Columbia River CROSSING

Memorandum

November 20, 2007

TO: CRC Task Force

FROM: CRC Project Staff

SUBJECT: **Preliminary Findings on Key Decisions for a Locally Preferred Alternative**

Introduction

This memorandum describes preliminary findings for the alternatives being analyzed by the I-5 Columbia River Crossing (CRC) project in the Draft Environmental Impact Statement (DEIS). These findings provide the Task Force with important information to compare alternatives and various design options.

The DEIS and a Draft Locally Preferred Alternative are scheduled to be issued in February 2008 for formal public comment. The project findings, stakeholder input, and public comments will be considered by the Task Force in March 2008 for the purpose of making a Draft Locally Preferred Alternative (LPA) recommendation. Upon completion of the formal public comment period, and after the Task Force makes their recommendation, the Draft Locally Preferred Alternative will go to the local sponsoring agencies for their consideration. The Task Force's recommendation will be important input for these sponsor agencies during their decision making processes.

The three decisions for the LPA are:

- River crossing
  - Replacement river crossing, or
  - Supplemental river crossing
- High Capacity Transit (HCT) mode
  - Bus Rapid Transit (BRT), or
  - Light Rail Transit (LRT)
- HCT alignment
  - Vancouver alignment, or
  - I-5 alignment

The key preliminary findings that show a difference between the alternatives as they relate to the three LPA decisions are outlined in this document. A summary of the alternatives being considered and how those alternatives were developed follows the findings. The attached appendices provide more detailed findings for all of the Task Force adopted values under each decision.

Preliminary findings on river crossing options

Overall, the Replacement river crossing performs better than the Supplemental river crossing based on most values and criteria adopted by the Task Force. A Supplemental river crossing performs better in two areas: it would have less impact on historic resources and is about 10 percent to 15 percent cheaper to construct, depending upon HCT mode. A Replacement river crossing performs better for congestion relief, traffic capacity, safety design features, seismic vulnerability, Hayden Island impacts, accommodating future development, and river navigation.

Congestion Relief

A Replacement river crossing would provide more congestion relief than the Supplemental river crossing and No Build scenario. The No Build scenario accommodates about 55,000 person-trips during peak periods, and is predicted to increase congestion to 15 hours/day by 2030. The greater capacity of a Replacement river crossing – over 75,000 person-trips/day during peak commute periods, versus approximately 66,000 person-trips for a Supplemental river crossing – would reduce duration of congestion to between 3.5 to 5.5 hours/day. A Supplemental river crossing would result in about 11 hours of congestion each day.

Table 1. Interstate transportation performance	**Existing**	**2030 No Build**	**2030 Replacement**	**2030 Supplemental**
Peak-period person-trips	49,000	55,000	75,000	66,000
Duration of Congestion	6 hours	15 hours	3.5 - 5.5 hours	11 hours

Local street traffic would experience more congestion with a Supplemental river crossing than with a Replacement river crossing, particularly in lower downtown Vancouver, on Hayden Island, and near the Marine Drive interchange. The Supplemental river crossing would disrupt traffic flow on downtown Vancouver streets by closing the intersection at 6th and Washington and prohibiting a planned Main Street extension. This would result in shifting hundreds of vehicles per hour onto Columbia, which would result in over-capacity traffic conditions at many intersections as well as traffic back-ups along the SR 14 off-ramp and throughout lower downtown Vancouver.

Under the Supplemental river crossing, northbound I-5 would operate under congested conditions for multiple hours each day due to the "split" freeway system from near Marine Drive to north of Mill Plain. The outside lanes of I-5 would experience substantial congestion due to merging, weaving, and diverging maneuvers for five interchanges within the separated freeway lanes. This congestion, in turn, would limit the ability of the on-ramps from Marine Drive and Hayden Island to serve their traffic demands, resulting in ramp back-ups and arterial and local roadway congestion throughout the two interchange areas. Only about 50 percent of the Marine Drive and Hayden Island on-ramp traffic demand would be able to reach northbound I-5.

Accommodating Future Development

Plans for waterfront development in downtown Vancouver are better supported by a Replacement river crossing. A Replacement option allows Main Street to be extended south to the waterfront and also opens up the waterfront underneath the proposed bridge. A Replacement river crossing would vacate the existing I-5 right-of-way underneath the BNSF Railroad berm

and clear a path for extending Main Street south to Columbia Way. The Supplemental river crossing leaves the existing freeway in place, which does not afford space for extending Main Street, nor does it provide the opportunity to open up the waterfront area underneath the bridge. The City of Vancouver plans to extend Main Street south to strengthen the connection between downtown Vancouver and the riverfront. Improving this connection is especially important for traffic circulation needed by planned development along the Columbia River.

Traffic Safety

Existing safety hazards to freeway traffic – nonexistent shoulders, narrow lanes, poor sight distances, short merge lanes, and bridge lifts – would be fixed with a Replacement river crossing. None of these safety problems would be solved with the No Build scenario. A Supplemental river crossing would improve safety for southbound I-5 traffic and transit because those vehicles would be placed on a new structure built to current safety standards, but would only provide partial safety improvements for northbound traffic. Northbound I-5 traffic would remain on the existing bridges, and still be subjected to bridge lifts, and substandard sight distances due to the "hump" in the current structures. A supplemental river crossing would also create a divergence in the highway for northbound traffic between Marine Drive and Fourth Plain Blvd. Northbound traffic needing to exit the freeway 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.

Seismic Vulnerability

Both build options offer improved stability and safety during a seismic event. The new Supplemental bridge (carrying southbound Interstate traffic and HCT) and the entire Replacement river crossing would be constructed to withstand a 2,500-year seismic event, and to require only minimal repair after a 500-year event. The Existing bridges would be retrofitted to require minimal repair after a 500-year event but would only be able to withstand a 1,000-year seismic event. Any of these seismic events could force the existing bridges to collapse under the No Build scenario, and pose significant risk to any people on these structures during that event, not to mention the regional traffic and economic effects of losing the interstate connection.

Table 2. Stability during a seismic event	**No Build**	**Replacement**	**Supplemental**
Serviceability*	<500-year event	500-year event	500-year event
No Collapse**	<500-year event	2,500-year event	1,000-year event***

* Serviceability means that the structure would sustain only minor damage and would be operational with minimal repair

** No Collapse means that the structure(s) would remain standing during the seismic event to prevent injury and loss of life, but would need substantial repairs afterward to continue serviceability.

*** The northbound bridges would be retrofitted to withstand a 1,000 year event, but the new supplemental structure would be built to withstand a 2,500 year event.

Property Impacts on Hayden Island

A Replacement river crossing minimizes property acquisition on Hayden Island, avoiding some properties that a Supplemental river crossing cannot avoid. A Replacement river crossing can avoid acquisition of the Safeway on Hayden Island (the community's only supermarket), and affect fewer floating homes on the south shore of the island. Approximately 13-20 floating homes west of I-5 could need to be acquired with a Replacement river crossing depending upon whether HCT is aligned adjacent to, or offset from I-5. A Supplemental river crossing could acquire 22-23 floating homes and require acquisition of Safeway (though Safeway might be able to relocate on the island).

