



Value Performance

Value Performance

Value 1 – COMMUNITY LIVABILITY AND HUMAN RESOURCES

♦ Best Performing Package(s) and/or Component(s)

The alternatives with the least physical improvements (Alternative Packages 1 and 2) have the lowest direct impacts on existing community resources. However, these packages can do little to enhance access or livability, do not support the community’s future vision as expressed in local plans, and would do little to manage or address the impacts that future population and traffic growth will have on communities and livability.

The diversity of objectives within this value provides no clear winning component or package. Current evaluations have yielded the following conclusions among the Build alternatives:

- LRT, and to a lesser extent BRT, supports local planning goals and provides potential to improve vitality and access to downtown Vancouver and Hayden Island. However, these transit modes require more direct impacts to residential and commercial properties and potentially to existing historic and archaeological resources because of their exclusive ROW.
- Replacement bridges and the new arterial bridge better support LRT or BRT, and generally require slightly less ROW through downtown Vancouver and Hayden Island. However, a replacement bridge would entail removal of the northbound bridge that is a historic resource.
- Upstream replacement bridges require complete removal of the Safeway on Hayden Island, while design refinements may allow other bridge options to avoid or minimize impacts to the only grocery store on the island.

♦ Key Findings

➤ River Crossing

Alternatives using a replacement bridge (Alternative Packages 8 – 12) would have a greater adverse effect on historic resources because they would remove the existing northbound bridge which is on the National Register of Historic Places. Alternatives using a supplemental bridge (Alternative Packages 3 - 7) would also impact this existing bridge due to seismic retrofits and design upgrades. Only No-Build alternatives would avoid impact to the existing bridge. Alternative Packages 4 - 12 would all impact the historic Apple Tree Park.

All of the Build alternatives (Alternative Packages 3 - 12) could affect the recreational trails crossing under them.

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 are a major factor. River crossings require the acquisition or relocation of approximately 5 to 15 houseboats. This range varies largely on whether HCT is present and on the interchange configurations at Marine Drive and on Hayden Island. Supplemental and replacement bridges in all Build alternatives require acquisition of at least portions of approximately 30 commercial parcels.

No neighborhoods will be bisected by new construction and no neighborhoods will lose more than 10 percent of their total area for construction. 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 may require partial or full acquisition of Safeway as well due to interchange improvements. Safeway could likely be relocated on Hayden Island.

➤ **Transit Performance**

LRT and BRT would have the greatest potential to affect unknown archaeological resources beneath downtown Vancouver roadways, as well as the locally-designated historic district, because they introduce a new transit ROW through Vancouver. They would also have the greatest opportunity to enhance this district.

LRT and BRT necessitate widening river crossings across the Oregon Slough which requires acquisition of approximately 5 additional houseboats for most bridge options.

LRT and BRT would affect up to 30 commercial properties, mostly partial acquisitions. BRT-Lite (Alternative Packages 5 and 11) affects fewer properties and Express Bus only (Alternative Packages 7 and 12) impacts no commercial properties.

None of the transit options would bisect neighborhoods or affect more than 10 percent of any neighborhood. LRT and BRT add high capacity transit to Vancouver and Hayden Island neighborhoods, helping to improve residents' access to resources.

Alternative Packages with LRT or BRT meet local plans better than those with BRT-Lite or Express Bus only. LRT performs best on a replacement bridge, making Alternative Packages 8 and 9 appear to best meet local plans and uphold principles of multi-modalism.

➤ **Roadways North and South**

Interchange configurations at SR 500 are the primary contributor to the limited range of residential acquisitions occurring from roadways north. Potential commercial property acquisitions from Roadways South options are smaller, ranging from 0 to 14 largely depending upon the interchange configuration on Hayden Island. Likewise, commercial acquisitions from Roadways North are also small, ranging from 5 to 15.

