EAST-WEST PASSENGER RAIL STUDY

Advisory Committee Meeting #6
September 30, 2020
Meeting Agenda

• Review of Study Process and Next Steps
• Review of 3 Final Alternatives Selection
• Alternatives Evaluation
  • Service Performance
  • Costs
  • Environmental and Community Impacts
  • Benefit-Cost Analysis
• Advisory Committee Discussion
• Next Steps
Study Process and Next Steps

- Existing Conditions & Market Analysis
- Alternatives Development
- Preliminary Alternatives Evaluation (6 Alternatives)
- Final Alternatives Evaluation (3 Alternatives)
- Findings, Recommendations, Next Steps
- Draft Report
- Final Report

Community and Stakeholder Engagement
Full Study Process – 3 Public Meetings * 6 Study Advisory Committee Meetings * Online Input * Briefings

We Are Here
Upon completion of the East-West Passenger Rail Study, what next steps would you recommend?

Study Alternatives
- Are there any alternatives that you would prioritize or deprioritize?
- What phasing approaches, if any, should be considered?

Potential items for further analysis to consider
- Examples: indirect economic benefits, impacts to freight service, electrification of the alternatives, life-cycle cost analysis, disposition/condition of CSX infrastructure

Potential operational items to consider
- Safety issues associated with grade crossings
- Discussions with CSX

Governance and funding items to consider
- Proposed operating entity (e.g., Amtrak or other railroad)
- Legislative actions that may be required
- Funding sources (including federal funding under new proposed legislation)
The Following 3 Alternatives Were Selected for Final Analysis:

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>Alternative 3</td>
<td>Alternative 4</td>
</tr>
<tr>
<td>Rail Service</td>
<td>PIT – BOS</td>
<td>PIT – BOS</td>
</tr>
<tr>
<td>Intermediate Stops</td>
<td>Chester and Palmer</td>
<td>Chester and Palmer</td>
</tr>
<tr>
<td>Infrastructure and Improvements</td>
<td>Double-tracking of single-track segments for full corridor</td>
<td>New railroad line mostly within CSX property, double-track between Pittsfield and Springfield</td>
</tr>
<tr>
<td></td>
<td>Improvements to railroad, signals, control – increased maximum allowable speed</td>
<td>Newly built railroad infrastructure (SPG – WOR) and lack of freight conflict enables increased maximum allowable speed</td>
</tr>
</tbody>
</table>
Review of 3 Final Alternatives Selection

Alternative 3: Passenger Rail between Pittsfield and Boston with Upgrades to Existing Track

ANTICIPATED SCHEDULED SPEEDS

- < 50 mph
- 50 - 59 mph
- 60 - 69 mph
- 70 - 79 mph
- 80 - 89 mph
- 90 - 99 mph
- 100 - 109 mph

Pittsfield
Chester
Springfield
Palmer
Worcester
Framingham
South Station
Lansdowne
Back Bay
Vermonter
Lake Shore Limited
Review of 3 Final Alternatives Selection

Alternative 4: Passenger Rail between Pittsfield and Boston with New Track in Existing Alignment

ANTICIPATED SCHEDULED SPEEDS

- < 50 mph
- 50 - 59 mph
- 60 - 69 mph
- 70 - 79 mph
- 80 - 89 mph
- 90 - 99 mph
- 100 - 109 mph
Alternative 4/5 Hybrid: Passenger Rail between Pittsfield and Boston with New Track and Priority Realignments

ANTICIPATED SCHEDULED SPEEDS

- < 50 mph
- 50 - 59 mph
- 60 - 69 mph
- 70 - 79 mph
- 80 - 89 mph
- 90 - 99 mph
- 100 - 109 mph

Rail Service with No Transfer
Existing Single-Track Segments
Existing Double-Track Segments
New Separate Track Next to Existing Alignment
Priority Realignments
Outside of Existing Alignment

Pittsfield
Chester
Vermont
Palmer
Springfield
Lake Shore Limited
South Station
Lansdowne
Worcester
Back Bay
Framingham

Review of 3 Final Alternatives Selection
## Alternative 4/5: Rail Corridor Realignments