Marine Navigation Safety

The river navigation route for vessels traveling downstream between the I-5 crossing and the BNSF railroad bridge ½ mile west is substantially improved by a Replacement river crossing but worsened by a Supplemental river crossing. Currently, vessel captains making this trip must make a difficult "S" curve maneuver to navigate between the high span of the current bridges and the swing-span of the BNSF bridge because these channels are misaligned – the I-5 bridges' high span is roughly in the center of the river whereas the BNSF swing-span is closer to the north bank. During high water periods this maneuver is especially dangerous, forcing boats to frequently wait to use the lift-span that is closer to the north bank and thus better aligned with the BNSF bridge. A Replacement river crossing would be built with enough clearance to accommodate vessels without a lift-span, even during high water, and with a navigation channel aligned with the BNSF bridge. A Supplemental river crossing would make the current situation worse by adding more piers between the existing I-5 bridges and the BNSF bridge. Furthermore, a Supplemental river crossing would narrow the horizontal clearance of the high-span and lift-span channels approximately 40' to 60' each because the piers would need to be widened by the seismic retrofit.

Capital and Maintenance & Operations Costs

The Supplemental river crossing is approximately 20 percent cheaper to construct, but it is more expensive to maintain and operate. Reusing the existing bridges reduces capital costs, but would require repairs to these structures, such as resurfacing the bridge decks and repairing the lift-span equipment, through 2030. These repairs are the primary contributor to the substantially higher maintenance and operation cost of a Supplemental river crossing. The existing bridges are also required to be staffed 24 hours per day to operate the lift span.

Table 3. River Crossing Costs

	Replacement	**Supplemental**
Capital cost (millions $)	$1,240 - $1,590	$1,034 - $1,310
Annual operation cost	$700,000	$7,700,000

Capital cost range is due to a range of contingency that is included to address risk of cost overrun, and because of the range of HCT cost.

Historic Resources

The existing northbound bridge, which was built in 1917, is a historic resource that is on the National Register of Historic Places (NHRP). The supplemental river crossing retains this bridge, and the Replacement would remove it. However, the Supplemental river crossing would include extensive seismic retrofits to the current northbound bridge and the construction of an adjacent, modern bridge would substantially change the historic setting and visual integrity of the historic bridge. The Supplemental river crossing would also have slightly less physical impact on the historic Academy property in Vancouver and the Vancouver National Historic Reserve. Mitigation for any of these impacts is not included in this report, but will be considered and identified during later phases of design.

Preliminary findings on high capacity transit mode

LRT performs better than BRT on most key measures adopted by the Task Force. LRT provides quicker and more direct access to key markets, which helps attract 30 percent to 40 percent more transit river crossing riders than BRT. BRT costs about 20 percent to 30 percent less to construct, but costs 25 percent to 50 percent more to operate than LRT (Table 5). Because LRT attracts more riders and has lower operating costs, it would have better cost effectiveness than BRT, costing about 35 percent to 95 percent less per passenger (Table 5). Additionally, research suggests that LRT is likely to attract more investment around transit stations, which better allows the cities of Vancouver and Portland to attain locally and regionally adopted land use goals.

Travel times and Reliability

LRT provides better travel times and reliability than BRT (Table 4). BRT buses travel with general traffic outside the project area, and are thus subjected to congestion-induced delays before they enter the exclusive guideway in the project area. Such delays can cause the buses to miss their schedules and increase travel-times. This introduces an element of unreliability. Also, increasing the frequency of buses (labeled “Increased Transit” in Tables 4 and 5) further increases BRT travel times by congesting the transit guideway. The larger capacity of LRT trains would mean that fewer vehicles would be required to provide the same or greater passenger capacity, which means that the guideway would not be congested under either of the operating scenarios evaluated. Thus, LRT travel times are the same for both transit operating scenarios.

Table 4. **HCT Travel Times** (minutes)	BRT		LRT	
	Efficient transit operations	Increased transit operations*	Efficient transit operations	Increased transit operations*
Expo Center to terminal park and ride***	13	19	12	12
Lombard TC to terminal park and ride	25	28	18	18
Downtown Portland to downtown Vancouver	38	39	32	32
Downtown Portland to terminal park and ride	46	48	40	40

* "Increased transit operations" provide more frequent BRT or LRT service

** Terminal park and ride refers to the Lincoln or Kiggins Bowl park and rides which are the terminus for the Vancouver and I-5 alignments, respectively.

Transit Ridership

All build alternatives at least double transit ridership crossing the Columbia River compared to the No Build scenario. LRT attracts approximately 30 percent to 40 percent more riders across the Columbia River than BRT (Table 5). Integration with the existing MAX system is an important benefit of an LRT option because it helps attract these additional transit riders. This integration allows transit patrons to travel between Vancouver and Portland without a transfer. Transfers add time and, more importantly, are perceived by potential transit patrons as adding even more time, unreliability, and inconvenience to their commute.

Capital and Maintenance & Operations Costs

Relative to BRT, LRT costs more to build, but is more cost effective. LRT operating cost per annual transit river crossing rider is about half the cost of BRT. LRT is also cheaper per annual transit river crossing rider when taking into account the greater annualized capital expense of LRT infrastructure. This is due to lower maintenance and operation costs as well as the additional ridership garnered by LRT.

Table 5. **HCT Costs**	**BRT**				**LRT**			
	Vancouver Align.		*I-5 Alignment*		*Vancouver Align.*		*I-5 Alignment*	
	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.
Capital cost (millions $)*	$600 - $770	$720 - $810	$790 - $940	$910 - $1,010	$780 - $940	$880 - $980	$970 - $1,130	$1,070 - $1,180
Annual operating cost over No Build (millions $)	$5.3	$44.6	N/A	N/A	$3.5	$35.7	$4.2	N/A
Total annual transit passengers over I-5 crossing (millions)	4.8	5.7	N/A	N/A	6.7	7.4	6.8	N/A
Annualized cost per transit passenger over I-5 river crossing**	$16.82	$27.96	N/A	N/A	$12.29	$16.21	N/A	N/A

* Capital cost ranges are due to the range of potential risk for cost-overruns

** Includes annualized capital costs plus annual operating costs, per transit rider

*** This number is total annual operating cost in 2030 for the No Build scenario. All build scenarios are reported by the incremental new operating cost over the No Build scenario.

Investment Potential at Transit Stations

Academic research, case studies, and public outreach suggest that both LRT and BRT can attract economic investment, but also suggests that LRT can attract more investment than BRT. Rail lines have greater visibility and appeal than buses[1], and studies have correlated this with a rider preference for trains over buses [2]. These factors, in addition to the perception that rail infrastructure is a more permanent and fixed public investment[3] indicate developers are more likely to invest around LRT stations than around BRT stations. Economic investment around transit stations leads to new, generally pedestrian-oriented and higher density, commercial and residential development that then further supports the nearby transit service. This type of development focuses growth along established transportation corridors and helps communities and the region to attain adopted land use and transportation goals for managing sprawl, decreasing automobile dependence, and increasing pedestrian-oriented development.