The SR 14 interchange is a key factor for effects on Fort Vancouver and on the Apple Tree Park. Impacts to these historic resources are largely determined by the design of this interchange. Designs seeking to minimize ROW requirements and include three levels of ramps would have less physical impacts but would cause visual impacts to Fort Vancouver. Conversely, interchange designs that expand outward and minimize vertical stacking of ramps could encroach further on Apple Tree Park and downtown Vancouver.

The interchanges at Marine Drive and on Hayden Island can affect the number of houseboats that would be acquired. A more extensive interchange at Marine Drive pushes the bridge over the Oregon Slough north slightly, impacting additional houseboats. Removing an I-5 interchange on Hayden Island, necessitates an arterial crossing over the Oregon Slough which would consume additional house boats.

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

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Value 2 – MOBILITY, RELIABILITY, ACCESSIBILITY, CONGESTION REDUCTION, AND EFFICIENCY

♦ Best Performing Package(s) and/or Component(s) [Summarize your findings regarding the components and combination of components that perform best for this value.]

- Overall, alternative packages with a replacement bridge and LRT (packages 8 and 9) perform best for measures relating to mobility, reliability, accessibility, congestion reduction, and efficiency.
- The LRT, BRT, BRT-Lite and Express Bus options all enable access to more households than the TDM/TSM, and No-build alternatives. Higher levels of transit access are provided in the HCT alternatives.
- Supplemental Interstate and Replacement Bridge alternatives provide significantly more vehicle throughput and substantially reduce the duration of daily congestion over the New Arterial, TDM/TSM or No-build alternatives.
- HCT modes (LRT, BRT, and BRT-Lite) have significantly lower vehicle hours of delay (VHD) and more person throughput than other modes. LRT performs better than BRT for most measures.

♦ Key Findings

➤ River Crossing

Overall, a Replacement bridge performs best for this value. The Supplemental Interstate and Replacement bridge alternatives provide the highest traffic volume throughput, greatest reduction in congestion, and lowest overall travel times. Replacement bridges reduce transit vehicle hours of delay by placing transit on a new fixed-span crossing, whereas Supplemental Interstate bridge options subject transit to delay from bridge lifts on the existing bridges.

The TDM/TSM and New Arterial alternatives provide similar peak period throughput across the I-5 Bridge as the No Build alternative. 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 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.

The Supplemental Interstate and Replacement Bridge alternatives provide the greatest reduction (55% to 60% lower) in daily highway congestion on the I-5 Bridge compared to No-Build. The TDM/TSM alternative would be similar to the No Build alternative. The New Arterial alternative reduces the duration of daily congestion by about 5% compared to the TSM/TDM alternative.

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 about 50% or more. However, southbound I-5 travel times during the AM peak period are similar or slightly higher compared to the TDM/TSM and New Arterial alternatives because Supplemental Interstate and Replacement alternatives would carry more vehicles and still be constrained by limitations on I-5 south of the BIA. A New Arterial bridge provides similar travel times as No-build and TDM/TSM.

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. Bridge lifts also cause system-wide disruption for LRT.

➤ **Transit Performance**

Overall, LRT performs best for value 2. LRT would have fewer transit vehicle hours of delay (VHD) during peak periods than all other modes, including BRT, within the I-5 corridor, because of the exclusive guideway that continues south of the bridge influence area. 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.

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 approximately 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.

➤ **Roadways North and South**

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

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Value 3 – Modal Choice

♦ Best Performing Package(s) and/or Component(s)

- Pairing LRT and Express Bus provides the best performance overall for the Modal Choice value since this combination provides the highest access to transit markets, transit in exclusive guideway (LRT) throughout the BIA and south of the BIA, and the non-stop service of Express Bus. BRT with Express Bus provides similarly strong performance on the Modal Choice criteria but unlike LRT, it 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.
- The Replacement Bridge options and the New Arterial Bridge option perform best for Modal Choice primarily because they would operate LRT or BRT on a new fixed-span bridge, thus avoiding travel time delays and service interruptions associated with bridge lifts (as occurs with the Supplemental Bridge options). The Replacement and Supplemental bridge options provide the best bike and pedestrian connectivity (compared to the New Arterial and TSM/TDM options)

