three park and ride locations were evaluated in the DEIS. Expected utilization of parking spaces, cost-effectiveness, transit operations, and traffic modeling were considered by project staff when recommending the proposed park and ride locations with the LPA. Upon selection of the Clark College area as the terminus of the light rail alignment, it was determined that three park and ride stations in their proposed locations would be the most cost-effective option. For more information, see Appendix D of the Transit Technical Report, included as an electronic appendix to this FEIS.

Cost Reduction/Saving Measures

Since the publication of the DEIS, it has become increasingly evident that there will likely not be adequate funding to construct all elements of the LPA in a single phase. This compelled the project sponsors to identify ways to reduce project costs and/or to phase construction. The project team, working with stakeholder groups, identified several elements of the project design that could be modified or postponed to reduce construction costs. These would reduce or delay some of the project benefits but would still allow the project to meet the purpose and need.

These cost reduction measures include:

- *Retain the existing North Portland Harbor bridge*: This would utilize the existing North Portland Harbor bridge for mainline I-5 traffic. By reusing the existing bridge, the freeway across Hayden Island would be shifted slightly east from the designs evaluated in the DEIS. This shift changes some impacts on the island; these are discussed in Chapter 3.

- *Lower the Hayden Island interchange onto fill and retaining walls*: The DEIS alternatives assumed the Hayden Island interchange ramps and freeway mainline would be on fill. However, after the DEIS, the project team investigated the option of supporting the interchange on structures. That option would be more expensive and was not forwarded to the FEIS.

- *Eliminate one proposed northbound add/drop lane on I-5 from SR 14 to SR 500*: The connection from SR 14 to the I-5 northbound CD would be one lane, rather than two lanes. This slightly reduces cost, actually provides for a smoother transition on the CD by reducing the number of merging movements, and provides preference to the I-5 traffic. The result is one less add/drop lane on northbound I-5 between the SR 14 and the SR 500 interchanges. The structures over I-5 and the retaining walls on either side of I-5 would be constructed to allow this additional lane in the future, but this lane would not be built as part of the project.

- *Defer northern improvements to the SR 500 interchange*: This would defer the northernmost I-5 improvements so that they would not be constructed as part of the CRC project but could be constructed at some unknown date in the future. This would retain the existing freeway-to-freeway

connection at the I-5/SR 500 interchange (I-5 northbound to SR 500 westbound, and SR 500 westbound to I-5 southbound).

- *Defer I-5 to Victory Boulevard braided ramp*: This would retain the existing connections between I-5 southbound and Victory Boulevard. The braided ramp connection could be constructed separately in the future as funding becomes available.

- *Defer the flyover connection at the Marine Drive interchange*: This would defer the direct connection provided by a flyover ramp between eastbound Marine Drive and I-5 northbound. The CRC project improvements to the interchange would instead provide connection through a signal-controlled intersection.

It is important to note that the final three cost-reduction measures that defer certain elements of the project may or may not be funded with construction of the first phase of the LPA. These elements would be included if funding is available, but this will not be known until closer to the time of construction when financing for the project is secured. The likely effects of the project both with and without these potentially deferred elements are compared in this FEIS. Analysis of the LPA assuming that these three elements would be deferred is referred to in this FEIS as "the LPA with highway phasing."

NEPA Determinations

FTA and FHWA prepared NEPA determinations to analyze changes in the project and project impacts that have occurred since the DEIS. Two NEPA re-evaluations, a technical memorandum and a documented categorical exclusion (DCE) were prepared. The NEPA re-evaluations addressed the changes in project impacts from 1) the selection of the composite deck truss bridge type and 2) all other changes in design between the DEIS and FEIS. The technical memorandum addressed the changes in impacts from the 17th Street transit alignment, and the DCE addressed the impacts from the track work on the Steel Bridge.

Both agencies concluded from these determinations that these changes and new information would not result in any new significant environmental impacts that were not previously considered in the DEIS. These changes in impacts are described in Appendix O of this FEIS.

The program evaluated terminus options for each alignment and mode (described above), including Hayden Island in Portland and Waterfront, Turtle Place, Evergreen/I-5, McLoughlin/I-5 and Kiggins Bowl in Vancouver.

