

**REVIEW DRAFT**

*I-5 Columbia River Crossing Partnership:  
Traffic and Tolling Analysis*

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Toll Collection  
Options and Impacts for  
Bridge Crossing Concept 7

Working Paper 12.33

**Prepared by**

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## TABLE OF CONTENTS

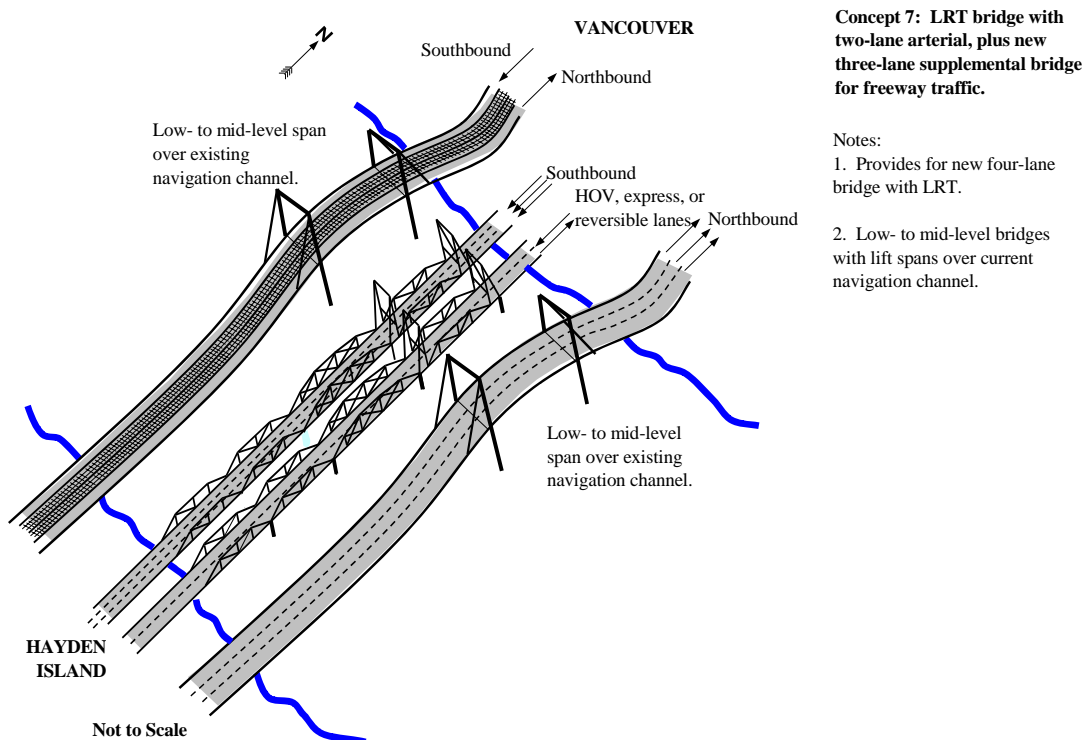
	Page
<b>OVERVIEW .....</b>	<b>1</b>
<b>TOLL COLLECTION OPTIONS .....</b>	<b>2</b>
WORKSHOP ASSUMPTIONS FOR SITING TOLL PLAZAS .....	2
INITIAL WORKSHOP RECOMMENDATIONS FOR BRIDGE CONCEPT 7 .....	3
<i>Toll I-5 Only Scenario</i> .....	4
<i>Toll NB and SB in Washington</i> .....	5
<i>Toll NB and SB in Oregon</i> .....	5
<i>Toll NB in Oregon and SB in Washington</i> .....	5
<i>Toll NB in Washington and SB in Oregon</i> .....	6
<i>Toll I-5 and I-205 Scenario</i> .....	6
<b>RECOMMENDATIONS .....</b>	<b>6</b>

