HCT Corridor Studies

Review of Corridors and Findings

May 2015
• A three-step approach:

1. HCT Corridor Studies per ST2 (2013-2014)

2. Long-Range Plan Update (unconstrained) with environmental documentation (2013-2014)

High Capacity Transit Corridor Studies

- High-level, conceptual in nature
  - Designed to provide information on possible options
  - Consistent methods across all studies for costing and ridership
  - Focused on the purpose stated in ST2
    - “Inform the Sound Transit Board’s consideration of potential updates to Sound Transit’s Long-Range Plan”
    - “To advance completion of further expansions of the system”
- First part of planning for potential ST3 package
• Lynnwood to Everett Study Area
  - Part of the regional light rail “spine”
  - Three PSRC designated centers; one PSRC designated metropolitan center (Everett)
  - Congestion rapidly increasing in general purpose and HOV lanes
  - Considerable population and employment growth expected
  - Many park-and-ride lots at capacity
  - Frequent ST and Community Transit commuter service, and CT and Everett Transit local service
• Five options
  - 3 light rail, 2 bus
• Corridors
  - Boeing/Paine Field via I-5/SR 99
  - I-5
  - SR 99
• College Extension
  • Everett Station to Everett Community College
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>15.7 miles 17.3 miles*</td>
<td>12.6 miles 14.8 miles*</td>
<td>14.0 miles 15.6 miles*</td>
<td>19.6 miles 23.5 miles*</td>
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<tr>
<td>33 min 37 min*</td>
<td>22 min 29 min*</td>
<td>29 min 34 min*</td>
<td>30 min (Lynnwood-Everett) 44 min*</td>
<td>50 min 64 min*</td>
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<td>37,000 - 50,000 daily riders</td>
<td>32,000 - 43,000 daily riders</td>
<td>36,000 - 51,000 daily riders</td>
<td>14,000 - 21,000 daily riders</td>
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<td>35,000 - 48,000 daily riders*</td>
<td>39,000 - 53,000 daily riders*</td>
<td>15,000 - 23,000 daily riders*</td>
<td>13,000 - 20,000 daily riders*</td>
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## Level 2 Evaluation Results

### Lynnwood to Everett HCT Corridor Study

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<tr>
<td>Travel Time</td>
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<td>Disruption to Other Modes</td>
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<tr>
<td>Station Area Development Potential</td>
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<td>Cost</td>
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<td>Cost Effectiveness</td>
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<td>Environmental Effects</td>
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</table>

Lower performing ➔ Higher performing
General Findings

• Lynnwood to Everett is a mature transit corridor, highly congested, with considerable future growth expected

• Relatively strong project ridership potential

• LRT alignments present tradeoffs between costs, travel time, TOD potential, and centers served

• For BRT options, the I-5 BRT option is most cost effective option
Ballard to Downtown Seattle Transit Expansion Study

Review of General Findings
Ballard to Downtown Seattle Transit Expansion Study

- Support implementation of the Seattle Transit Master Plan
- Support future ST Board discussions and Long-Range Planning on HCT options
- Study Modes: Link light rail & rapid Streetcar
Study Process

Start: Broad range of options gathered from outreach process and considered based on connections to key travel markets, impacts to traffic, and engineering feasibility.

Level 1: 8 Corridors evaluated for conceptual-level capital costs, travel time, and engineering considerations.

Level 2: Based on feedback from Level 1, five corridors were refined and evaluated for capital costs, travel time, and ridership. Results documented in final report.
<table>
<thead>
<tr>
<th>CORRIDOR</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<td>Tunnel Crossing Option</td>
<td>⬤</td>
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<tr>
<td>70' Bridge Crossing Option</td>
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<tr>
<td>15th Avenue/ Elevated</td>
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<td>⬤</td>
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<tr>
<td>15th Avenue/At-grade</td>
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<tr>
<td>2nd/4th Ave Routing Option</td>
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<tr>
<td>1st Ave Routing Option</td>
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<tr>
<td>Queen Anne Tunnel</td>
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<tr>
<td>Tunnel Crossing Option</td>
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<tr>
<td>70' Bridge Crossing Option</td>
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</tbody>
</table>

- **Ridership**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Reliability**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Travel Time Improvement**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Disruption to Other Modes**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Station Area Development Potential**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Cost**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Cost Effectiveness**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Complexity (Risk/Construction Challenges)**: ⬤ (Lower Performing) ⬤ (Higher Performing)
- **Environmental Effects**: ⬤ (Lower Performing) ⬤ (Higher Performing)
South King County HCT Corridor Study

