



Component Findings

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River Crossing Findings

Key Findings
Value 1 – Community Livability and Human Resources
<p>The alternatives with no new river crossings (No-Build and TDM/TSM) would have the fewest direct adverse impacts to community resources. However, they would not address local or regional plans nor meet the project’s Purpose and Need.</p> <p>Of the Build Alternative Packages:</p> <p>Property acquisitions in the river crossing area (from SR 14 to Marine Drive) are a function of several factors, only one of which is the river crossing option itself. Interchange designs at SR 14, Hayden Island, and Marine Drive interchanges are a major factor. River crossings would displace approximately 5 to 15 floating homes. This range varies largely on whether it includes LRT or BRT (that makes the bridge wider) and on the interchange configurations at Marine Drive and on Hayden Island. Supplemental and replacement bridges in all Build alternatives affect up to 30 commercial parcels; most of these would be partial, not full property acquisitions.</p> <p>A new supplemental arterial bridge (Alternative Package 3) would have the fewest impacts to historic, archaeological, and recreational properties. Replacement bridges (Alternative Packages 8 - 12) would have the greatest historic impacts due to removing the historic, northbound I-5 bridge. However, supplemental bridges (Alternative Packages 3 - 7) would also have impacts to the historic character of the bridge because they would likely require substantial seismic upgrades. Other than the historic bridge, the impacts to historic resources would be similar for all the replacement and supplemental bridge options.</p> <p>No neighborhood will be bisected by construction of a new replacement or supplemental bridge and no neighborhood will lose more than 10 percent of its total area for construction of the bridges. Upstream replacement bridges require complete acquisition of Safeway, the only grocery store on Hayden Island and a significant resource for the neighborhood. A downstream replacement bridge and supplemental interstate bridge could avoid the Safeway acquisition with some interchange options and would acquire it with other interchange options. The supplemental arterial bridge (Alternative Package 3) would avoid direct impact to Safeway. Safeway could likely be relocated on Hayden Island.</p> <p>Replacement bridges and the supplemental arterial bridge all put LRT or BRT on the new bridge. This would provide more reliable service and faster travel times, thus better supporting local plans than placing LRT or BRT on the existing lift span bridge (Alternative Packages 4 and 5) or options with BRT-Lite or Express Bus only (Alternative Packages 6, 7, 11, and 12).</p>
Value 2 – Mobility, Reliability, Accessibility
<p>The Supplemental Interstate and Replacement Bridge alternatives result in the shortest overall travel times. These alternative packages reduce northbound I-5 travel times compared to the TDM/TSM and New Arterial alternatives by 50% or more. However, build alternatives do not improve southbound AM peak period travel times because they would carry more vehicles and would not improve capacity limitations south of the project area. A New Arterial bridge provides similar travel times as No-build and TDM/TSM.</p> <p>Replacement bridges reduce transit vehicle hours of delay (VHD). Supplemental bridge alternatives place transit vehicles on the existing bridges, subjecting them to bridge lift interruptions. Bridge lifts add substantial delay – at least 17 minutes – to vehicles directly affected and cause system-wide disruption for LRT.</p> <p>The Supplemental Interstate and Replacement Bridge alternatives provide the highest traffic volume throughput. The No-Build, TDM/TSM and New Arterial alternatives provide similar peak period throughput across the I-5 Bridge. The TDM/TSM and New Arterial alternatives do not accommodate I-5 Bridge travel demands, resulting in substantial congestion and increased travel times. The Supplemental Interstate alternatives accommodate about 15% to 20% higher southbound AM peak period traffic volumes and about 35% to 45% higher northbound PM peak</p>

period traffic volumes than the TDM/TSM and New Arterial alternatives. The Replacement Bridge alternatives perform best, accommodating about 20% to 25% higher southbound AM peak period traffic volumes and about 50% to 55% higher northbound PM peak period traffic volumes than the TDM/TSM and New Arterial alternatives.