## LIST OF FIGURES

	Follows page
Figure 1. Bridge Concept 7, Characteristics .....	1
Figure 2. Bridge Concept 7, Hayden Island Alignments .....	1
Figure 3. Bridge Concept 7, Washington Alignment Vic. SR 14 Interchange .....	2
Figure 4. Bridge Concept 7, Washington Alignment Vic. Mill Plain Interchange .....	5

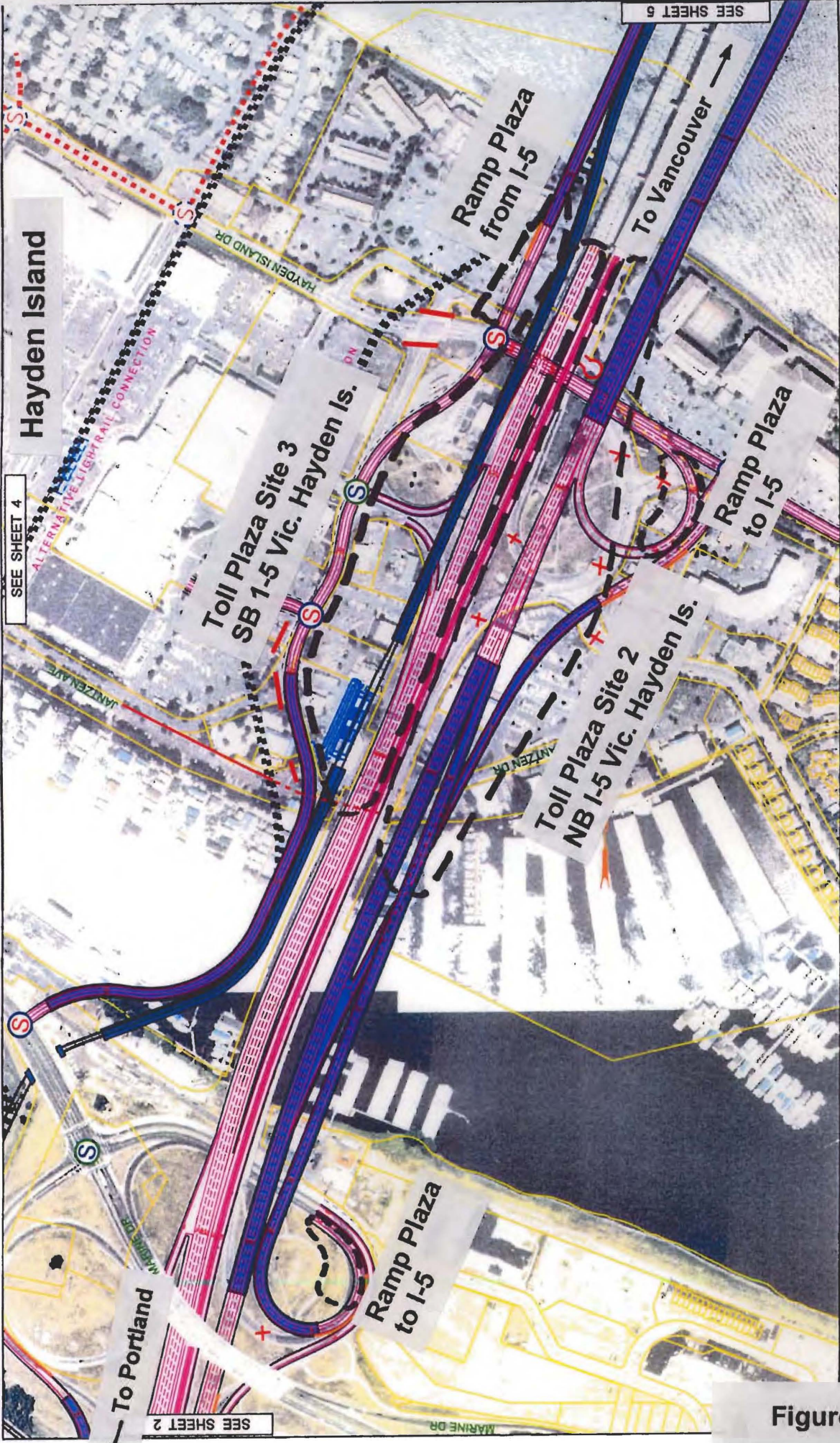
## OVERVIEW

This Working Paper (WP) reviews the options and impacts for collecting tolls for Columbia River Crossing Bridge Concept 7 as described in the “Bridge Influence Area Summary Draft,” dated April 19, 2002. Bridge Concept 7 was one of four Columbia River Crossing concepts that were selected for detailed design and evaluation in the I-5 Transportation and Trade Partnership project. **Figure 1** below depicts the characteristics of Bridge Concept 7:



Bridge Concept 7 provides for new bridges east and west of the existing low-level I-5 bridges. The West Bridge would carry two light rail lines plus two arterial lanes. The East Bridge would carry three northbound (NB) I-5 lanes. The existing Southbound (SB) I-5 Bridge would still carry three lanes of interstate traffic and the existing NB lanes would be High Occupancy Vehicle (HOV), express, or reversible lanes.

**Figures 2, 3, and 4** show alignments in Oregon on Hayden Island, and in Washington near the SR 14 and Mill Plain interchanges that were developed for Bridge Concept 7. These conceptual alignments were not designed for collection of tolls. Bridge Concept 7 (**Figure 2**) requires a much larger right-of-way footprint on Hayden Island in Oregon compared to other options because of the two new bridges located either side of the existing I-5 bridges and the resulting split alignment. The West LRT/2-Lane Arterial Bridge requires an arterial connection to Hayden Island Drive and Marine Drive



MARCH 2002  