Preliminary findings on high capacity transit alignment

The full-length alignments north of downtown Vancouver have distinct advantages and disadvantages. The I-5 alignment would impact less property but would cost more to construct and be less integrated with the surrounding community. The Vancouver alignment costs less to construct and would be better integrated with neighborhoods and commercial areas, but would have more local traffic and property impacts.

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[1] Dittmar, H. and G. Ohland. 2004. Defining Transit-Oriented Development: The New Regional Building Block. in Dittmar H & Ohland G The New Transit Town: Best Practices in Transit-oriented Development. Island Press.

[2] Kenworthy, Jeff. 2000. Techniques of Urban Sustainability: Quality Transit. Institute for Sustainability and Technology Policy. Accessed June 27, 2007 at: http://www.sustainability.murdoch.edu.au/casestudies/Case_Studies_Asia/qtrans/qtrans.htm.

[3] WMATA (Washington Metropolitan Area Transit Authority). 2005. Columbia Pike Transit Alternatives Analysis Final Report. Arlington, VA. Accessed June 21, 2007 at: http://www.piketransit.com/media/publications.aspx#Reports.

Operating Characteristics and Ridership

Table 6 shows that both full-length alignments operate comparably. The I-5 alignment provides similar travel times despite a longer guideway by providing a faster average speed. Ridership is also comparable between both alignments.

Table 6. **Alignment Characteristics***	**Vancouver Alignment**	**I-5 Alignment**
Total Guideway length	3.43 miles	4.21 miles
Property acquisition in northern Vancouver**	14 acres***	5-6 acres
Average Guideway speed	17.3 mph	21.5 mph
Expo Center to northern terminus	12.0 min	11.7 min
Pioneer Courthouse Square to northern terminus	39.9 min	39.6 min
Daily passenger trips on transit over I-5 crossing	20,800	21,100

* Values are for LRT, but the relationships between the alignments are the same for BRT

** Property acquisition north of 16th Street

*** Does not include 11 acres that is the existing WSDOT mainenance facility that would be used for the Lincoln Park and Ride

Property Acquisition

The I-5 alignment requires less property acquisition – only 5 or 6 acres in northern Vancouver – than the Vancouver alignment, which would acquire 14 acres of property (not including 11 acres in the existing WSDOT maintenance facility) in northern Vancouver. The Vancouver alignment would widen Main Street to accommodate the HCT guideway, whereas the I-5 alignment would largely use the existing I-5 right-of-way.

Capital and Maintenance & Operations Costs

Table 5 provides more distinction between the Vancouver and I-5 alignments. The I-5 alignment is about 25 percent more expensive to construct than the Vancouver alignment, requiring an additional 8 more months to build because it is longer, requires a new tunnel underneath I-5 to connect to the Clark College park and ride, and an elevated structure to cross back over I-5 to connect to the Kiggins Bowl park and ride. The longer and more elaborate structure of the I-5 alignment is also about 25 percent more expensive to maintain and operate than the Vancouver alignment.

Local Traffic Impacts

The Vancouver alignment has more impact on local traffic circulation because it reduces automobile capacity on Main Street (north of Fourth Plain), the only north-south arterial west of

I-5 in Vancouver. This could potentially cause more traffic congestion on Main Street. The I-5 alignment has less effect on local streets because it is primarily within the I-5 right-of-way, though it adds congestion on 16th Street or McLoughlin Street because it would use one of these streets to connect to the Clark College park and ride. The project team is just beginning to evaluate potential mitigation measures to reduce the impact of the HCT alignment on local street traffic in Vancouver. Potential mitigation measures could include peak-hour parking prohibitions, improved traffic signal timing, adding turn pockets, street conversions (e.g., two-way streets to one-way streets or vice-versa), and reclassifying streets (e.g., from a collector roadway to an arterial roadway).

Zoning and Land Use

The land use and zoning around the Vancouver alignment is more supportive of high capacity transit. The Vancouver alignment has more conducive zoning (commercial or medium-density residential) and thus greater opportunity for attracting economic investment around transit stations. Conversely, the I-5 alignment runs through the Rose Village neighborhood which is primarily a single-family residential area. Development around stations along the I-5 alignment is constrained by zoning (low-density residential) and the I-5 freeway that runs immediately west of the guideway. The Vancouver alignment places stations in areas more supportive of pedestrian use and that are more likely to develop greater concentrations of commercial and residential uses that take advantage of the improved access afforded by high capacity transit.

Alternatives considered

How were alternatives developed and evaluated?

In October 2005, the CRC Task Force adopted a Vision and Values statement that identified broad goals and priorities for this project and served as a basis for developing criteria to evaluate alternatives. In collaboration with project sponsor agencies, the CRC Task Force, and state and federal permitting agencies, the project team developed an Evaluation Framework. That document outlined a process for narrowing a wide range of possible alternatives to a short list to be evaluated in the DEIS, and ultimately for the selection of a preferred alternative. The first step in this process was to identify transportation components (i.e., river crossing options and transit modes) that might address the project's needs. Over 70 such components were identified, building from the 2002 I-5 Transportation and Trade Partnership Final Strategic Plan and through extensive public and stakeholder outreach.

After identifying components, project staff performed two rounds of evaluation and screening to narrow those options. The initial screening effort in April 2006 narrowed over 70 components using a pass/fail test to eliminate ideas that did not meet the Purpose and Need of the project. A second round of screening in June 2006 evaluated the performance of the remaining components in relation to criteria specified in the Evaluation Framework. The Task Force and general public provided input and comment on both screening processes. After the second round of screening, components were evaluated on the following values adopted by the Task Force:

- Community livability and human resources
- Mobility, reliability, accessibility, congestion reduction, and efficiency

- Modal choice
- Safety
- Regional economy, freight mobility
- Stewardship of natural resources
- Distribution of benefits and impacts

The second round of screening did not reveal any new fatal flaws, so no components were eliminated at that time. The remaining components were carried forward into the next step in the evaluation process.

What alternatives were considered and dropped prior to the DEIS?

The early screening efforts identified several promising options for further study. The river crossing options remaining were a replacement Interstate bridge, a supplemental arterial bridge, and a supplemental Interstate bridge. Express Bus, BRT, and LRT were the best performing transit modes at that time. Those river crossing and transit components were combined into 12 alternative packages designed to assess how they performed generally, and as individual features in different combinations. Each alternative package included these features: a river crossing option (existing, supplemental arterial, supplemental Interstate, or replacement Interstate bridge; a transit mode(standard buses, bus rapid transit, or light rail) option; transportation demand management options (more and less aggressive assumptions); as well as specific designs to improve safety, freight movement, highway operations, and bicycle and pedestrian access

Project staff used the criteria outlined in the Evaluation Framework to assess the performance of each alternative. The assessment focused on the performance of river crossing options and transit modes. Other elements of alternatives, such as interchange configurations and transit alignments were used for modeling transportation performance but were not individually evaluated. Those elements were developed for alternatives that were assessed in the DEIS.