♦ Key Findings

➤ River Crossing

Improve Transit Service to Target Markets

Most of the supplemental bridge alternatives (packages 4-6) would operate transit on the existing I-5 bridge. This would subject high capacity transit service to interruptions from bridge lifts. The US Coast Guard has indicated that the current restrictions on bridge lifts (lifts are not allowed during peak travel times) would likely be removed if I-5 traffic were no longer on these bridges. Thus, bridge lifts would occur much more frequently than today and would occur during peak travel periods. Each bridge lift currently results in at least 17 minutes of delay. During the peak period, this would cause 3 to 4 LRT trains or BRT vehicles to be stopped at each end of the bridge, with each bridge lift. The impacts to schedules, travel time, service reliability and operations costs would extend to other parts of the system. There would be no bridge lift impacts on high capacity transit with the New Arterial bridge option (package 3) and all the Replacement Bridge options (packages 8-12) because they would operate transit on the new fixed-span bridge.

Improve Bike and Pedestrian Connectivity

- The TDM/TSM alternative would provide improved connections to existing pathways at either end of the bridge but would not improve connections beyond that and would not improve sub-standard conditions on the bridge bike path.
- The New Arterial Bridge option would provide a multi-use pathway on the existing bridge and connect it to existing pathways on both ends of the bridge.
- The Supplemental Interstate and Replacement Bridge options would provide the greatest improvements for bike and pedestrian connectivity by adding a new multi-use pathway with an improved network of paths and connections in the I-5 Bridge Influence Area.

➤ Transit Performance

The best performing packages are those that include both an HCT mode and Express Bus, followed by those with either an HCT mode or Express Bus. The No Build and the TSM/TDM would provide the least amount of transit access.

- The local bus network for all of the alternatives would result in approximately 88% of the 2030 population in Clark County within ¼ mile of a bus route.
- In addition, with LRT or BRT service, about 8% of the population and 12% of employment in Clark County would be within ½ mile of a proposed HCT station.
- With Express Bus, approximately 17% of the population and 12% of employment in Clark County would be within ½ mile of a newly planned or existing park-and-ride lot (a total of 10 park-and-ride lots with 4,500 spaces).

Transit travel-times from Clark County transit markets to Oregon transit markets (in vehicle travel times in the AM and PM peak periods for two representative pairs) were also compared with the following conclusions:

- Due to an exclusive guideway, LRT alternatives have the most reliable overall travel time between the BIA and downtown Portland.
- BRT provides similar travel times to LRT through the BIA, but south of the BIA| BRT vehicles operate in general traffic. This increases southbound AM peak travel times but decreases northbound PM peak travel times because the BRT makes no stops south of the BIA and the I-5 traffic improvements allow free-flow traffic in the NB direction.
- Express Bus travel times are 10 to 90% longer than LRT in the AM peak (southbound) and the same as or up to 50% shorter than LRT in the PM peak (northbound). With the I-5 traffic improvements and no stops south of the BIA, northbound Express Buses would travel in largely free flow traffic conditions.
- BRT-Lite alternatives have the longest travel times due to their use of downtown general purpose lanes and I-5 managed lanes in lieu of an exclusive guideway.