SHEET 3 OF 10

**I-5 TRANSPORTATION AND TRADE PARTNERSHIP**

CONCEPT 7 - 3 LANE STRUCTURE WITH ARTERIAL

SCALE 1" = 300'

Portland/Vancouver I-5 Transportation and Trade Partnership

**LEGEND**

- LIGHT RAIL
- RIGHT OF WAY
- ROADWAY CONSTRUCTION
- BRIDGE CONSTRUCTION
- RETAINING WALL
- CUT/FILL LIMITS

Figure 2

as well as a LRT station. Additional space is needed on the east to allow for the transition from the existing NB lanes to the new NB Columbia River crossing located east of the existing I-5 bridges, and for the connections to the arterials on Hayden Island. In Washington (**Figure 3**), the new NB Bridge aligns well with the existing I-5 alignment and has less of an impact on needs for added right-of-way.

Although the purpose of this WP is to assess the options and impacts for toll collection for Bridge Concept 7, it is also worth noting that there are operational issues associated with the concept. A key characteristic of Bridge Concept 7 is use of the existing NB Bridge for HOV, express, or reversible lanes. Previous WPs (6.1 and 6.2) addressed traffic impacts of HOV lanes and Truck-Only lanes. Findings from the two WPs recommended against a reversible lane for either HOV or Truck-Only in the Draft Environmental Impact Statement. The WPs also supported not combining HOV and trucks in a combined facility. In general, the projected travel demand in one direction was not substantially higher than in the other direction during the peak periods and would result in under-utilization of new capacity on I-5 if reversible lanes are provided. The forecasted I-5 Bridge Influence Area (BIA) directional splits were not consistent with operation of a reversible lane system.