Transportation modeling revealed that multi-modal packages performed the best. Alternatives that did not include a combination of both highway and transit improvements were not recommended to be analyzed in the DEIS. Options that contained either 1) only transit improvements without highway capacity, or 2) only new highway capacity without transit improvements, did not meet the Purpose and Need established for the project.

Analysis revealed that a replacement bridge performed best on nearly all criteria, and that BRT and LRT provide the best transit performance, particularly when paired with Express Bus service. In November 2006, staff recommended to the CRC Task Force that the DEIS evaluate: 1) No Build, 2) Replacement Bridge with BRT and Express Bus, and 3) Replacement Bridge with LRT and Express Bus. The CRC Task Force gave a preliminary recommendation to further develop these alternatives for evaluation in the DEIS. The Task Force also recommended the project team undertake a substantial public involvement effort to gauge public opinion on the staff recommendation.

In January 2007, staff launched an intensive public involvement effort to present the screening results and receive comments on the staff recommendation. The public and most agencies generally agreed with the staff recommendation but there was interest in further evaluation of an

alternative that would reuse the existing I-5 bridges, and maximize transit use. This interest led to the formation of a Task Force subcommittee in February 2007 to explore how the existing I-5 bridges could be reused and still meet the project's Purpose and Need. The subcommittee recommended the DEIS evaluate reusing the existing bridges. Northbound I-5 traffic and bicycles and pedestrian facilities would operate on the existing bridges while HCT and southbound I-5 traffic would function on a new supplemental crossing. The Task Force adopted the subcommittee's recommendation in March 2007.

What alternatives are being considered in the DEIS?

The DEIS evaluates a wide range of options addressing this project's Purpose and Need statement. Full build alternatives include improvements to highway safety and capacity throughout the project area, and access, reliability, and mobility for transit, bicycles, and pedestrians. There are additional options for funding and transportation demand management (TDM) and transportation system management (TSM) measures. Generally, these options are autonomous; any option for improving the river crossing (i.e. replacement or supplemental) can be paired with any transit mode and any transit alignment. This creates far too many unique combinations to feasibly or usefully evaluate each possible combination. So, the DEIS evaluates the following five different combinations or "alternatives" that represent the range of potential combinations:

Alternative	River Crossing Option	HCT Mode	Transit Alignment
1	Existing	None	N/A
2	Replacement	BRT	Vancouver or I-5
3	Replacement	LRT	Vancouver or I-5
4	Supplemental	BRT	Vancouver or I-5
5	Supplemental	LRT	Vancouver or I-5

A replacement river crossing would remove the existing highway bridge structures across the Columbia River and replace them with three new parallel structures – one for I-5 northbound traffic, another for I-5 southbound traffic, and a third for HCT, bicycles, and pedestrians. The replacement crossing would include three through-lanes (or general purpose lanes) in each direction and two or three auxiliary lanes to address the safety issues of vehicles merging on or off of the freeway.

A supplemental river crossing would build a new bridge downstream of the existing I-5 bridge and seismically upgrade the existing bridges. The new supplemental bridge would carry southbound I-5 traffic and HCT, while the existing I-5 bridges would carry northbound I-5 traffic, bicycles, and pedestrians. The supplemental crossing would include three through-lanes and one auxiliary lane in each direction. Alternatives 4 and 5 were also evaluated with a higher toll than the toll assumed for Alternatives 2 and 3. This was a recommendation from the Task Force subcommittee in an effort to evaluate the congestion relief potential of a toll.

Two HCT modes were considered – bus rapid transit and light rail transit. Both would operate in an exclusive right-of-way through the project area, and were evaluated for the same alignments

and station locations. BRT would use 60-foot long articulated buses (standard buses are 40-feet long) in exclusive guideway lanes separated from other traffic. LRT would use one and two-car trains in an extension of the MAX Yellow Line that currently ends at the Expo Center in Portland. As part of the Task Force subcommittee recommendation, Alternatives 4 and 5 increased both the number and frequency of HCT vehicles in an effort to dramatically increase the capacity of the transit system. Feeder buses were also dramatically increased from Alternatives 2 and 3, which were already significantly increased from a No Build scenario.

How to extend HCT north of downtown Vancouver is an important choice that affects transit performance, cost, and impacts in the surrounding community. Two full-length alignments were evaluated that would extend HCT through northern Vancouver. The "Vancouver" alignment would provide HCT north from downtown Vancouver, either along Broadway or on Broadway and Main Street in the Uptown Village area, then to Main Street only (north of Fourth Plain) and end at a new park and ride north of 39th and Main (site of the current WSDOT maintenance facility). The "I-5" alignment would provide HCT east from downtown Vancouver to connect with a new Clark College Park and Ride and then north along the east side of I-5 to a new park and ride north of Kiggins Bowl.

There are also two shorter alignment options, referred to as Minimum Operable Segments, (MOS's) under consideration. After crossing the Columbia River and heading north through downtown Vancouver, HCT could end at a park and ride at Clark College, or could end on the west side of I-5 on Washington Street between 15th and 16th Streets. The Draft LPA will focus on the selection of one of the two full-length alignments. Subsequent tasks and decision-making will determine whether the full-length alignment or a shorter-length option is selected for initial construction.

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Appendix A – River Crossing

	Value	**Replacement**	**Supplemental**
1	Community Livability and Human Resources ✓ Noise ✓ Neighborhood cohesion ✓ Air quality ✓ Business displacements ✓ Cultural resources ✓ Parks and recreational areas ✓ Local plans ✓ Aesthetics	• Potentially 10 fewer floating home acquisitions when paired with adjacent transit alignment, 2 fewer with the offset transit alignment; • 8 partial property acquisitions in Shumway neighborhood along I-5, but similar acreage to supplemental; • Acquires Hayden Island Yacht Club, where Hayden Island Neighborhood Network meets; • Could avoid Hayden Island Safeway; • 5-6 historic resources potentially adversely affected o E.g., Fort Vancouver Historic Reserve, the Kiggins House (which will likely be relocated by other project before CRC is built), the Academy, Pier 99, Clark Public Utilities building, the I-5 bridges; o Would require demolition of nationally registered 1917 I-5 bridge, which would be inconsistent with local Historic Preservation Plans; • Greater potential for impact to sensitive archaeological resources due to larger footprint; • 6 Parks and Recreational resources potentially affected; • Would vacate the existing I-5 right-of-way under railroad berm in Vancouver, allowing Main Street extension between downtown Vancouver and riverfront development; • Would not require closure of Washington and 6th St intersection; • Greater interstate capacity better addresses local plans for mobility and freight	• More potential acquisitions of floating homes on Hayden Island, depending on which transit alignment is paired with the river crossing; • 19 partial property acquisitions in Rose Village neighborhood along I-5, but similar acreage to replacement; • Avoids Former Hayden Island Yacht Club; • Acquires the Hayden Island Safeway; • 4 historic resource potentially adversely affected o Impacts a private residence of historic value, not affected by Replacement o Avoids potential adverse impact to Old Apple Tree Park and the parcel on which the Academy is located; o Retains historic I-5 bridge, but still adversely affects historic character; o Adversely affects historic Pearson Field's airspace, more so than Replacement and "No-Build"; • Smaller footprint reduces potential for impact to sensitive archaeological resources • 4 Parks and Recreational resources potentially affected, Convention Center, and Esther Short Park; • Would not allow Main Street extension between downtown and riverfront development; • Closure of 6th and Washington intersection could impact access to adjacent businesses; Less interstate capacity fails to address local plans for mobility and freight movement