Value 3 – Modal Choice

The Replacement Bridge options and the New Arterial Bridge option perform best for Modal Choice because they would operate transit on a new fixed-span bridge, allowing transit to avoid delays and service interruptions from bridge lifts. Supplemental Interstate bridge options place transit on the existing bridges, subjecting it to bridge lifts that cause at least 17 minutes of delay to vehicles immediately affected and substantially more delay to other vehicles due to system-wide disruption (particularly for LRT). These delays not only impair travel time, but also introduce reliability problems that would make transit a less viable choice.

The Replacement and Supplemental Interstate bridge options provide the best bike and pedestrian connectivity, improving the viability of choosing these modes.

Value 4 – Safety

A replacement bridge (Alternative Packages 8 – 12) provides the greatest safety improvements because it would: provide separate facilities for bicycle and pedestrian travel; increase vehicle capacity over I-5 and provide full shoulders for incident response; eliminate bridge lifts which would alleviate both highway and marine conflicts and congestion; and, particularly for downstream replacement bridges (Alternative Packages 8, 9, and 11), reduce encroachment into the desirable clearance zone for Pearson Airpark. In addition, the replacement bridges would be constructed to current seismic standards. Overall, a replacement bridge would best enhance safety.

Using a new supplemental bridge for interstate traffic (Alternative Packages 4 – 7) would provide similar highway safety benefits as a replacement bridge except that the obstruction into Pearson Airpark’s airspace would remain because the existing bridges would be reused. Also, unless the existing bridges are seismically retrofitted, they may not withstand an earthquake event.

Using a supplemental bridge for arterial traffic, and continuing to operate I-5 on the existing bridges (Alternative Package 3) would likely have a negative impact on highway safety as congestion would increase, which would also likely increase the “no bridge lift” periods and impact marine safety.

Value 5 – Regional Economy, Freight Mobility

The Replacement Bridge options provide the greatest overall benefit to the Regional Economy and Freight Mobility value. The Supplemental Interstate bridge options also perform well on most criteria, but provide much less benefit to marine navigation efficiency.

Supplemental Interstate and Replacement bridges provide the best travel times for trucks in the BIA and I-5 corridor and reduce periods of congestion over the No-Build, TDM/TSM, and New Arterial alternatives. Supplemental Interstate and Replacement bridges also provide the greatest truck throughput and provide more improvements to interchanges used to access ports, freight, and industrial facilities.

Replacement bridges (Alternative Packages 8 – 12) provide the greatest benefit to marine navigation because they eliminate the “no bridge lift” period, remove the S-curve maneuver for vessels, and increase the horizontal clearance between piers. Supplemental bridge options would likely require seismic upgrades to the existing bridge piers that would narrow the horizontal clearance between piers. The supplemental options would further increase physical obstructions in the river by adding additional piers (approximately 14 piers, versus approximately 5 with the replacement bridge options). These factors increase the size and number of piers in the navigation channel and thus adversely impact navigation operations and safety.

Value 6 – Stewardship of Natural Resources

Alternative Packages 1 and 2 (No-Build and TSM/TDM) have the least direct impact on natural resources, but they would not meet the project’s Purpose and Need. They would also likely continue to discharge untreated stormwater runoff from the existing bridge into the Columbia River.

Replacement bridges (Alternative Packages 8 - 12) would perform better than supplemental bridges (Alternative Packages 3 - 7) due to smaller total footprint, greater ability to treat stormwater runoff, and fewer permanent in-water structures than supplemental bridges.

Value 7 – Distribution of Benefits and Impacts

Replacement bridge options provide the greatest equity between transit and auto users by operating both transit and auto modes on equivalent structures over the river. Supplemental bridge options that locate autos on the new, fixed span bridge, and locate high capacity transit on the existing, lift span bridge (which is subject to bridge lifts that reduce transit reliability, increase transit travel times and increase transit operation costs) could have transportation equity concerns.

The Replacement bridge options (8-12) and the Supplemental Bridge options that provide an interchange on Hayden Island (Alternative Packages 6 and 7) offer the greatest access improvements for all populations and do not appear to have notable disproportionate adverse effects.