Review of General Findings
South King County HCT Corridor Alternatives

- A3 LRT via Delridge to Burien/Renton
- A4 BRT via Delridge to Burien/Renton
- A5 LRT via Alaska Junction to White Center and Burien/Renton
- B2 BRT to West Seattle and via South Park to Burien/Renton
- B4 LRT to West Seattle and via South Park to Burien/Renton
- C5 LRT to West Seattle/White Center, BRT between Burien and Renton
South King County HCT Corridor Study

General Findings

• Strong overall ridership within the corridor
• Market characteristics vary
• BRT demand is relatively high but can be difficult to serve with realistic bus headways
• High potential right-of-way impacts for the surface & elevated segments from West Seattle to Burien & in Renton because of existing development patterns
• No major natural environmental effects; some potential visual & noise issues
• High potential for equity issues given diverse population groups
## Level 2 Evaluation Results

<table>
<thead>
<tr>
<th>Goal</th>
<th>A3 LRT Delridge</th>
<th>A4 BRT Delridge</th>
<th>A5 LRT Tunnel White Center</th>
<th>B2 BRT White Center &amp; Burien/Renton</th>
<th>B4 LRT Tunnel West Seattle</th>
<th>C5 LRT to White Center; Burien/Renton BRT</th>
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<td>Environmental Effects</td>
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<td>Contribute to the region's economic vitality</td>
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<td>Strengthen communities' access to and use of the regional transit network</td>
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<td>Cost Effectiveness</td>
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</table>
Federal Way to Tacoma HCT Study

Review of General Findings

South Corridor Alternatives Planning

Based on information as of 9/5/2014
Federal Way – Tacoma Corridor

• Approx. 10 miles between Federal Way Transit Center and Tacoma Dome Station along I-5 or SR 99.

• Connects the 2nd and 7th largest cities in the region, with areas of relatively low density in between (approx. 10% of district population).

• ST Express, King County Metro and Pierce Transit bus routes currently serve the corridor, with connections to Sounder commuter rail and Amtrak at TDS.
Level 2 Options Map

Federal Way to Tacoma HCT Study
### Level 2 Evaluation Results

**Federal Way to Tacoma HCT Study**

<table>
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<tr>
<th></th>
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<th>SR 99 Center</th>
<th>SR 99 Hybrid</th>
<th>SR 99 to I-5</th>
<th>I-5 West</th>
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<th>I-5 BRT</th>
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<td>Reliability</td>
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<td>Disruption to Other Modes</td>
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<td>Station Area Development Potential</td>
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<td>Cost (Capital)</td>
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<td>Environmental Effects</td>
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</table>
Central and East HCT Corridor Studies

Review of General Findings
Ballard to the U District

Level 2 Alternatives – Geographic Map

Legend:
- Link Station
- Link Alignment
- Station Vicinity
- Potential Rail Ballard to Downtown

Ballard - University District (BUD) Alignment Alternatives

A: University District to Ballard via Wallingford

- **A1**: BRT in a combination of arterial mixed traffic and exclusive busway along N 50th St

B: University District to Ballard via Fremont

- **B2**: LRT via N Pacific St/Leary Way NW
- **B2a**: LRT with elevated segments through University District and Fremont

- **B3**: BRT in a combination of arterial mixed traffic and exclusive busway along N Pacific St/Leary Wy NW

C: University District to Ballard via Wallingford and Fremont

- **C1**: LRT via N 45th St/Stone Wy N/ Leary Wy NW

Alignment Profiles:
- At-grade
- Elevated
- Tunnel
- Interline (Shared Track)

Mode:
- Light Rail
- Transit (LRT)
- Bus Rapid Transit (BRT)
<table>
<thead>
<tr>
<th>GOAL</th>
<th>PERFORMANCE MEASURES</th>
<th>U District – Wallingford–Ballard</th>
<th>U District – Fremont–Ballard</th>
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<td></td>
<td></td>
<td>BRT in a combination of mixed traffic and exclusive busway along N 50th St</td>
<td>LRT via N Pacific St and Leary Wy NW</td>
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<tr>
<td></td>
<td>Travel Market Potential</td>
<td>18 to 22 minutes</td>
<td>6 to 9 minutes</td>
</tr>
<tr>
<td></td>
<td>14k to 17k riders per day</td>
<td>22k to 26k riders per day</td>
<td>20k to 24k riders per day</td>
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<tr>
<td></td>
<td>Reliability</td>
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<td></td>
<td>Environmental Effects</td>
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<td></td>
<td>Existing Transportation System</td>
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<td>Development Potential</td>
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<td>Regional Connectivity</td>
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<td>Cost Effectiveness</td>
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</tbody>
</table>

Note: Cost estimates are conceptual and for comparative purposes only, calculated in 2014 $. 