		movement; • Fewer distant views blocked by new bridge, and greater coherence of style	• Could result in an ungainly aesthetic due to seismic retrofits of existing bridges, and inconsistent heights and bridge types
2	Mobility, Reliability, Accessibility, Congestion Reduction, and Efficiency ✓ Travel times ▪ SOVs ▪ Transit ✓ Congestion ✓ Accessibility ✓ Throughput ▪ Person ▪ Transit	• Serves substantially more traffic trips; • 50% - 60% less congestion each day, compared to Supplemental o 3.5 to 5.5 hours of congestion each day, most of which would be the result from downstream congestion outside of the study area; • Serves 11% - 20% more person-trips, compared to Supplemental o 75,600 to 78,200 person-trips across the I-5 Columbia River Crossing during peak periods; • Serves 8% more vehicle-trips each day, compared to Supplemental o 178,000 vehicle-trips; • Serves 17% more vehicle-trips during peak periods o 52,200 vehicle-trips; • About 1 million or 10-15% less annual HCT passenger trips over the river. However, this difference is primarily due to longer transit headways and a lower toll on the bridge than was modeled with the Supplemental river crossing and is not directly attributable to the crossing type – including the same transit headways and toll with a Replacement crossing would result in essentially the same level of transit ridership as with the Supplemental.	• Serves less traffic trips; • Greater length of congestion o 11 hours of congestion each day; • Fewer person-trips each day o 65,000 to 67,900 person-trips across the I-5 Columbia River Crossing during peak periods; • Fewer vehicle trips each day o 165,000 vehicle-trips/day, 44,600 vehicle-trips/daily peak periods; • Fewer vehicle trips during peak periods • About 1 million, or 10-15% more annual HCT passenger trips over the river than with the Replacement crossing, but this is not directly attributable to the supplement crossing, but more attributable to the increase in transit service applied to Alternatives 4 and 5.
3	Modal Choice ✓ Multi-modal choices ✓ Transit services ✓ Bike/Ped	• BRT travel time from Pioneer Square to terminal P&R (Kiggins or Lincoln, depending on HCT alignment) is reduced from 54 to 46 minutes with Replacement;	

	Connectivity ✓ Vehicle Occupancy	• Light-rail maintains a 40 minute trip from Pioneer Square to Terminal P&R, regardless of roadway alignment; • Provides a continuous grade-separated multi-use pathway from downtown Vancouver to the Marine Drive Interchange, providing better pedestrian and bicycle connectivity than No-Build and Supplemental; • HCT travel times to and from target markets are generally shorter in 2 hour AM and PM peak than with Supplemental: o 99th St TC to Hayden Island (AM): 7.5 to 10 minutes faster, o Hayden Island to 99th St TC (PM): 2 to 12 minutes faster, o Lombard TC to Vancouver Mall (AM): approx. 8 minutes faster, o Vancouver Mall to Lombard TC (PM): 2 to 6 minutes faster;	• Requires bicyclists and pedestrians to leave multi-use trail at Hayden Island and navigate at-grade streets and intersections; • HCT travel times to and from target markets are generally longer
4	Safety ✓ Vehicle/freight safety ✓ Bike/Ped safety ✓ Marine safety ✓ Aviation safety ✓ Life-line connectivity ✓ I-5 incident/ emergency response	• Improves vehicle and freight safety substantially over Supplemental, by providing full shoulders, decreasing congestion, reducing weave/merges on I-5, and eliminating bridge lifts; • Improves marine safety by eliminating "S" curve maneuver; • Improves aviation safety by eliminating lift	• Provides some, but substantially fewer vehicle/freight safety improvements, as it retains existing non-standard design features, including substandard shoulders, introduces new mainline diverging and merging areas, results in more congestion and retains bridge lifts; • Would improve bike and pedestrian facilities over No-Build, but would require bikes and pedestrians to navigate at-grade streets on Hayden Island, and grade of pathway would continue to not meet ADA requirements; • Marine navigation safety decreased compared to No-build because "S" curve maneuver still required and channel width decreased (see Value 5 for more detail); • Leaving lift towers and adding Supplemental

<table>
<tr><td></td><td></td><td>towers;
• Provides more effective incidence/emergency response, as it reduces congestion more significantly and addresses most of the existing non-standard design features</td><td>bridge congests airspace, adversely affecting aviation safety;
• Longer duration of construction due to seismic rehabilitations and retrofits could have greater impact on aviation</td></tr>
<tr><td></td><td></td><td colspan="2"><table>
<tr><th>Stability during a seismic event</th><th>No Build</th><th>Replacement</th><th>Supplemental</th></tr>
<tr><td>Serviceability*</td><td><500-year event</td><td>500-year event</td><td>500-year event</td></tr>
<tr><td>No Collapse**</td><td><500-year event</td><td>2,500-year event</td><td>1,000-year event***</td></tr>
</table>
* Serviceability means that the structure would sustain only minor damage and would operational with minimal repair
** No Collapse means that the structure(s) would remain standing during the seismic event to prevent injury and loss of life, but would need substantial repairs afterward to continue serviceability.
*** The northbound bridges would be retrofitted to withstand a 1,000 year event, but the new supplemental structure would be built to withstand a 2,500 year event.</td></tr>
<tr><td>5</td><td>Regional Economy; Freight Mobility
✓ Freight travel times
▪ In BIA
▪ I-5 corridor
✓ Marine Navigation
✓ Freight throughput
✓ Parallel corridor
✓ Facility Access</td><td>• More effectively moves freight within BIA and on I-5, as congestion during midday periods (9am to 3pm) would be reduced to 2 hours in the southbound direction;
• Improves freight truck travel speeds, therefore freight truck travel times;
• Serves 8% more vehicle-trips each day, including freight truck trips;
• Enables more freight truck trips to be accommodated during mid-day (as well as peak) periods, due to lesser amount of congestion;
• Improves access to port, freight, and industrial facilities by reducing congestion, increasing vehicle throughput, increasing</td><td>• Freight not moved as effectively within BIA and on I-5, as congestion during mid-day periods (9am to 3pm) would be 5 hours (2 hours SB, 3 hours NB)(more than double the duration of congestion with Replacement;</td></tr>
</table>