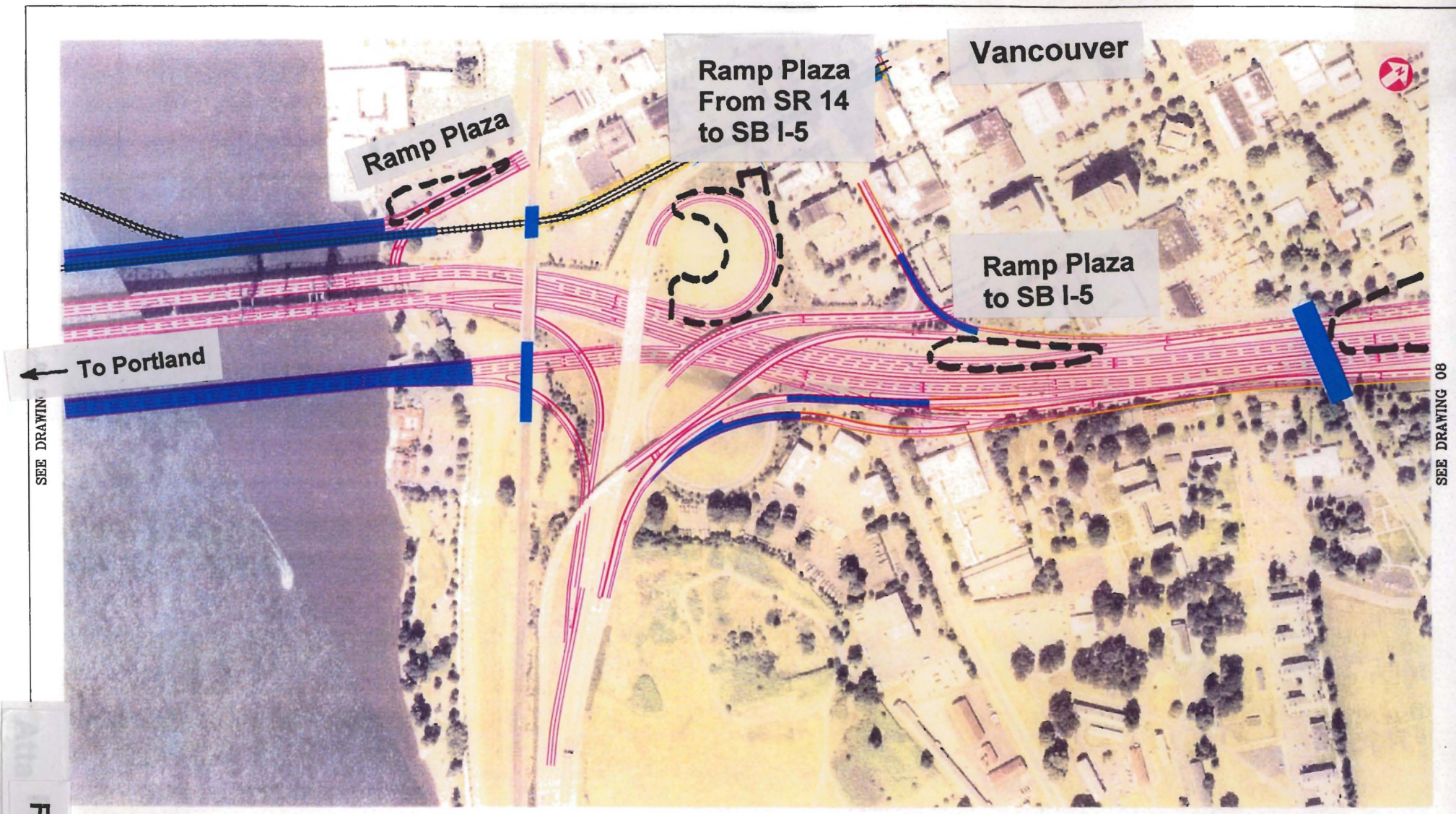
## **TOLL COLLECTION OPTIONS**

Options for collecting tolls for Bridge Concept 7 were first evaluated in a toll plaza design workshop held on August 25, 2004. The purpose of the workshop was to gain a better understanding of the impacts of siting toll plazas for each of the four river crossing concepts studied for the I-5 Transportation and Trade Partnership project. Experts on interstate freeway design from ODOT, WSDOT, consultants, and toll plaza design experts from Vollmer and WSDOT participated in the workshop to help identify design parameters and introduce opportunities for “right-sizing” the plaza design to fit within the constraints of the adjacent land use.