Ballard to the U District
General Findings

- Above ground options trade off reliability and speed for traffic and ROW impacts
- Tunnels achieve reliability with limited impacts, but are costly
- Options that serve both Fremont and Wallingford have slightly stronger ridership potential than options that serve just one neighborhood
Level 2 Alternatives – Geographic Map

University District - Kirkland - Redmond (UKR) Alignment Alternatives

A: University District (U District) to Kirkland via I-405

- A1 BRT in a combination of managed and HOV lanes, and mixed traffic via I-405, SR 520, NE Pacific St, and University Wy NE

B: U District to Kirkland via Eastside Rail Corridor (ERC)

- B1a BRT in managed lanes and exclusive busway, and mixed traffic via I-405, SR 520, NE Pacific St, and University Wy NE
- B2b LRT via ERC, SR 520, elevated along lakeshore, tunnel along NE 45th St

C: U District to Kirkland to Redmond via SR 520 Corridor

- C1 BRT in managed and HOV lanes, and mixed traffic via SR 520, Montlake Blvd NE, and NE 45th St
- C2 LRT via shared track with East Link, elevated along Montlake Blvd NE, tunnel along NE 45th

- C2a LRT from U District to Hospital Station with transfer opportunity to East Link
**Note:** Cost estimates are conceptual and for comparative purposes only, calculated in 2014 $.  
*Reliability assumes operation of WSDOT managed lanes at 45MPH.
General Findings

• Serving the U District is highly complex with potential impacts to:
  • ST agreement with UW
  • Vibration sensitive research facilities at UW
  • Historic properties
  • Tribal burial ground
  • Recreational and wetland resources
  • Major utility lines
  • Viewsheds

• Expanding the SR 520 floating bridge deck improves reliability and travel time but is profoundly costly, complex and impactful

• BRT options rely on WSDOT to operate managed lanes on SR 520 and I-405 at 45MPH

• A new HCT corridor across Lake Washington may impact cross-lake travel patterns including East Link ridership
Level 2 Alternatives – Geographic Map
**Kirkland – Bellevue – Issaquah**

### Performance Measures

<table>
<thead>
<tr>
<th>Goal</th>
<th>BRT in managed lanes</th>
<th>BRT in managed lanes</th>
<th>LRT via I-90, Richards Rd, and ERC</th>
<th>LRT via I-90, I-405, and ERC</th>
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</thead>
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<td>Travel Market Potential</td>
<td>23 to 28 minutes</td>
<td>28 to 34 minutes</td>
<td>26 to 32 minutes</td>
<td>26 to 32 minutes</td>
</tr>
<tr>
<td>0k to 7k riders per day</td>
<td>9k to 11k riders per day</td>
<td>6k to 9k riders per day</td>
<td>6k to 9k riders per day</td>
<td>9k to 11k riders per day</td>
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<td>Reliability</td>
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<tr>
<td>Contribute to the region’s economic viability</td>
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</table>

*Reliability assumes operation of WSDOT managed lanes at 45MPH.*

| Note: Cost estimates are conceptual and for comparative purposes only, calculated in 2014 $. |

*Reliability assumes operation of WSDOT managed lanes at 45MPH.*
General Findings

• Options that serve South Bellevue Station and Bellevue Transit Center provide strong access to Downtown Bellevue and Downtown Seattle

• Design options to the Issaquah Highlands trade off reliability and speed for cost and complexity

• BRT options rely on WSDOT to operate managed lanes on I-90 and I-405 at 45MPH
I-405 Bus Rapid Transit

With full build out of WSDOT I-405 Master Plan
• Single route BRT
• Trunk and branch BRT

With WSDOT I-405 Master Plan Phased Plan
• Single route BRT
• Trunk and Branch BRT
Alternatives Compared

Single Route Options

Riders shown are segment volumes

Trunk and Branch Options

Lynnwood

13 Mi
26-32 Min
4700-5700 Segment Volume
13 Mi
33-41 Min
3700-4600 Segment Volume
13 Mi
26-32 Min
5600-6900 Segment Volume

Totem Lake/Kingsgate

7 Mi
14-18 Min
6300-7800 Segment Volume
7 Mi
12-14 Min
4900-6000 Segment Volume
7 Mi
14-18 Min
8300-10200 Segment Volume

Downtown Bellevue

9 Mi
15-19 Min
7100-8700 Segment Volume
9 Mi
15-19 Min
6600-8100 Segment Volume
9 Mi
15-19 Min
8100-9900 Segment Volume

N 8th Street

4 Mi
18-22 Min
3800-4600 Segment Volume
4 Mi
20-24 Min
3000-3700 Segment Volume
4 Mi
18-22 Min
700-900 Segment Volume

Tukwila Sounder Station

Full WSDOT Build Out
33 Mi
73-91 Min
17000-21000 Daily Riders
Capital Cost: $1280-$1670M
O&M Cost: $24M/Year

WSDOT Phased Plan Build Out
33 Mi
80-98 Min
14000-17000 Daily Riders
Capital Cost: $680-$920M
O&M Cost: $23M/Year