		average travel speed of freight truck traffic; • Improves marine navigation because fewer piers (obstacles) in water (6 sets), primary navigation channels better aligned with downstream Railroad Bridge's swing span; • Eliminates lift span, thereby improving marine safety and eliminating time of day restrictions;	• Narrower marine navigation channels, caused by misaligned piers from Existing and Supplemental bridges (10 total), that do not align well with the downstream railroad bridge o Will make navigation more difficult than existing; o Will still have time of day restrictions for some large vessels; o May increase use of lift span due to increased difficulty maneuvering between I-5 river crossings and railroad bridge; • Seismic retrofits of existing bridge will increase the footprint of the piers in the water, reducing existing marine navigation channels by approx. 40-60 feet
6	Stewardship of Natural Resources ✓ Threatened/ endangered fish and wildlife ✓ Other fish and wildlife ✓ Threatened/ endangered plants ✓ Wetlands ✓ Water Quality ✓ Energy Consumption ✓ Waterways	• Greater bridge deck surface area, therefore greater potential shading of habitat, though elevated structure would reduce shading and therefore impact; • Slightly less impact to wetlands (0.037 acres); • Greater surface area, but better stormwater treatment and drainage; • Fewer total piers (6 sets) in Columbia River and Oregon Slough, therefore smaller volume of concrete and fill in water; • Fewer piers in water to provide habitat for fish that prey on juvenile salmon and alter stream flow; • Lesser potential backwater effect and rise in floodwater elevation	• Less total surface area, but poorer stormwater treatment and drainage because the existing bridges' lift span would still drain directly into the Columbia River. • Slightly greater impact to wetlands (0.08 acres) • More piers in water (14 sets) in the Columbia River; • Largest extent of in-water disturbance area • More in-water work related to construction and deconstruction of bridge piers and decking, therefore greater chance of chemical spill and longer exposure of fish species to stress (e.g., dewatering, detours, noise);
7	Distribution of Benefits and Impacts		

<table>
<tr><td>8</td><td>Cost Effectiveness and Financial Resources
✓ Minimize costs
✓ Cost-effectiveness
▪ Construction
▪ Maintenance
▪ Operation
✓ Reliable funding plan</td><td colspan="2"><table><tr><th>River Crossing Costs</th><th>Replacement</th><th>Supplemental</th></tr><tr><td>Capital cost (millions $)</td><td>$1,240 - $1,590</td><td>$1,034 - $1,310</td></tr><tr><td>Annual operation cost</td><td>$700,000</td><td>$7,700,000</td></tr></table>Capital cost range is due to a range of contingency that is included to address risk of cost overrun, and because of the range of HCT cost.</td></tr>
<tr><td>9</td><td>Growth Management/Land Use
✓ Support regional plans</td><td>• Greater interstate capacity better accommodates plans for mobility and freight movement</td><td>• Constrained capacity may be slightly more effective at limiting SOV trips, therefore more consistent with regional policies promoting SOV reduction</td></tr>
<tr><td>10</td><td>Constructability
✓ Maintain transportation
✓ Construction impacts
✓ Future Flexibility
✓ Temporary Environmental impacts</td><td>• Approximately 1 year shorter total construction duration;
• Access to and from Vancouver is affected for longer period of time;
o Movements from Washington St to SR 14 EB, from I-5 NB to C Street and from SR 14 WB to C Street will be closed for 3.5 years (though alternative access would be provided);
• Potentially greater impact on downtown Vancouver, due to larger construction footprint of three new structures;
• One year less construction time for completing Hayden Island Interchange – 3 years, 6 months for Replacement versus 4 years, 6 months for Supplemental;
• Removal of existing bridges and disposal of materials;
• Shoulders could be utilized to provide additional travel lanes in both directions on I-5 if capacity above 30 year design life is required</td><td>• Approximately 1 year greater total construction duration;
• Access to and from Vancouver is affected for shorter periods of time than the Replacement;
• Access to Hayden Island from I-5 SB is affected for 6 months;
• Access from Hayden Island to I-5 NB will be affected for 1.5 years;
• Northbound I-5 traffic will be impacted during seismic retro-fitting of the existing structures;
• Nine months less construction time for completing SR 14 Interchange – 3 years, 3 months versus 4 years for Replacement;
• Traffic movement from Marine Drive to I-5 NB will have to merge into the through lanes rather than enter into its own lane as currently exists for a period of 4 years;
• With foundation requirements for only one structure, pile driving and time on the water is much less; however, seismic retrofitting requires pile driving;
• Additional work on and in the water exceeds that</td></tr>
</table>

		needed for simply removing the old structures by at least 6 months; • Seismic retrofitting adds time and impacts to river navigation; • Shorter duration of construction over BNSF railroad;

Appendix B – High Capacity Transit Mode

	Value	**Bus Rapid Transit (BRT)**	**Light Rail (LRT)**

1	Community Livability and Human Resources
	✓ Noise
	✓ Neighborhood cohesion
	✓ Air quality
	✓ Business displacements
	✓ Cultural resources
	✓ Parks and recreational areas
	✓ Local plans
	✓ Aesthetics
		• As BRT can stay within existing Right-of-Way, it would avoid some acquisitions, including impact to the US Bank building;
		• Unless electric buses are used, BRT will be associated with greater noise and air pollution (even with alternative fuels);
		• BRT maintenance facility would require acquisition of 2 occupied residences;[1]
		• BRT maintenance facility would require acquisition of 1 business;
		• Shorter headways could result in greater impacts to parking, access, visual connectivity;
			• One alignment variation would require acquisition of the US Bank building in Arnada neighborhood, though this is easily avoided by other alignments;
			• Some plans specify LRT - Vancouver Transportation Plan and Portland Comprehensive Plan;
			  • The Esther Short and Hough neighborhood plans call specifically for LRT
			  • Other plans support energy efficiency, which indirectly promotes LRT over BRT;
			• Perceived as more reliable, spacious, and comfortable overall by passengers
			• LRT maintenance facility expansion would require the acquisition of 5-6 occupied residences;
			• LRT maintenance facility expansion would require the acquisition of 6 businesses

2	Mobility, Reliability, Accessibility, Congestion Reduction, and Efficiency
	✓ Travel times
	  ▪ SOVs
	  ▪ Transit
	✓ Congestion
	✓ Accessibility
	✓ Throughput
	  ▪ Person
	  ▪ Transit
		• Slower in every instance during 2 hour PM peak (on average 4.75 minutes slower), e.g.,
		  o Lombard TC to terminal P&R (Lincoln or Kiggins depending on HCT alignment): 7.5 minutes longer (Replacement),
		  o Pioneer Square to terminal P&R: 14 minutes longer (Supplemental);
		  o Expo Center to Terminal P&R: 1 minute longer (Replacement), 11 minutes longer (Supplemental)
		  o Downtown Vancouver to Pioneer Square: 2 minutes longer (Supplemental), 4 minutes longer (Replacement);
		• About 3,000 - 4,000, or 15-23% less passengers over River Crossing per working weekday;
			• On average 4.75 minutes faster trips, faster in every instance during PM peak;
			• Sees about 3,000- 4,000 more passengers per working weekday than BRT;
			• Serves more river crossing trips annually:
			  o 6.7 million river crossings per year with Replacement,
			  o 7.4 million per year with Supplemental

[1] This includes the *entire* CTRAN maintenance facility expansion in East Vancouver and the *entire* Tri-Met maintenance facility expansion in Gresham.