➤ **Roadways North and South**

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

Value Performance

Value 4 – SAFETY

◆ Best Performing Package(s) and/or Component(s)
<ul style="list-style-type: none"> • With all modes of transportation (bicycle/pedestrian, highway, air, and marine), safety increases when points of conflict are removed and congestion is decreased. • Overall, Alternative Package 10 includes the most improvements and components that would enhance safety such as providing a replacement bridge, a transit mode that would operate in a separate guideway, removing short weaving sections north and south of the river crossing, and adding freight bypass lanes at difficult merge locations. • Alternative Packages 8 and 9 would next best enhance safety by providing a replacement bridge and HCT in a separate guideway.
◆ Key Findings
<p>➤ River Crossing</p> <p>Operating I-5 on a new supplemental or replacement bridge constructed to current seismic standards would best maintain a highway life-line connection across the Columbia River in the event of an earthquake. This connection would have adequate capacity and would maintain a direct connection through the I-5 corridor.</p> <p>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; result in fewer piers and bridges, thus further simplifying navigation; 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. Therefore, overall, a replacement bridge would best enhance safety.</p> <p>Using a supplemental bridge for interstate traffic (Alternative Packages 4 – 7) would provide some of the safety benefits as a replacement bridge except that the existing bridges would remain, thus maintaining the obstruction into Pearson Airpark’s airspace and resulting in greater obstructions to marine navigation. Also, the existing bridges, even with seismic upgrades, will likely be more vulnerable to earthquake damage.</p> <p>Using a supplemental bridge for arterial traffic and continuing to operate I-5 on the existing bridges (Alternative Package 3) would have a negative impact on highway safety as congestion would increase, which would also likely increase the “no bridge lift” periods and further impact marine safety.</p>
<p>➤ Transit Performance</p> <p>Transit modes that would operate on a guideway separate from vehicle traffic would help reduce conflicts and congestion in I-5 general purpose lanes. Therefore, providing HCT with either LRT or BRT in an exclusive guideway (on a new supplemental or replacement bridge) would best enhance safety.</p>
<p>➤ Roadways North and South</p> <p>North of the river crossing, a new supplemental or replacement bridge for I-5, which would include widening I-5 through the Bridge Influence Area, would increase safety because full highway shoulders along I-5 could be provided. Widening I-5 would also require reconstruction of the existing 39th Street over-crossing, which is a route to Discovery Middle School. The over-crossing would be constructed with a greater sidewalk width. Accessibility at SR 500 would also be improved because ramps would be added to and from the north.</p> <p>At the 39th Street interchange removing the ramps to and from the north on I-5 would improve bicycle and pedestrian safety on 39th Street by reducing the number of ramp crossings. This improvement could be packaged with a new supplemental or replacement bridge for I-5; it is currently included as an option in four of the Alternative Packages.</p>

Removing a short weaving section at Marine Drive and Hayden Island would improve safety. This improvement could be accomplished with the supplemental bridge options by eliminating the Hayden Island interchange, or with the replacement bridge options by adding braided ramps.

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

Bicycle and pedestrian safety would be best improved by providing separate facilities across the river and connections to the north and south.

Adding freight bypass lanes in areas where trucks currently have difficulty entering and exiting I-5 would enhance safety. This improvement could be packaged with a new supplemental or replacement bridge for I-5; it is currently included as an option in four of the Alternative Packages.

Re-striping I-5 (in both directions) between 39th Street and SR 500 to add a managed lane could improve safety by increasing capacity on I-5, however, it would also result in substandard shoulder widths which decrease safety.

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Value 5 – Regional Economy, Freight Mobility

♦ Best Performing Package(s) and/or Component(s)

- 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.

♦ Key Findings

➤ River Crossing

Reduce truck travel times in the Bridge Influence Area (SR 500 to Columbia Boulevard)

- The TDM/TSM and New Arterial options provide similar I-5 truck travel times as the No-Build
- The Supplemental Interstate and Replacement Bridge options reduce, by 50 to 60%, I-5 northbound, pm peak truck travel times compared to the TDM/TSM and New Arterial options
- The Supplemental Interstate and Replacement Bridge options result in higher I-5 southbound, am peak travel times compared to the TDM/TSM and New Arterial options. This is due to carrying more trips than the other options and to constraints on I-5 south of the Bridge Influence Area. Overall duration of congestion is reduced and throughput is increased for these options compared to the TDM/TSM and New Arterial.

Reduce Truck Travel Times in the I-5 corridor (179th to I-84)

- The TDM/TSM and New Arterial options provide similar truck travel times along I-5 as the No-Build alternative.
- The Supplemental Interstate and Replacement Bridge options reduce, by 50% or more, I-5 northbound, pm peak travel times compared to the TDM/TSM and New Arterial options.
- The Supplemental Interstate and Replacement Bridge options reduce, by 5 to 10%, I-5 southbound, am peak truck travel times compared to the TDM/TSM and New Arterial options.