<table>
<thead>
<tr>
<th>Segment</th>
<th>Location</th>
<th>Length Reduction (miles)</th>
<th>Travel Time Savings (min:sec)</th>
<th>Net Cost ($M)</th>
<th>Rate ($M/min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortcut 1</td>
<td>Auburn, Oxford, Charlton</td>
<td>0.64</td>
<td>03:58</td>
<td>$199</td>
<td>$50</td>
</tr>
<tr>
<td>Shortcut 2</td>
<td>Charlton</td>
<td>0.14</td>
<td>00:13</td>
<td>$61</td>
<td>$269</td>
</tr>
<tr>
<td>Shortcut 3</td>
<td>Charlton</td>
<td>0.24</td>
<td>01:32</td>
<td>$86</td>
<td>$56</td>
</tr>
<tr>
<td>Shortcut 4</td>
<td>Spencer</td>
<td>0.47</td>
<td>01:35</td>
<td>$330</td>
<td>$209</td>
</tr>
<tr>
<td>Shortcut 5</td>
<td>East Brookfield</td>
<td>0.04</td>
<td>00:28</td>
<td>$52</td>
<td>$110</td>
</tr>
<tr>
<td>Shortcut 6</td>
<td>West Brookfield</td>
<td>0.04</td>
<td>00:28</td>
<td>$6</td>
<td>$12</td>
</tr>
<tr>
<td>Shortcut 7</td>
<td>Warren</td>
<td>0.05</td>
<td>01:14</td>
<td>$5</td>
<td>$4</td>
</tr>
<tr>
<td>Shortcut 8</td>
<td>Monson (not feasible*)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Grade Separate Crossings</td>
<td>Wilbraham (Consolidate 3 crossings into 2 overhead bridges)</td>
<td>0.00</td>
<td>00:52</td>
<td>$27</td>
<td>$30</td>
</tr>
</tbody>
</table>

* The realignment in Monson is classified as “not feasible” because while the track could be realigned, doing so would not offer benefit because an adjacent curve (that cannot be straightened) prevents the trains from going any faster through that segment.
• The following slides will evaluate the three final alternatives based on service performance, cost, environmental and community impacts, and the Benefit-Cost Analysis.
Key Findings – Overall

• Ridership forecasts range from 922 to 1,554 daily boardings (278K to 469K annual boardings)

• Conceptual capital costs range from $2.4 to $4.6 billion

• Interaction between passenger and freight trains is higher in the Pittsfield to Springfield segment
  • Due to sharing the double-track, higher level of freight volumes west of Springfield, and lower speeds because of steep grades

• Differences in improvements, costs, and travel time are all attributable to the Springfield–Worcester segment
Evaluation Criteria for the 3 Final Alternatives

• Service Performance
  • Travel time
  • Frequency
  • Station stops
  • Ridership

• Costs
  • Capital
  • Operations and Maintenance

• Environmental and Community Impacts
  • Wetlands, Article 97 Lands, Areas of Critical Environmental Concern, Existing Buildings and Structures, Non-Rail/ROW Land, At-Grade Crossings, Grade Separations

• Benefit-Cost Analysis
# Frequency, Travel Time, and Speed

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekday Round-Trips</strong></td>
<td><strong>up to 7</strong></td>
<td><strong>up to 9</strong></td>
</tr>
<tr>
<td><strong>Average Travel Time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WOR – BOS</td>
<td>0.53</td>
<td>0.53</td>
</tr>
<tr>
<td>SPG – WOR</td>
<td>1:04</td>
<td>0.54</td>
</tr>
<tr>
<td>PIT – SPG</td>
<td>1:12</td>
<td>1:12</td>
</tr>
<tr>
<td><strong>Total Average Travel Time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPG – BOS</td>
<td>1:57</td>
<td>1:47</td>
</tr>
<tr>
<td>PIT – BOS</td>
<td>3:09</td>
<td>2:59</td>
</tr>
<tr>
<td><strong>Max. Operating Speed (mph)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WOR – BOS</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>SPG – WOR</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>PIT – SPG</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td><strong>Average Speed (mph)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WOR – BOS</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>SPG – WOR</td>
<td>51</td>
<td>60</td>
</tr>
<tr>
<td>PIT – SPG</td>
<td>44</td>
<td>44</td>
</tr>
</tbody>
</table>

Note: Service frequencies are approximate and subject to change due to layovers and operational needs.
# Ridership: 2040 Daily Boardings