<table>
<tr><td></td><td></td><td>

- Serves fewer river crossing trips annually:
  - 4.8M river crossings per year with Replacement, which is 28% fewer than LRT,
  - 5.7M river crossings per year with Supplemental, which is 23% fewer than LRT

</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">

HCT Travel Times (minutes)	BRT		LRT	
	Efficient transit operations	Increased transit operations*	Efficient transit operations	Increased transit operations*
Expo Center to terminal park and ride***	13	19	12	12
Lombard TC to terminal park and ride	25	28	18	18
Downtown Portland to downtown Vancouver	38	39	32	32
Downtown Portland to terminal park and ride	46	48	40	40

* "Increased transit operations" provide more frequent BRT or LRT service

** Terminal park and ride refers to the Lincoln or Kiggins Bowl park and rides which are the terminus for the Vancouver and I-5 alignments, respectively.

</td></tr>
<tr><td>3</td><td>Modal Choice
✓ Multi-modal choices
✓ Transit services
✓ Bike/Ped Connectivity
✓ Vehicle Occupancy</td><td>

- Generally less timely service to the target market by 1 minute to 16 minutes
  - Lombard Transit Center to Terminal P&R (2 hour PM peak): 7.5 minutes, or 30% slower (Replacement), 16 minutes, or 48% slower (Supplemental)
  - 99th Street TC to Hayden Island (2 hour AM peak): 5 minutes, or 21% slower (Supplemental)

</td><td>

- Generally more timely PM peak service, by a range 1 to 16 minutes per trip to target markets;
- In *one* instance, longer travel time during 2-hour PM peak:
  - Hayden Island to 99th St. TC: 8.5 minutes, or 34% slower – attributed to the transfer (15 minute transfer time) required between LRT to bus at the LRT railhead at end of line in Vancouver

</td></tr>
<tr><td>4</td><td>Safety
✓ Vehicle/freight safety
✓ Bike/Ped safety
✓ Marine safety</td><td></td><td></td></tr>
</table>

	✓ Aviation safety ✓ Life-line connectivity ✓ I-5 incident/ emergency response		
5	Regional Economy; Freight Mobility ✓ Freight travel times ▪ In BIA ▪ I-5 corridor ✓ Marine Navigation ✓ Freight throughput ✓ Parallel corridor ✓ Facility Access		• Additional ridership will reduce SOV trips over river crossing, leading to an incremental improvement in freight mobility compared to BRT or No-Build
6	Stewardship of Natural Resources ✓ Threatened/ endangered fish and wildlife ✓ Other fish and wildlife ✓ Threatened/ endangered plants ✓ Wetlands ✓ Water Quality ✓ Energy Consumption ✓ Waterways	• Direct impact to 0.05 acres of wetlands for bus bays and turn-around facilities just east of the existing Expo MAX Station; • Slightly larger impervious area; • Pollutant constituents are comparable to automobiles and trucks, such as metals (e.g., copper from brake pad wear)	• No direct impact to wetlands; • Not associated with many pollutants found in road runoff, therefore less impact to water resources
7	Distribution of Benefits and Impacts ✓ Low-income/ minority populations ▪ Conditions of ▪ Benefits to		• Requires the full acquisition of the Wellness Project (if Vancouver alignment is selected), which provides free mental health care to low-income and uninsured residents

8 Cost Effectiveness and Financial Resources

- ✓ Minimize costs
- ✓ Cost-effectiveness
  - Construction
  - Maintenance
  - Operation
- ✓ Reliable funding plan

HCT Costs	BRT				LRT			
	Vancouver Align.		*I-5 Alignment*		*Vancouver Align.*		*I-5 Alignment*	
	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.
Capital cost (millions $)*	$600 - $770	$720 - $810	$790 - $940	$910 - $1,010	$780 - $940	$880 - $980	$970 - $1,130	$1,070 - $1,180
Annual operating cost over No Build (millions $)	$5.3	$44.6	N/A	N/A	$3.5	$35.7	$4.2	N/A
Total annual transit passengers over I-5 crossing (millions)	4.8	5.7	N/A	N/A	6.7	7.4	5.7	N/A
Annualized cost per transit passenger over I-5 river crossing**	$16.82	$27.96	N/A	N/A	$12.29	$16.21	N/A	N/A

* Capital cost ranges are due to the range of potential risk for cost-overruns

** Includes annualized capital costs plus annual operating costs, per transit rider

*** This number is total annual operating cost in 2030 for the No Build scenario. All build scenarios are reported by the incremental new operating cost over the No Build scenario.

9 Growth Management/Land Use

- ✓ Support regional plans

- Bus Rapid Transit may have less potential to attract economic development around transit stations.
  - Bus lines have less visibility than rail lines
  - Developers see bus lines as a less permanent, fixed investment than rail lines
  - People generally prefer trains over buses

- Evidence and surveys suggest that Light Rail stations are more likely to attract transit-oriented-development, which is targeted by regional plans such as the Vancouver City Center Vision plan. Developers tend to see rail as a more permanent investment; Riders tend to prefer rail over buses;
- Some plans specify LRT – Vancouver Transportation Plan and Portland Comprehensive Plan;
- Some regional and state plans support energy efficiency, which indirectly promotes LRT

10 Constructability

- ✓ Maintain transportation
- ✓ Construction impacts
- ✓ Future Flexibility

- Shorter construction duration, and therefore less temporary disruption, because there would not be any electrification or track work;
- Guideway could be converted to accommodate LRT

- Longer construction duration because the laying of tracks and electrification would have to occur, and more utilities relocated;
- LRT would not be easily converted to support BRT

Appendix B: HCT Mode- *Bus Raid Transit versus Light Rail*

	✓ Temporary Environmental impacts		

Appendix C – High Capacity Transit Alignment

Value	**Vancouver**	**I-5**
1 Community Livability and Human Resources ✓ Noise ✓ Neighborhood cohesion ✓ Air quality ✓ Business displacements ✓ Cultural resources ✓ Parks and recreational areas ✓ Local plans ✓ Aesthetics	<table><tr><th>Acquisition Impacts*</th><th>Vancouver Alignment</th><th>I-5 Alignment</th></tr><tr><td>Total area acquired</td><td>24 to 25 acres***</td><td>5 to 6.5 acres</td></tr><tr><td>Residential Buildings**</td><td>10 to 11***</td><td>1 to 8</td></tr><tr><td>Commercial Buildings**</td><td>8</td><td>2 to 4</td></tr><tr><td>Businesses**</td><td>17 to 18</td><td>2 to 8</td></tr><tr><td>Employees**</td><td>50 to 56</td><td>10 to 31</td></tr></table>*Ranges presented above are a result of river-crossing choice and minor HCT alignment. **Number of buildings, businesses, employees that are "displaced" as a result of this project *** These numbers include the 17 acre Lincoln Park and Ride (11 acres of which is the WSDOT maintenance facility), and the six residential displacements that this Park and Ride requires, respectfully	
	• Requires the acquisition of the Wellness Project building, and two medical offices in the Lincoln neighborhood; • Requires the acquisition of 6 residences for the Lincoln Park and Ride; • Affects 3 potentially historic resources on Main Street; • Would occur in a pre-existing transportation corridor (i.e., a street), therefore less visual impact; • Greatest number of on-street parking spaces and access points lost	• Avoids the Wellness Project, and medical offices on Main St; • Avoids acquisition of 6 residences for Lincoln Park and Ride; • Affects 3 potentially historic properties along McLoughlin Blvd; • Potential impact to possible archaeological site (rated as having a moderate potential) in Burnt Bridge Creek Drainage; • Could have more adverse visual affect than the Vancouver alignment because of proximity to residences along I-5 and local parks; • Fewer number of parking spaces lost, but greater percentage of total along corridor
2 Mobility, Reliability, Accessibility, Congestion Reduction, and Efficiency ✓ Travel times	• Local and express bus routes within the corridor and bridge influence area see more delay	• Less likely to impact local and express bus routes