The evaluation of Hayden Island as a terminus was a hybrid option that included the extension of LRT north from Expo Center to Hayden Island and the extension of BRT from Turtle Place south to Hayden Island. It was an exploratory option that did not perform as well as others in the evaluation process from a ridership standpoint and ultimately was removed from consideration in combination with the decision on mode.

On the Vancouver side, the five terminus options included two that would result in a single station just across the Columbia River (Waterfront and Turtle Place) and three that would extend farther north, including options for one additional station (Evergreen/I-5), two additional stations (McLoughlin/I-5), or four additional stations (Kiggins Bowl). The single station terminus options did not perform as well as others that extended farther into Vancouver from a ridership standpoint, regardless of which mode was considered. Alignments with stations north of Evergreen Boulevard offered more ridership, but with greater impacts to properties and increased costs.

Through analysis and conversations with partners, it was determined that an Evergreen Boulevard terminus would:

- Have fewer potential property impacts compared to other locations.

- Have lower operating and capital costs compared to other locations.
- Avoid impacts to Clark Community College as a result of the station, alignment, and park and ride that were included in options that assumed Mcloughlin/I-5 as a terminus.
- Avoid impacts to C-TRAN network and Vine service.
- Avoid impacts to the City of Vancouver's vision and downtown development.
- Provide increased transfer options to additional C-TRAN routes.
- Connect directly to downtown library, jobs, services and amenities.
- Support transit-oriented development opportunities at Library Square and on nearby City-owned parcels.
- Maximize transfer opportunities given planned direct connections to several local routes, as well as existing and planned BRT routes.
- Provide convenient access to Evergreen Boulevard, which connects east over I-5 to the Historic Reserve, and west through downtown to Main Street and Esther Short Park via the planned 9th Street pedestrian way.

Based on evaluation during screening along with feedback from partner agencies, the IBR program and partner agencies recommended advancing the terminus at Evergreen Boulevard for further study and refinement.

Auxiliary Lanes

Auxiliary lanes improve traffic safety and reliability by providing sufficient merge, diverge, and weaving space for vehicles entering and exiting the freeway while allowing the through traffic to maintain fuel-efficient driving speeds in the adjacent through lanes. In addition to maintaining the existing three through lanes in each direction across the bridge, the IBR program evaluated the addition of one and two auxiliary lanes in each direction. Two auxiliary lane options (one and two auxiliary lanes) were advanced for additional analysis and consideration. The results of the auxiliary lane evaluation are summarized in Table 2-7.

Table 2-7. Summary of Auxiliary Lanes Evaluation Results

Benefits of One or Two Auxiliary Lanes (Compared to No-Build)	Supplemental Benefits of One Auxiliary Lane	Supplemental Benefits of Two Auxiliary Lanes
• Mode choice benefits (high-capacity transit, bus on shoulder and active transportation). (MA, ME) • Mode shift: the daily transit share is expected to increase from 7% to 11%. (ME) • Reduced overall congestion. (MA, RID) • Off-peak benefits including weekends. • Less diversion to local streets. (AH) • Faster congestion recovery from crashes and incidents. (RID). • Fewer lane changes required (i.e., lane balance). • Safety improvements realized due to fewer sideswipe crashes and improved visibility. • Lane widths to allow for current vehicle widths, turning, and comfort. • Anticipated greenhouse gas reduction due to less congestion. (RID)	• Travel time improvements compared to No-Build (MA, RID): – Southbound AM travel time would be reduced by 3 minutes (5% faster) between I-5/I-205 split and I-405. – Northbound PM travel time would be reduced by 11 minutes (30% faster) between Broadway Avenue and SR 500.	• Travel time improvements compared to No-Build (MA, RID): – Southbound AM travel time would be reduced by 6 minutes (10% faster) between I-5/I-205 split and I-405. – Northbound PM travel time would be reduced by 25 minutes (70% faster) between Broadway Avenue and SR 500. • Reduced congestion compared to No-Build (RID): – Congestion would be reduced by 20% during the 8-hour AM/PM peak period.