Value 8 – Cost Effectiveness and Financial Resources

Capital cost estimates are being developed for the river crossing options.

Supplemental bridge options have much higher annual maintenance and operation costs (approximately \$3 million/year) than replacement bridge options (approximately \$35,000/year). This is due to higher operation costs (largely because of staffing the lift structure) and major maintenance/preservation work (such as repaving and repainting) that will be required for the existing bridges. The new, fixed span bridge would not require 24-hour staffing, and would not require any additional major preservation or maintenance improvements during the planning period (2035).

Value 9 – Growth Management/Land Use

A new bridge for LRT service (Alternative Packages 3, 8, and 9) best adheres to regional plans and policies because it provides more reliable and faster service than running LRT on the existing bridge, or providing BRT, BRT-Lite or Express Bus only. This favors replacement bridge options.

Supplemental bridges and No-Build alternatives better support the Clark County planning policy that includes historic preservation because replacement bridges remove the existing northbound bridge that is on the National Register of Historic Places.

Value 10 – Constructability

Construction impacts would be less for the New Arterial bridge compared to the other Supplemental and Replacement bridge options because it has the smallest footprint and would not require construction phasing to transfer I-5 traffic to a new bridge and interchanges. Designs are currently conceptual and therefore provide little basis or detail for distinguishing other aspects of constructability at this phase.

Transit Findings

Key Findings
Value 1 – Community Livability and Human Resources
<p>No-Build and TSM/TDM only options (Alternative Packages 1 and 2), followed by Express Bus only (Alternative Packages 7 and 11) would have the lowest direct impact on community resources but would not meet key policies in local plans.</p> <p>Of the Build Alternative Packages, Express Bus only (in Alternative Packages 7 and 12) would have the lowest direct impact because they would be contained largely within the I-5 right-of-way. However, better transit and pedestrian access to Hayden Island and downtown Vancouver afforded by LRT and BRT (in Alternative Packages 3 - 5 and 8 - 10) would provide greater potential for commercial and residential vitality and community enhancement. None of the transit options would bisect neighborhoods or affect more than 10 percent of any neighborhood.</p> <p>LRT and BRT (Alternative Packages 3 - 5 and 8 - 10) necessitate widening river crossings across the Oregon Slough, displacing up to approximately 5 additional floating homes. LRT and BRT also affect up to about 30 commercial properties; most of these would be partial property acquisitions (not displacing the existing uses). BRT-Lite (Alternative Packages 6 and 11) and Express Bus only (Alternative Packages 7 and 12) impact few or no residential or commercial properties.</p> <p>Alternative Packages with LRT or BRT meet local plans better than those with BRT-Lite or Express Bus only. Alternative Packages 8 and 9 appear to best meet local plans and uphold principles of multi-modalism because they provide LRT on a new fixed-span crossing that affords more reliable transit service compared to all other alternatives.</p>
Value 2 – Mobility, Reliability, Accessibility
<p>Overall, LRT performs best for value 2.</p> <p>LRT would have the fewest transit vehicle hours of delay (VHD) during peak periods because of the exclusive guideway that continues south of the BIA. BRT-Lite would be subject to twice as much VHD as LRT. Express Bus in general purpose lanes has up to six times more transit VHD than LRT. Express bus in managed lanes performs better than in general purpose lanes, but still has twice as much VHD as LRT.</p> <p>Transit mode split during the PM peak period would be 30% to 40% higher for LRT and BRT options compared to the No-Build or TDM/TSM alternatives (the mode split would be 16%, 13% and 11%, respectively). Additionally, LRT can carry at least 1.5 times more people than BRT, express bus, or BRT-Lite alone. Alternatives with both Express Bus and LRT have the highest transit carrying capacity because of the combined service. The no-build has the lowest transit mode split share, and also has a 5% to 10% higher share of single occupancy vehicles compared to the build alternatives.</p>
Value 3 – Modal Choice
<p>Pairing LRT and Express Bus provides the best performance overall for modal choice since this combination provides the highest access to transit markets, an exclusive guideway for transit throughout the BIA and south of the BIA, and the non-stop service of Express Bus. BRT with Express Bus provides similarly strong performance except that BRT would be delayed by I-5 traffic congestion south of the BIA. BRT-lite has relatively good transit access but would have the longest travel times because it diverts through downtown and has no exclusive guideway on I-5.</p>
Value 4 – Safety
<p>Transit modes that would operate on a guideway separate from vehicle traffic would help reduce conflicts and congestion on I-5. Therefore, providing LRT or BRT (Alternative Packages 3 - 5 or 8 - 9) would best enhance safety. However, introducing LRT or BRT at-grade crossings with arterial traffic in Vancouver would create potential new safety hazards.</p>