<table>
<tr><td></td><td>▪ SOVs
▪ Transit
✓ Congestion
✓ Accessibility
✓ Throughput
▪ Person
▪ Transit</td><td colspan="2"><table><tr><th>Alignment Characteristics*</th><th>Vancouver Alignment</th><th>I-5 Alignment</th></tr><tr><td>Total Guideway length</td><td>3.43 miles</td><td>4.21 miles</td></tr><tr><td>Property acquisition in northern Vancouver**</td><td>14 acres***</td><td>5-6 acres</td></tr><tr><td>Average Guideway speed</td><td>17.3 mph</td><td>21.5 mph</td></tr><tr><td>Expo Center to northern terminus</td><td>12.0 min</td><td>11.7 min</td></tr><tr><td>Pioneer Courthouse Square to northern terminus</td><td>39.9 min</td><td>39.6 min</td></tr><tr><td>Daily passenger trips on transit over I-5 crossing</td><td>20,800</td><td>21,100</td></tr></table>* Values are for LRT, but the relationships between the alignments are the same for BRT
** Property acquisition north of 16th Street
*** Does not include 11 acres that is the existing WSDOT mainenance facility that would be used for the Lincoln Park and Ride</td></tr>
<tr><td>3</td><td>Modal Choice
✓ Multi-modal choices
✓ Transit services
✓ Bike/Ped Connectivity
✓ Vehicle Occupancy</td><td>• Provides access to 1% more households and employment within ½ mile of a station;
• Provides equal to better travel times to target markets:
o PM peak travel same, except Hayden Island to 99th St TC: 10 minutes faster (32.4 minutes vs. 42.4 minutes)
• AM peak travel times same, except 99th St TC to Hayden Island: 15 minutes faster (19.1 vs. 34.1)</td><td>• Provides access to 1% fewer households and employment within ½ mile of a station:
• Provides equal travel times, except for 99th St TC to Hayden Island, and visa versa, where the Vancouver alignment is faster</td></tr>
<tr><td>4</td><td>Safety
✓ Vehicle/freight safety
✓ Bike/Ped safety
✓ Marine safety
✓ Aviation safety
✓ Life-line connectivity
✓ I-5 incident/ emergency response</td><td>• Encounters more high risk hazardous material sites than I-5 alignment (3 vs. 1)</td><td>• Steep slopes near Burnt Bridge Creek Greenway put LRT or BRT alignment at greater potential risk of landslides</td></tr>
</table>

5	Regional Economy; Freight Mobility
	✓ Freight travel times
	✓Marine Navigation
	✓Freight throughput
	✓Parallel corridor
	✓Facility access
		• Acquires commercial properties with approximately $7.2 - $7.9 million in annual revenue.
		  • It is important to note that all properties acquired by this project will be provided relocation assistance, so these businesses and this revenue can be retained in Vancouver.
			• Acquires commercial properties with approximately $0.2 - $3.3 million in annual revenue. This substantially lower number than the Vancouver alignment is a result of the I-5 alignment running next to a residential neighborhood, rather than through a commercial district.
			  • It is important to note that all properties acquired by this project will be provided relocation assistance, so these businesses and this revenue can be retained in Vancouver.

6	Stewardship of Natural Resources ✓ Threatened/ endangered fish and wildlife ✓ Threatened/ endangered plants ✓ Wetlands ✓ Water Quality ✓ Energy Consumption ✓ Waterways	• No anticipated impact to ecosystem resources; • Alignment drains into the Columbia River, therefore less severe consequences on water resources from additional impervious surface	• Impact approximately 2 acres of riparian buffer deemed "sensitive" habitat under the Clark County Critical Areas Ordinance; • Greater impervious surface area and greater pollutant runoff into Burnt Bridge Creek; • Construction on steep slopes could result in erosion and subsequent sediment pollution of Burnt Bridge Creek;
7	Distribution of Benefits and Impacts ✓ Low-income/ minority populations ▪	• Impacts the Community Wellness Project (LRT only), which provides free mental health care to low-income or uninsured residents	• Avoids impact to Community Wellness Project

Appendix C: HCT Alignment- *Vancouver versus I-5*

8 Cost Effectiveness and Financial Resources

- ✓ Minimize costs
- ✓ Cost-effectiveness
  - Construction
  - Maintenance
  - Operation
- ✓ Reliable funding plan

HCT Costs	BRT				LRT			
	Vancouver Align.		*I-5 Alignment*		*Vancouver Align.*		*I-5 Alignment*	
	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.	Efficient transit ops.	Increased transit ops.
Capital cost (millions $)*	$600 - $770	$720 - $810	$790 - $940	$910 - $1,010	$780 - $940	$880 - $980	$970 - $1,130	$1,070 - $1,180
Annual operating cost over No Build (millions $)	$5.3	$44.6	N/A	N/A	$3.5	$35.7	$4.2	N/A
Total annual transit passengers over I-5 crossing (millions)	4.8	5.7	N/A	N/A	6.7	7.4	5.7	N/A
Annualized cost per transit passenger over I-5 river crossing**	$16.82	$27.96	N/A	N/A	$12.29	$16.21	N/A	N/A

* Capital cost ranges are due to the range of potential risk for cost-overruns

** Includes annualized capital costs plus annual operating costs, per transit rider

*** This number is total annual operating cost in 2030 for the No Build scenario. All build scenarios are reported by the incremental new operating cost over the No Build scenario.

9 Growth Management/Land Use

- ✓ Support regional plans

- More opportunity for Transit Oriented Development (TOD)
  - Alignment is not constrained by I-5, and has more conducive zoning;
- Greatest direct land use impact from 17 acre Lincoln Park and Ride;
- Impact to medical offices could result in shift in land use on upper Main;
- More consistent with current land use patterns

- Benefits of HCT alignments (land values, density, mixing of land uses) will not be as effectively realized in low density residential zoned areas along I-5

10 Constructability

- ✓ Maintain transportation
- ✓ Construction impacts
- ✓ Future Flexibility
- ✓ Temporary impacts

- Temporarily impacts traffic on Main St north of McLoughlin Blvd, in downtown Vancouver, and on Hayden Island;
- Temporary construction noise and disruption to businesses and residents on Main St north of McLoughlin Blvd, in downtown Vancouver, on Hayden Island;
-

- Temporarily impacts traffic on McLoughlin Blvd or 16th St, downtown Vancouver, on Hayden Island
- Construction noise and disruption to residents along I-5, on McLoughlin Blvd or 16th St, in downtown Vancouver, on Hayden Island;
-