Full WSDOT Build Out
33 Mi
73-91 Min
20000-25000 Daily Riders
Capital Cost: $1280-$1670M
O&M Cost: $44M/Year

WSDOT Phased Plan Build Out
33 Mi
80-98 Min
17000-20000 Daily Riders
Capital Cost: $680-$920M
O&M Cost: $40M/Year
General Findings

- Moderate ridership across all options
- No exclusive ROW
- Reliance on WSDOT implementation of I-405 Master Plan elements and 45 MPH operation of Express Toll Lanes
- Strong access to activity centers and development potential, especially in Bellevue and Renton
- Cost to operate trunk and branch service substantially higher than single route service due to increased bus platform hours
## Level 2 Evaluation results

<table>
<thead>
<tr>
<th>Goal</th>
<th>Bellevue-Renton</th>
<th>Bellevue-Woodinville</th>
<th>Renton-Tukwila</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide a transportation system that facilitates long-term mobility</td>
<td>Travel Market Potential</td>
<td>LRT along ERC + BRT in Busway along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td></td>
<td>Reliability</td>
<td>CR along ERC</td>
<td>CR along ERC</td>
</tr>
<tr>
<td>Enhance communities and protect the environment</td>
<td>Environmental Effects</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td></td>
<td>Existing Transportation System</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td>Contribute to the region’s economic viability</td>
<td>Development Potential</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td>Strengthen communities’ access to and use of the regional transit network</td>
<td>Regional Connectivity</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td></td>
<td>Preliminary Design Cost Estimate</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td></td>
<td>Complexity</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
<tr>
<td></td>
<td>Cost Effectiveness</td>
<td>CR along ERC</td>
<td>LRT along ERC + LRT to Tote Lake</td>
</tr>
</tbody>
</table>

* Does not include cost or complexity of acquiring BNSF easements
### Eastside Rail Corridor

#### Alternatives Compared

<table>
<thead>
<tr>
<th>Location</th>
<th>Commuter Rail</th>
<th>LRT</th>
<th>BRT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Woodinville</strong></td>
<td>4 Mi 10-12 Min 100-200 Segment Volume</td>
<td>4 Mi 10-12 Min 500-1000 Segment Volume</td>
<td>4 Mi 10-12 Min 500-1000 Segment Volume</td>
</tr>
<tr>
<td><strong>Totem Lake/Kingsgate</strong></td>
<td>7 Mi 18-22 Min 1000-1500 Segment Volume</td>
<td>7 Mi 18-22 Min 4000-5000 Segment Volume</td>
<td>8 Mi 18-22 Min 4000-5000 Segment Volume</td>
</tr>
<tr>
<td><strong>Downtown Bellevue</strong></td>
<td>11 Mi 24-30 Min 1000-1500 Segment Volume</td>
<td>11 Mi 24-30 Min 4500-5500 Segment Volume</td>
<td>11 Mi 24-30 Min 4500-5500 Segment Volume</td>
</tr>
<tr>
<td><strong>N 8th Street</strong></td>
<td>3 Mi 7-8 Min 800-1200 Segment Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tukwila Sounder Station</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td></td>
<td>25 Mi 60-72 Min 3500-5000 Daily Riders $1200-$1570M O&amp;M Cost: $71M/Year</td>
<td>22 Mi 52-64 Min 9000-11000 Daily Riders $1980-$2640M O&amp;M Cost: $24M/Year</td>
<td>23 Mi 52-64 Min 9000-11000 Daily Riders $1070-$1440M O&amp;M Cost: $17M/Year</td>
</tr>
<tr>
<td></td>
<td>With Totem Lake terminus: 19 Mi 42-52 Min 8500-10500 Daily Boardings $1670-$2220M O&amp;M Cost: $26M/Year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
General Findings

• Limited ridership across corridor – strongest south of Totem Lake, maximized with shorter headways
• Strong reliability across modes due to exclusive ROW
• Moderate connectivity and development potential – more opportunities from Bellevue north
• Constrained ROW and possible encroachments increase potential impacts
• Trail/utility relocation increases cost and complexity
• Commuter rail less expensive and complex to build, but more costly to operate than BRT or LRT
Overall HCT Corridor Study Findings

• Identified high ridership corridors on the spine—Lynnwood to Everett
• Identified some high demand areas off the spine—Ballard to downtown Seattle to West Seattle
• Identified some very complex areas, for example—between SR 520 and the University District
• Confirmed that exclusive guideways provide reliability and increase ridership
• Tunnels achieve reliability with limited impacts but high costs
• Above ground options trade off reliability and speed with traffic and ROW impacts
• Expanding the SR 520 bridge deck to accommodate light rail is profoundly costly, complex and impactful
• BRT options rely on operation of managed lanes on SR 520 and I-405 to operate at 45 mph