Marine navigation Efficiency

The greatest benefit to the efficiency of marine navigation would be with the Replacement Bridge options because they would:

- Eliminate the existing liftspan bridges, thus eliminating the “no bridge lift” period that restricts marine vessels
- Result in fewer total bridge piers in the water (approximately 5, compared to 14 with the Supplemental options)
- Provide a permanently open, direct path to the downriver, BNSF railroad swing-span.

Improve Freight Truck Throughput in the Bridge Influence Area

- The TDM/TSM and New Arterial options provide similar peak period truck throughput across the I-5 Bridge as the No Build alternative. The TDM/TSM and New Arterial options do not accommodate I-5 bridge travel demands, including truck traffic, resulting in substantial congestion and increased travel times (see Criteria 2.1 and 2.3)
- The Supplemental Interstate options accommodate about 20% higher southbound AM peak period truck traffic volumes and about 30% (without a Hayden Island interchange) to 50% (with a Hayden Island interchange) higher northbound PM peak period truck traffic volumes than the TDM/TSM and New Arterial options
- The Replacement Bridge options accommodate about 25% higher southbound AM peak period truck traffic volumes and about 50% higher northbound PM peak period truck traffic volumes than the TDM/TSM and New Arterial options.

Avoid or minimize impacts to parallel freight rail corridor

- None of the alternatives would result in traffic back-ups that would affect at-grade freight rail crossings. The nearest crossing to the Bridge Influence Area is about 1.3 miles west of I-5.

Enhance or maintain access to port, freight or industrial facilities

- The TDM/TSM and New Arterial options would provide minimal accessibility improvements to I-5 Bridge Influence Area interchanges.
- The Supplemental Interstate and Replacement Bridge options would provide improvements to most or all interchanges thereby improving accessibility to port, freight, and industrial facilities

➤ **Transit Performance**

➤ **Roadways North and South**

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

Value Performance

Value 6 – STEWARDSHIP OF NATURAL RESOURCES

◆ Best Performing Package(s) and/or Component(s)
<ul style="list-style-type: none"> • Alternative Package 12 would have the least direct impact on natural resources but could miss potential indirect benefits associated with more robust high capacity transit options. • BRT-Lite and Express Bus have a smaller footprint than BRT and LRT. • Replacement bridges perform slightly better than supplemental bridges because of their smaller footprint in the water and greater ability to manage stormwater runoff.
◆ Key Findings
➤ River Crossing
<p>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 bridge into the Columbia River.</p> <p>Replacement bridges perform moderately better than supplemental bridges. Replacement bridges can better treat stormwater runoff and would have a smaller total footprint. Replacement bridges would also require fewer in-water piers than supplemental bridges. Short-term impacts are similar for replacement and supplemental bridge alternatives: the replacement alternatives require in-water work to deconstruct the existing bridges and remove piers and foundations, which would likely be accomplished quicker than pier and foundation seismic upgrades associated with the supplemental alternatives.</p>
➤ Transit Performance
<p>The Express Bus and BRT-Lite options would have a smaller footprint and less direct impacts than either BRT or LRT.</p> <p>BRT and LRT, as designed, would impact the Burnt Bridge Creek riparian area, City of Portland Environmental Zones, Metro Goal 5 habitats, and habitats identified in field surveys. However, these impacts are based on a sample alignment and could likely be reduced through design refinement. LRT and (to a lesser extent) BRT are also likely to increase transit mode share and better support growth management, reducing secondary impacts to natural resources.</p>
➤ Roadways North and South
<p>The SR 500 Tunnel Access performs better than SR 500 Flyover Access because it impacts less of the Burnt Bridge Creek riparian and open space area.</p> <p>Hayden Island Access and Hayden Island Folded Diamond Access perform slightly better than Hayden Island Arterial and Full Standard options because they have fewer crossings across the Oregon Slough, and do not come as close to the wetland area southwest of the Marine Drive interchange.</p>
➤ Other (Bike/Ped, Freight, TSM/TDM, Tolling)

Value Performance

Value 7 - DISTRIBUTION OF BENEFITS AND IMPACTS

◆ Best Performing Package(s) and/or Component(s)

- 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 high capacity transit on the existing lift span bridge and autos on the new, fixed span bridge could have transportation equity concerns.
- The Replacement bridge options 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.
- Transit options that combine either LRT or BRT with Express Bus, offer the greatest improvements in transit service to all populations, and do not appear to have notable disproportionate adverse effects.