Equity Objectives – AH = Avoid further harm; MA = Mobility and accessibility; PD = Physical design
Climate Objectives – ME = Multimodal environmental; RID = Reduces idling

Based on initial results and feedback from the partner agencies, one auxiliary lane northbound and one auxiliary lane southbound between Marine Drive and Mill Plain Boulevard was recommended to be advanced. The addition of auxiliary lanes can help optimize the existing three through lanes and allow for more efficient movement through the corridor, thus improving safety, helping to relieve congestion with better traffic flow, and reducing emissions from vehicles idling in congestion. Studying one auxiliary lane in each direction recognizes the desire to balance all of the regional needs and priorities, including safe, efficient, and reliable travel, as well as equity and climate goals. Refer to the Design Options Development, Screening and Evaluation Technical Report (Appendix D) for additional information.

2.5.4 Adopting Foundational Components of the Modified LPA

The Modified LPA consists of recommendations for four key program components: the interchanges on Hayden Island and Marine Drive; transit mode, general alignment and termini; the number of auxiliary lanes; and variable-rate tolling. The guiding bodies of each of the eight IBR program partners, including the regional transit agencies, cities, metropolitan planning organizations and ports, met between June 22 and July 14, 2022, to consider the IBR program's recommendation for the Modified LPA. These boards, councils, and commissions voted to endorse the IBR program's Modified LPA through their agency's resolution. However, in

addition to the Modified LPA resolutions, many partners included conditions reflecting their priorities and requests for additional work, considerations, and analysis. The IBR program acknowledges that the analysis to support the Modified LPA was conceptual; more design refinement, transportation and transit analysis, financial analysis, and environmental evaluation is needed to better understand the impacts and benefits of the Modified LPA as the program continues to develop a multimodal corridor solution. Therefore, the IBR program is committed to further refinements and analysis, as well as sharing the results to gather additional input on the Modified LPA.

Environmental analyses for this Supplemental Draft EIS have been conducted to evaluate benefits and impacts to environmental and community resources (e.g., air quality, climate, land use, transportation) and to identify potential mitigation for adverse impacts. Agencies, stakeholders, advisory groups, and the public will have additional opportunities to provide input and feedback on the Modified LPA, environmental analyses, and proposed mitigation. The opportunities include a public comment period, public hearings held for the Supplemental Draft EIS, and other options to be identified.

2.6 Additional Compliance Underway

In addition to compliance with NEPA through development of this Supplemental Draft EIS, the IBR program will comply with a number of other federal and state regulatory requirements, which are summarized below and described in more detail in Appendix A.

- **Endangered Species Act** – The IBR program is consulting with NOAA Fisheries and USFWS to comply with Section 7. A new biological assessment was prepared to address changes since the 2013 consultation. It is expected that NOAA Fisheries will issue a new biological opinion and the USFWS will issue a new letter of concurrence prior to the publication of the combined Supplemental Final EIS and ROD.
- **U.S. Army Corps of Engineers Section 408** – When alterations to a USACE Civil Works project are proposed, Section 14 of the Rivers and Harbors Act of 1899 (codified as 33 USC §408 and referenced as Section 408) requires a determination that these alterations will not be injurious to the public interest nor impair the usefulness of the USACE Civil Works project. The IBR program is coordinating with USACE to complete the permitting process started by the CRC Project; anticipated activities include developing and submitting a 60 percent design package to address proposed alterations to the federally authorized navigation channel. Permits would be issued by USACE following publication of the ROD for IBR and prior to the beginning of construction.
- **U.S. Army Corps of Engineers Section 404** – The IBR program will submit a new permit application to obtain a permit from the USACE for impacts to designated waters of the United States. Program activities underway to support the permit application include wetland delineation, coordination with USACE to provide jurisdictional determination, and evaluation of potential impacts to wetlands and other waters from development of the Modified LPA. As with Section 408 compliance, permits would be issued by USACE following publication of the ROD for IBR and prior to the beginning of construction.
- **U.S. Coast Guard Section 9** – A permit under Section 9 of the Rivers and Harbors Act is required for any authority planning to construct or modify a bridge or causeway across a navigable waterway under the jurisdiction of the USCG. The USCG issued a bridge permit in September 2013 for the CRC Project. However, this authorization has expired, and a new permit process is required. The USCG issued new bridge permit application guidance (COMDTPUB P16591.3D) in July 2016. The IBR program has prepared a new Navigation Impact Report to support the USCG's Preliminary Navigation Clearance Determination and will submit new bridge permit applications for bridges proposed over the Columbia River and North Portland Harbor in accordance with the 2016 bridge permit application guidance. In addition, the IBR program will comply with the 2014 USCG/FHWA/FTA/Federal Railroad Administration Memorandum of