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekday Round-Trips</strong></td>
<td><strong>7</strong></td>
<td><strong>9</strong></td>
</tr>
<tr>
<td>Forecast Scenario Proxy</td>
<td>'Enhanced' Hartford Line</td>
<td>Downeaster</td>
</tr>
<tr>
<td>BOS + BBY + LAN</td>
<td>389</td>
<td>449</td>
</tr>
<tr>
<td>FRA (LSL)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>WOR (Direct Access)</td>
<td>64</td>
<td>117</td>
</tr>
<tr>
<td>WOR (MBTA Transfers)</td>
<td>21</td>
<td>31</td>
</tr>
<tr>
<td>PLM</td>
<td>16</td>
<td>22</td>
</tr>
<tr>
<td>SPG (Direct Access)</td>
<td>350</td>
<td>387</td>
</tr>
<tr>
<td>SPG (HL Transfers)</td>
<td>34</td>
<td>74</td>
</tr>
<tr>
<td>CHS</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>PIT</td>
<td>38</td>
<td>92</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>922</strong></td>
<td><strong>1,188</strong></td>
</tr>
</tbody>
</table>

*Note: Forecasts represent likely ridership assumptions given available data and tools*
## Ridership: 2040 Annual Boardings

### Note:
Forecasts represent likely ridership assumptions given available data and tools.

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative</strong></td>
<td><strong>3 – BOS-PIT, Double-Track + Rail and Equipment Upgrades</strong></td>
<td><strong>4 – BOS-PIT, New Track</strong></td>
</tr>
<tr>
<td><strong>Weekday Round-Trips</strong></td>
<td><strong>7</strong></td>
<td><strong>9</strong></td>
</tr>
<tr>
<td><strong>Forecast Scenario Proxy</strong></td>
<td><strong>'Enhanced' Hartford Line</strong></td>
<td><strong>Downeaster</strong></td>
</tr>
<tr>
<td><strong>Station Boardings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOS + BBY + LAN</td>
<td>117,350</td>
<td>149,700</td>
</tr>
<tr>
<td>FRA (LSL)</td>
<td>1,550</td>
<td>1,550</td>
</tr>
<tr>
<td>WOR (Direct Access)</td>
<td>19,300</td>
<td>23,250</td>
</tr>
<tr>
<td>WOR (MBTA Transfers)</td>
<td>6,400</td>
<td>7,250</td>
</tr>
<tr>
<td>PLM</td>
<td>4,950</td>
<td>6,050</td>
</tr>
<tr>
<td>SPG (Direct Access)</td>
<td>105,700</td>
<td>135,700</td>
</tr>
<tr>
<td>SPG (HL Transfers)</td>
<td>10,250</td>
<td>10,500</td>
</tr>
<tr>
<td>CHS</td>
<td>1,400</td>
<td>1,700</td>
</tr>
<tr>
<td>PIT</td>
<td>11,400</td>
<td>13,650</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>278,300</strong></td>
<td><strong>349,350</strong></td>
</tr>
</tbody>
</table>
Key Findings – Costing

• Alternatives 4 and the Alternative 4/5 Hybrid provide separated track between Springfield and Worcester to comply with CSX guidance
  • This results in a capital cost increase of approximately $1.5 billion

• The proposed improvements/cost estimates in the Pittsfield to Springfield and Worcester to Boston segments are the same for all 3 Final Alternatives

• The cost difference between Alternative 4 and the Alternative 4/5 Hybrid primarily relates to track realignments that reduce travel time by approximately 10 minutes

• At this conceptual stage of planning, the standard contingencies added to cost estimates to account for unknowns (e.g., condition of CSX assets, condition of utilities) constitute 23% of the total capital cost for each alternative
Conceptual Cost Estimates – Refined for Final Alternatives

• Followed federal guidelines for cost estimation – Federal Railroad Administration (FRA) 2016 rail estimation guidance

• “Quantities” (i.e. amount of demolition, construction, tracks, support facilities, etc.) developed based on GIS-based rail alignments and alternatives development

• Unit costs based on actual expenditures on recent construction projects in Massachusetts and New England

• Adherence to CSX guidance for physical separation of freight and passenger services also impacts cost estimates
Cost Estimates - CSX Policies and Study Assumptions

• Under federal law, Amtrak has the right to provide passenger service on freight-owned lines, but the host railroad (CSX) sets the terms for an operating agreement

• For passenger service operating at 90 mph or lower, CSX allows shared operation of freight and passenger service
  • Pittsfield to Springfield & Worcester to Boston
    • Operating speed = 65 mph, shared corridor/track for 40+ mile segments

• For passenger service operating in excess of 90 mph, CSX requires operation on separate track with 30 foot spacing from existing freight rail
  • Springfield to Worcester
    • Alternative 3: operating speed = 85 mph, shared corridor/track for 50+ mile segment
    • Alternatives 4 & 4/5 Hybrid: operating speed = 100 & 105 mph, separate track is consistent w/ CSX standards, costs approximately $1.5 billion
## What is Included in the Capital Cost Estimates?