◆ Key Findings

➤ River Crossing

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 Hayden Island and Marine Drive interchanges are a major factor. River crossings would likely displace 5-15 floating homes on the Oregon Slough. The number depends partly on the specific crossing option but depends more on the interchange designs at Marine Drive and Hayden Island, and on whether the river crossing would accommodate LRT or BRT. Residential acquisitions and displacements do not cluster in areas with notable low-income and/or minority populations.

Replacement bridge options provide the greatest potential benefit to transit users by locating transit on a new, fixed span bridge that would not be subject to bridge lift interruptions. Analysis of the demographics of transit users and auto users would be required to evaluate the effect on the distribution of benefits.

The Replacement bridge options and some of the Supplemental Bridge options (packages 6 and 7) offer similar access improvements to a wide range of populations. Supplemental Bridge options with no Hayden Island interchange (packages 3, 4, and 5) would remove the existing I-5 interchange on Hayden Island. This would provide poorer access to jobs, housing and retail businesses on the island, and poorer access by Hayden Island residents to jobs, housing and other destinations off the island. It is unclear whether this would differentially affect low income or minority populations.

➤ Transit Performance

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 approximately 5 floating homes for most bridge options. 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.

➤ Roadways North and South

➤ Other (Bike/Ped, Freight, TSM/TDM, Tolling)

FORM B: Value Performance

Value 8 – COST EFFECTIVENESS AND FINANCIAL RESOURCES

♦ Best Performing Package(s) and/or Component(s) [Summarize your findings regarding the components and combination of components that perform best for this value.]

Transit

- Express buses would have the lowest capital cost to construct and the lowest annual transit operating cost.
- LRT has the lowest annual operating costs for the HCT modes, and the highest capital costs.
- Cost effectiveness: LRT has the lowest annual operating cost per annual transit seat, followed by Express Bus, and then BRT and BRT-Lite with the highest annual operating cost per annual transit seat.

River Crossing

- Capital cost estimates are not yet available
- The replacement bridge options would have much lower annual operating and maintenance costs (approximately \$35,000/yr compared to approximately \$3 million/yr for the supplemental bridge options).

♦ Key Findings

➤ River Crossing

- Capital cost estimates are being developed for the river crossing options.
- Alternatives that reuse the existing bridges require vastly more annual maintenance and operation costs than replacement alternatives – \$3 million versus \$35,000. This is due to higher operation costs (largely because of staffing the lift structure) and capital improvements that will be required for the existing bridges. A new bridge would not require 24-hour staffing and would be constructed to operate without any capital improvements during the planning period (2035).

➤ Transit Performance

Table 1. 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

Table 1 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. The high end of the BRT cost range reflects the cost to build BRT “rail ready” (so that it could be more readily converted to an LRT line in the future).

Table 2. Annual 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

Table 2 presents the annual operating cost in 2006 dollars divided by the amount of transit capacity provided (or seats in buses and trains). Overall, annual operating cost per annual transit seat 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. The BRT and BRT-Lite alternatives 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 LRT train capacity and the already funded Yellow Line in Portland.