### **Workshop Assumptions for Siting Toll Plazas**

The following assumptions were originally developed in the Tolling Workshop and outlined in WP 8.0, *Evaluation of Toll Facility Design Options* to help guide the design of toll collection facilities for the BIA Columbia River bridge crossing concepts. These assumptions were also used to re-evaluate toll collection options in this paper for Bridge Concept 7:

- Tolling options should have the potential to provide sufficient revenue to recover capital, maintenance, and operational costs of the new facilities—within the framework of potential state and regional policies.
- There are no national standards for design of toll plazas. However, guidelines have been developed that are a synthesis of design practices used for existing facilities located throughout the United States. For the purpose of finding acceptable sites for toll plazas, it is assumed that deviations from the guidelines will be acceptable if approved by the state DOT with jurisdiction and Federal Highway Administration, depending on whether located in Oregon or Washington.
- Scenarios should include options that allow for the existing bridges on I-5 and the existing bridge on I-205 to be tolled, as well as tolling new capacity across the river.



SEE DRAWIN

SEE DRAWING 08

Figure 3

<b>LEGEND</b>					<b>SCALE 1" = 300'</b>		<b>I-5 TRANSPORTATION AND TRADE PARTNERSHIP</b>		MARCH 2002	
								<b>CONCEPT 7-3 LANE W/ ARTERIAL STR</b>		SHEET
										<b>6</b>

- Toll plazas can be located either in Washington or Oregon. Tolls can be collected one direction or two directions. If one direction, they can toll either SB or NB.
- If tolls are to be collected in both directions, toll facilities should ideally be sited in close proximity to reduce operational costs.
- Efforts should be made to avoid historic places, mitigation areas, and to minimize the impact on other sensitive areas such as neighborhoods, wetlands, and parks.
- All standard options for collecting tolls should be considered, such as ETC, manual, automatic coin machines, tokens, use of toll gates, bar code readers, credit card, and tickets.
- Because of policy issues such as concerns for privacy and the practical limitations of technology, it is premature to assume that 100% electronic toll collection (ETC) will be practicable in the immediate future. For design purposes, an assumption of 40% ETC is satisfactory for testing toll plaza configurations.
- Toll lane capacities, the number of vehicles per hour per lane that can be handled, should follow averages as outlined in NCHRP Synthesis 240.
- Innovative methods to minimize toll plaza footprints should be considered.

WP 8.0 also provided details on design parameters and toll plaza configurations, and lane requirements that also were used in the evaluation for Bridge Concept 7.

### **Initial Workshop Recommendations for Bridge Concept 7**

The preferred location for toll collection facilities within the BIA is to place the toll barrier as close to the Columbia River crossing as possible. This is because there are eight interchanges within the four-mile BIA. Placing the mainline toll plaza further from the Columbia River would require separate facilities for all of the ramp connections that are located between the plaza and river crossing.

Another factor is the impact toll plazas have on adjacent land uses. Mainline toll plazas would require between 200 and 300 feet of additional right-of-way for each direction depending on where they are located. Since the properties abutting I-5 are fully developed, this would require takings to accommodate the plaza.

The workshop team identified adjacent land uses that would be considered high risk for taking right-of-way. Historic properties located in close proximity to the right-of-way along the eastside of I-5 between SR 14 and Mill Plain Boulevard make it unlikely that a NB toll plaza could be located in Washington. In Oregon, sensitive properties south of Marine Drive interchange also are unlikely candidates for placing a toll plaza. Given that some encroachments would be more acceptable along the west side, two potential SB plaza sites for Bridge Concept 7 were initially evaluated in the workshop. One would be in the area of Mill Plain interchange in Washington, and the other on Hayden Island in Oregon.

From an operational viewpoint, several problems were identified in the workshop for placing toll collection facilities for Bridge Concept 7. The split alignments, use of reversible lanes, and added arterial lanes and connections required multiple remote toll collection facilities that are more difficult to access and service. In addition, queues from operation of the lift spans would result in a slug of traffic being released into the toll plaza, creating further delays.