Value 5 – Regional Economy, Freight Mobility

Transit mode options have little effect on the freight-related measures evaluated to date.

Value 6 – Stewardship of Natural Resources

LRT and BRT (Alternative Packages 3 - 5 and 8 - 10) have larger footprints which cause greater direct adverse impacts than transit options with smaller footprints such as BRT-Lite (Alternative Packages 6 and 11), Express Bus only (Alternative Packages 2, 7, and 12), and No-Build (Alternative Package 1).

LRT and BRT, as currently designed, would impact a buffer adjacent to Burnt Bridge Creek, City of Portland E-Zones, and habitat areas. However, these impacts are based on a sample alignment and could likely be reduced through design refinement. An additional consideration is that LRT and BRT are likely to increase transit mode share and better support regional growth management policies, which would lower secondary impacts to natural resources.

Value 7 – Distribution of Benefits and Impacts

LRT and BRT have higher potential to affect residential properties than BRT-Lite or Express Bus because they necessitate wider structures across the Oregon Slough, which may displace up to approximately 5 floating homes. However, residential acquisitions and displacements do not cluster in areas with notable low-income and/or minority populations.

Transit options that provide either LRT or BRT, combined with Express Bus, offer the greatest improvements in transit service to all populations. There is no notable difference in the distribution of benefits.

Value 8, Cost Efficiency and Financial Resources

Per-Mile Transit Capital Costs

	LRT	BRT	BRT-Lite	Express Bus
Low	\$60 million	\$25 million	\$20 million	\$10 million
High	\$120 million	\$110 million	\$40 million	\$30 million

The table above shows the possible range of cost per-mile of the various transit modes. LRT would run for approximately 4.5 miles, whereas the bus lines would run for 5 miles. Alternative Packages 3 and 8 combine Express Bus service with LRT. With these Alternative Packages, in addition to the capital cost requirements for LRT, express bus service would require costs for the bus vehicles and a bus maintenance facility. This would be less than simply adding the Express Bus capital costs listed in Table 1 to the LRT costs.

Annual Transit Operating Costs

	Raw Costs	Cost per transit seat
LRT + Express Bus	\$10,600,000	\$0.35
LRT	\$8,700,000	\$0.33
BRT	\$13,300,000	\$1.92
BRT-Lite	\$17,000,000	\$1.37
Express Bus	\$7,000,000	\$0.67

Annual operating cost per annual transit seat (a proxy for operations cost-effectiveness) varies substantially across the modes. Express bus alternatives have moderate operating costs per seat due to their AM and PM peak period operation and lower bus capacity. BRT and BRT-Lite have higher operating costs per seat, reflecting a full, all day operation between downtown Portland and Kiggins Bowl. The LRT alternatives have lower operating costs per seat due to the large train capacity and the already operating Yellow Line in Portland.

Value 9 – Growth Management/Land Use

Alternative Packages with LRT (3, 4, 8, and 9) best support regional plans and policies. BRT (Alternative Packages 5 and 10) does not satisfy regional plans calling for LRT but would support multi-modalism and compact growth.

BRT-Lite (Alternative Packages 6 and 11) is less supportive. Express Bus only options (Alternative Packages 2, 7, and 12) are the least supportive of regional plans and growth management goals.

Value 10 – Constructability

LRT and BRT (Alternative Packages 3 - 5 and 8 - 10) would have the greatest amount of construction impacts because they would have the largest footprints.