➤ **Roadways North and South**

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

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Value 9 – BISTATE COOPERATION

◆ Best Performing Package(s) and/or Component(s)
<p>Alternative Packages 8 and 9 perform the best because they include LRT as the transit mode, which is supported in regional plans, and would not result in cut-through traffic associated with separate arterial bridges (Alternative Packages 3 - 7). Alternative Packages 3 and 4 include LRT but also include arterial bridges.</p>
◆ Key Findings
<p>➤ River Crossing</p>
<p>Replacement bridges better support goals for regional economic development than supplemental bridges (Alternative Packages 3 – 7) because they require less total ROW on Hayden Island and in downtown Vancouver. Replacement bridges and the new arterial bridge option, because they would place LRT on a new bridge without a lift span, better support regional goals for provision of HCT.</p> <p>However, supplemental bridges and No-Build alternatives better support Clark County planning policies that include historic preservation because replacement bridges remove the existing northbound bridge that is on the National Register of Historic Places.</p>
<p>➤ Transit Performance</p>
<p>Alternative Packages 3, 4, 8, and 9 best support regional plans and policies because they include LRT. 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 (Alternative Packages 1, 2, 7, and 12) performs the worst.</p>
<p>➤ Roadways North and South</p>
<p>There is no discernable difference between Alternative Packages for this criterion.</p>
<p>➤ Other (Bike/Ped, Freight, TSM/TDM, Tolling)</p>
<p>Alternative Package 3 is the best option from a bicycle and pedestrian standpoint because it provides the shortest distance to travel, provides easy access onto the facility, and places bikers and pedestrians next to low-speed traffic traveling locally on an arterial bridge.</p> <p>All packages that provide full-width bike and pedestrian lanes on the new bridge would be a substantial improvement over existing conditions.</p>

Value Performance

Value 10 – CONSTRUCTABILITY

◆ Best Performing Package(s) and/or Component(s)

- Alternative Packages 1 and 2 would have the least amount of construction impacts.
- Among the Build alternatives, Alternative Package 3 would have the least amount of construction impacts because work would occur in a smaller area and it would have the shortest construction period.
- Alternative Packages 4 - 12, which would provide a new supplemental or replacement bridge for I-5, would have a similar duration of construction and would include components that would provide comparable flexibility to accommodate future transportation system improvements. However, a seismic retrofit of the existing bridges (with supplemental bridge options) would take longer than removing the bridges (with replacement bridge options).

Note: Many aspects of constructability are a function of design details that will not be determined until later phases of the project.

◆ Key Findings

➤ River Crossing

Constructing a new supplemental arterial bridge and continuing to use the existing bridges for I-5 (Alternative Package 3) would have the least amount of construction impacts because work would occur in a smaller area and would have the shortest construction period. Its temporary impacts to navigation would be similar to the other Build alternatives.

The construction duration of a new supplemental bridge for I-5, which would include subsequent improvements to seismically retrofit the existing bridges, would be similar to constructing a replacement bridge for I-5, which would include the subsequent removal of the existing bridges. The construction impacts to traffic, navigation, and residences and businesses would be similar.

With a new supplemental or replacement bridge for I-5, future improvements to the transportation system could be constructed by either using the width of the highway shoulders or by constructing further additions to the width of the bridges (such as by cantilevering an additional section). Such flexibility will be determined by future design decisions.

➤ Transit Performance

An Express Bus and Local Bus transit system requires less infrastructure and modifications to the existing transportation network to operate and, therefore, would have lower construction impacts.

Those transit modes that require the construction of an exclusive guideway for operation (either a trackway for LRT or exclusive lanes for BRT) would have the greatest amount of temporary construction impacts. The construction of the guideway would impact a larger area (including the route streets in Vancouver) and would require more time to construct.

BRT-Lite includes infrastructure that would have construction impacts, but less than with LRT or BRT, especially in downtown Vancouver.

➤ Roadways North and South

Improvements at SR 500 would create construction impacts but make future transportation improvements easier to construct.

Construction of improvements at Marine Drive would have associated impacts, but would likely make future transportation improvements easier to construct.

➤ **Other (Bike/Ped, Freight, TSM/TDM, Tolling)**

Bicycle and pedestrian improvements would have associated construction impacts but would make future improvements easier to construct.

Constructing freight bypass lanes would have associated impacts but would likely make future transportation improvements easier to construct. This improvement could be packaged with a new supplemental or replacement bridge for I-5; it is currently included as an option in four Alternative Packages.