This WP provides a more in-depth analysis of how tolls could be collected for Bridge Concept 7 for the two tolling scenarios analyzed in this tolling study. The first scenario is “Toll I-5 Only” that requires tolls be collected in both directions on I-5. The second scenario is “Toll I-5 and I-205” where tolls are collected in one direction only.

### ***Toll I-5 Only Scenario***

The Toll I-5 Only Scenario requires that tolls be collected in both directions on I-5. No tolls would be collected on I-205.

Not only is there a need to provide space for the toll plaza, but also for the facilities that service them. Ideally, toll collection facilities would be located opposite each other in either Washington or Oregon to take advantage of a common administration building. For Bridge Concept 7, this also would allow for use of reversible lanes on the median side to help reduce the size of the plaza.

The purpose of the administration building is to provide space for administrative, finance, maintenance, and security functions as well as accommodations for staff such as break rooms and restrooms. The Administration building would operate 24 hours a day, seven days a week. A two-way facility on I-5 would require about 15,000 to 20,000 square feet of building, a staff of about 150 employees, and parking for about 100-120 vehicles. If the mainline plazas are separated with one located in Washington and the other in Oregon, there would be one main administration building with a satellite building at the other plaza.

The remote ramp plazas would need a small building for collector breaks including a rest room, lunch room, equipment room and a counting room with a safe that has provisions for money drops. Collectors would typically report to the main plaza administration building to pick up their starting bank and then drive to their assigned ramp location. Armored service would be used to pick up the money at remote locations under the supervision of toll personnel.

Collection options include:

- Toll NB and SB traffic at a toll plaza located in Washington in downtown Vancouver.
- Toll NB and SB traffic at a toll plaza located in Oregon on Hayden Island.
- Toll NB in Oregon on Hayden Island and SB in Washington in downtown Vancouver.
- Toll NB in Washington in downtown Vancouver and SB in Oregon on Hayden Island.



### ***Toll NB and SB in Washington***

There are no ideal locations to site toll plazas opposite each other in downtown Vancouver because of the large footprint required and the restrictions of not encroaching on historic properties along the eastside of I-5. A combined mainline SB and NB toll plaza could be located further to the north between Fourth Plain and SR 500. However this option would require river-crossing traffic to be separated from local access traffic to enable toll collection to occur on both the mainline and applicable NB and SB ramps at the SR 14 and Mill Plain Boulevard connections.

Therefore, options for collecting tolls in both directions in Washington should be dropped from further consideration.

### ***Toll NB and SB in Oregon***

Hayden Island would be the best location for placing toll plazas for NB and SB I-5 traffic that are located opposite each other (Toll Plaza Sites 2 and 3 on **Figure 2**). Bridge Concept 7 would need significant redesign compared to the conceptual alignments shown on **Figure 2** that didn't provide for toll collection. The plaza could take advantage of the area between the new NB lanes and the existing HOV reversible lanes, but would require redesign of the ramp connections to Hayden Island. The LRT and Arterial Bridge would need to be relocated to accommodate the wider plaza footprint.