<table>
<thead>
<tr>
<th>Construction Cost</th>
<th>35% Contingency</th>
<th>Professional Services</th>
</tr>
</thead>
</table>
| • Includes rail, bridges, stations, support facilities (storage and maintenance), site work, utilities, environmental mitigation, signals, safety systems, fare collection, etc. | • Mitigates Unknowns  
  • Added to construction-only cost  
  • Accounts for uncertainties in conceptual planning phase  
  • Percentage decreases over course of design process as more becomes known  
  • FRA guidance: 35% contingency at Preliminary Engineering  
  • Further investigations of land, geotechnical, utility, and environmental conditions would influence final alignment and determine ultimate costs | • 30% of total construction cost (including 35% construction contingency)  
  • FRA guidance: 20 – 35%  
  • Services required to implement the project, including:  
    • Planning and environmental permitting (legal, external reviews)  
    • Project development / start-up  
    • Design and engineering  
    • Surveying and site assessment  
    • Project management for design and construction  
    • Professional liability and insurance |
| • Adheres to CSX guidance for physical separation along a shared corridor, leading to higher costs than NNEIRI  
  • Bridge reconstruction, not rehabilitation  
  • Relocation of associated track and utilities | | |
What is Included in the Capital Cost Estimates?

Property Acquisition and Rolling Stock

• Right-of-Way
  • Purchase or lease of all areas permanently incorporated, regardless of ownership, based on a standard rate per square foot
  • Relocation assistance for existing households and businesses whose buildings would be intersected by the proposed alignment

• Vehicles
  • Procure all non-maintenance vehicles necessary to operate the service
  • New single-level coaches
  • New diesel locomotives

Unallocated 5% Contingency

• Mitigates Unknowns
  • Added to all costs (including construction and 35% contingency, professional services, property acquisition, and rolling stock)
  • Accounts for uncertainties in project delivery and construction
  • Percentage remains constant, reflecting that, until construction has been completed, a degree of risk still remains

• FRA guidance: 5 – 8% and accounts for any remaining uncertainties in cost estimates
## Conceptual Cost Estimates (2020 $ Millions)

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
<th>4/5 Hybrid – BOS-PIT, New Track + Realignment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative</strong></td>
<td>3 – BOS-PIT, Double-Track + Rail and Equipment Upgrades</td>
<td>4 – BOS-PIT, New Track</td>
<td></td>
</tr>
<tr>
<td><strong>By Segment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Cost</td>
<td>$283.7</td>
<td>$1,665.2</td>
<td>$33.3</td>
</tr>
<tr>
<td>Contingency (35% of Construction Cost)</td>
<td>$99.3</td>
<td>$582.8</td>
<td>$11.6</td>
</tr>
<tr>
<td><strong>Construction Total</strong></td>
<td>$383.0</td>
<td>$2,248.0</td>
<td>$44.9</td>
</tr>
<tr>
<td>Professional Services (30% of Construction Total)</td>
<td>$496.3</td>
<td>$802.8</td>
<td>$971.0</td>
</tr>
<tr>
<td>Property Acquisition</td>
<td>$4.4</td>
<td>$37.2</td>
<td>$0</td>
</tr>
<tr>
<td>Vehicles</td>
<td>$131.8</td>
<td>$155.7</td>
<td>$155.7</td>
</tr>
<tr>
<td>Unallocated Contingency (5% of All Costs)</td>
<td>$114.9</td>
<td>$183.8</td>
<td>$220.3</td>
</tr>
<tr>
<td><strong>Capital Cost Total</strong></td>
<td>$2,413.9</td>
<td>$3,859.9</td>
<td>$4,625.3</td>
</tr>
<tr>
<td>Annual Operation &amp; Maintenance Cost (Gross)</td>
<td>$26.2</td>
<td>$34.1</td>
<td>$33.9</td>
</tr>
</tbody>
</table>

Note: Cost elements may not exactly sum to total costs due to rounding.
Key Findings – Environmental and Community Impacts

• Compared to Alternative 3, impacts to wetlands and open water are about 9 to 10 times greater for Alternative 4 and the Alternative 4/5 hybrid