Understanding and the 2014 USCG/FHWA Memorandum of Agreement (MOA). The bridge permit would be issued after publication of the ROD and prior to the start of construction.

- **Section 106 of the National Historic Preservation Act** – Under the CRC Project, cultural resource studies, consultations, surveys, testing, and evaluations were completed and culminated in a signed MOA to address adverse effects on historic properties. In the spring of 2021, the FHWA's Federal Preservation Officer in Washington, D.C., and the Advisory Council on Historic Preservation informed the IBR team that the signed 2011 MOA was no longer valid due to current policy and guideline standards. The IBR program is therefore updating the previous inventories, evaluating additional historic properties, and consulting with consulting parties and tribes to develop one or more mitigation plans for adversely affected historic properties. Any design changes or refinements proposed outside of the CRC Project's Area of Potential Effects would also require updates to the Section 106 consultation process. A new Programmatic Agreement will be developed and signed by applicable federal, state, and local agencies and tribes prior to the publication of the combined Supplemental Final EIS and ROD.

- **Other regulatory compliance for cultural resources** – Changes in the historic property inventory, significance, effects and mitigation will be subject to compliance with the Archaeological Resources Protection Act of 1979 and the Native American Graves Protection and Repatriation Act. Section 4(f) of the U.S. Department of Transportation Act of 1966 will also take into consideration any identified historic sites considered to have national, state, or local significance that are within the Project's Area of Potential Effects. The program is also subject to state cultural resources laws. In Oregon, these statutes include Archaeological Sites and Objects (ORS 358.905 to 358.955); Permit and Conditions for Excavation or Removal of Archaeological or Historical Material on Public Lands (ORS 390.235); and Indian Graves and Protected Objects (ORS 97.740-97.760). In Washington, these laws include Archaeological Sites and Resources (RCW 27.53), Indian Graves and Records (RCW 27.44), and Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60). Compliance with these regulations will occur during the NEPA process and/or as project elements advance into detailed design.

- **Tribal consultation** – Government-to-government consultation was reinitiated in September of 2020. This included outreach to 21 tribes, four of which have adjudicated treaty fishing access rights along the Columbia River. In February 2022, following consultation with the National Park Service, the IBR program conducted outreach to an additional 17 tribes. Based on that outreach and previous participation, the program has identified 10 consulting tribes. Consultation was also initiated with the Columbia River Intertribal Fish Commission, which will be actively engaged in natural resource discussions pertaining to fisheries.

2.7 References

Note to Reviewers: Section 2.7, References, will not be in Chapter 2. It is included here until references for all the chapters are combined into the final references list.

CRC (Columbia River Crossing). 2011a. Interstate 5 Columbia River Crossing Project Final Environmental Impact Statement and Final Section 4(f) Evaluation. Available at: <https://www.wsdot.wa.gov/accountability/ssb5806/environmental-process-and-permitting.htm>. Accessed January 12, 2023.

CRC. 2011b. Interstate 5 Columbia River Crossing Project Record of Decision. FHWA-WA-EIS-08-01-F. Available at: <https://www.wsdot.wa.gov/accountability/ssb5806/environmental-process-and-permitting.htm>. Accessed January 12, 2023.

IBR (Interstate Bridge Replacement program). 2021. Re-Evaluation of the Interstate-5 Columbia River Crossing Final Environmental Impact Statement and Record of Decision (2011; re-evaluated in 2012 and 2013). Available at: <https://www.interstatebridge.org/media/oikjjhz0/2021-12-29-ibr-reevaluation-final-version-signed_remediated.pdf>. Accessed January 12, 2023.