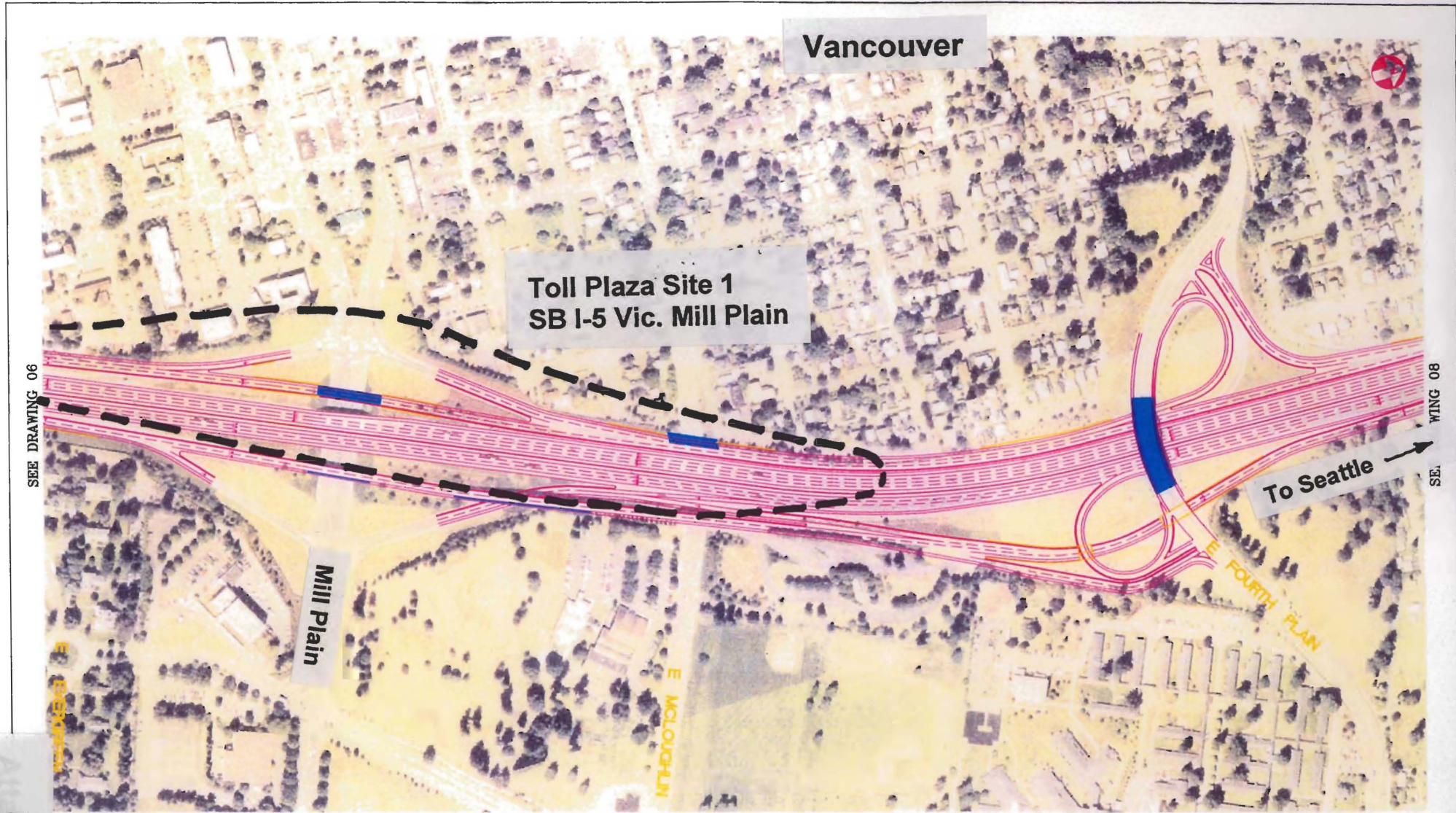
For SB traffic exiting to Hayden Island, a ramp plaza would be needed just prior to the Hayden Island Drive intersection. All other toll collection for vehicles crossing the river would be on the mainline. For NB traffic, two remote ramp plazas would be located to pick up traffic from the Marine Drive interchange and from Hayden Island Drive. The tight ramp approach radii and vertical alignment to I-5 will be a challenge for siting tollbooths on the ramps. The NB I-5 ramp connections could be redesigned to provide at-grade intersections that can access the mainline plaza.

Both a SB and NB plaza would require extending the approach and departure tapers to and from the toll plaza onto the new Columbia River crossing structures. The concept would require design deviations/exceptions, require between 15-20 acres of new right-of-way, and be the most expensive of the collection options because of the high cost of construction related to the need for new structures and larger right-of-way footprint. The concept would require a NB and SB mainline toll plaza and remote ramp plazas at three locations.

Because there are better options, this concept should be dropped from further consideration.

### ***Toll NB in Oregon and SB in Washington***

This option would provide for tolling NB on Hayden Island (Toll Plaza Site 2 on **Figure 2**) and SB near Mill Plain Boulevard (Toll Plaza Site 1 on **Figure 4**) in downtown Vancouver. Remote ramp plazas would be required in combination with the mainline plazas (**Figures 2 and 3**). The SB plaza at Mill Plain (Toll Plaza Site 1) would be the most feasible site for collecting tolls on I-5. The NB plaza on Hayden Island (Toll Plaza Site 2) is more complex and would require redesign of Bridge Concept 7 to work. The NB departure taper from Hayden Island would extend onto the new Columbia River Crossing structure.



Toll Plaza Site 1  
SB I-5 Vic. Mill Plain

Vancouver

Mill Plain

To Seattle

SEE DRAWING 06

SEE DRAWING 08

**LEGEND**

-  RIGHT OF WAY
-  ROADWAY CONSTRUCTION
-  BRIDGE CONSTRUCTION
-  RETAINING WALL
-  CUT/FILL LIMITS

**SCALE 1" = 300'**



**I-5 TRANSPORTATION AND TRADE PARTNERSHIP**

**CONCEPT 7-3 LANE W/ ARTERIAL STR**

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Figure 4

This option also would require two administration facilities with one of the two serving the primary administrative functions.

One advantage of this concept would be the perception of fairness by users because tolls would be collected in each direction just prior to crossing the bridge.

### ***Toll NB in Washington and SB in Oregon***

Because of the historical properties that abut the right-of-way along the eastside of I-5, it is unlikely that a NB toll plaza could be located in Washington. Combined with the difficulty in siting a SB toll plaza on Hayden Island in Oregon, this option should be dropped from further consideration.

### ***Toll I-5 and I-205 Scenario***

If I-5 and I-205 are tolled in one direction, the preferable site on I-5 for collecting tolls for Bridge Concept 7 is SB in downtown Vancouver (Toll Plaza Site 1) shown on **Figure 4**. The mainline plaza would be located near Mill Plain and remote ramp plazas would be required for the SB connections to I-5 from Mill Plain and SR 14 (**Figure 3**).

## **RECOMMENDATIONS**

Bridge Concept 7 is one of four Columbia River Crossing options that was evaluated in a Toll Collection Workshop that was conducted as part of this study. The concept provided for three SB lanes on the existing I-5 West Bridge; HOV, express, or reversible lanes on the existing I-5 East Bridge; a new LRT bridge with two arterial lanes west of the existing I-5 bridges, and a new NB bridge east of the existing I-5 bridges. Operationally, Bridge Concept 7 did not provide the same benefits for reducing traffic congestion compared to alternatives that provided for five lanes of traffic in each direction for I-5.

Bridge Concept 7 would prove more difficult for collecting tolls due to the split alignments and number of Columbia River Crossing structures. From a design and engineering perspective, it would be feasible to design toll collection facilities that function for Bridge Concept 7. However, the increased right-of-way impacts, construction costs, and complexity of operating and maintaining the toll facilities for Bridge Concept 7 would be higher than those for Bridge Concept 4, which provided for a new double bridge with five lanes in each direction and LRT on a separate structure.

Because Bridge Concept 7 uses the existing I-5 bridges, it would be premature to drop the concept from further analysis in the DEIS just because it would be more difficult and costly to provide toll collection facilities. If this concept is developed further as an alternative in the DEIS, the concept would need to be redesigned around toll collection facilities.

The recommended toll collection option for Toll I-5 Only is to provide a SB plaza in Washington in downtown Vancouver and a NB Plaza in Oregon on Hayden Island. Remote ramp plazas would be required to collect tolls from vehicles that enter downstream from the mainline plazas.