• The Article 97 land impacted by Alternative 4 and the Alternative 4/5 Hybrid is about 4-5 times greater than Alternative 3

• Alternatives 4 and 4/5 create greater environmental and community impacts because they diverge from the existing rail alignment
Key Findings – Environmental and Community Impacts

- For all 3 Final Alternatives, some air quality impacts improve and others worsen

<table>
<thead>
<tr>
<th>Metric</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
<th>Alternative 4/5 Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease in Auto VMT</td>
<td>23,371,876 miles</td>
<td>31,234,674 miles</td>
<td>29,497,986 miles</td>
</tr>
<tr>
<td>Increase in Train Miles</td>
<td>509,540 miles</td>
<td>509,540 miles</td>
<td>798,620 miles</td>
</tr>
<tr>
<td>Change in Emissions</td>
<td>+154.24 tons of NOX</td>
<td>+154.11 tons of NOX</td>
<td>+241.87 tons of NOX</td>
</tr>
<tr>
<td></td>
<td>+4.84 tons of PM2.5</td>
<td>+4.83 tons of PM2.5</td>
<td>+7.6 tons of PM2.5</td>
</tr>
<tr>
<td></td>
<td>-0.04 tons of PM10</td>
<td>-0.06 tons of PM10</td>
<td>-0.06 tons of PM10</td>
</tr>
<tr>
<td></td>
<td>+0.08 tons of SOX</td>
<td>+0.07 tons of SOX</td>
<td>+0.14 tons of SOX</td>
</tr>
<tr>
<td></td>
<td>+7.39 tons of VOC</td>
<td>+7.37 tons of VOC</td>
<td>+11.6 tons of VOC</td>
</tr>
<tr>
<td></td>
<td>-4.191.7 tons of CO2</td>
<td>-5.601.88 tons of CO2</td>
<td>-5.290.4 tons of CO2</td>
</tr>
</tbody>
</table>

- In the Pittsfield to Springfield segment, 16 of the existing at-grade railroad crossings would remain; 5 would require a new overpass or underpass
## Environmental and Community Impacts

### Environmental Impacts (Square Feet)

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>3 – BOS-PIT, Double-Track + Rail and Equipment Upgrades</td>
<td>4 – BOS-PIT, New Track</td>
</tr>
<tr>
<td>Wetlands</td>
<td>PIT – SPG: 814</td>
<td>PIT – SPG: 814</td>
</tr>
<tr>
<td></td>
<td>SPG – WOR: 18,771</td>
<td>SPG – WOR: 363,943</td>
</tr>
<tr>
<td></td>
<td>WOR – BOS: 0</td>
<td>WOR – BOS: 0</td>
</tr>
<tr>
<td>Open Water</td>
<td>PIT – SPG: 9,402</td>
<td>PIT – SPG: 9,402</td>
</tr>
<tr>
<td></td>
<td>SPG – WOR: 31,149</td>
<td>SPG – WOR: 175,136</td>
</tr>
<tr>
<td></td>
<td>WOR – BOS: 0</td>
<td>WOR – BOS: 0</td>
</tr>
<tr>
<td>Article 97 Lands</td>
<td>PIT – SPG: 133,997</td>
<td>PIT – SPG: 133,997</td>
</tr>
<tr>
<td></td>
<td>SPG – WOR: 2,514</td>
<td>SPG – WOR: 420,768</td>
</tr>
<tr>
<td></td>
<td>WOR – BOS: 0</td>
<td>WOR – BOS: 0</td>
</tr>
<tr>
<td>Area of Critical Env. Concern</td>
<td>PIT – SPG: 0</td>
<td>PIT – SPG: 0</td>
</tr>
<tr>
<td></td>
<td>SPG – WOR: 0</td>
<td>SPG – WOR: 0</td>
</tr>
<tr>
<td></td>
<td>WOR – BOS: 0</td>
<td>WOR – BOS: 0</td>
</tr>
</tbody>
</table>

### Community Impacts

<table>
<thead>
<tr>
<th>Corridor Type</th>
<th>Shared Corridor – Existing Alignment</th>
<th>Shared Corridor – New Separate Track Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative</td>
<td>3 – BOS-PIT, Double-Track + Rail and Equipment Upgrades</td>
<td>4 – BOS-PIT, New Track</td>
</tr>
<tr>
<td>Buildings – TOTAL</td>
<td>PIT – SPG: 0</td>
<td>PIT – SPG: 0</td>
</tr>
<tr>
<td>Non-Rail/ROW Land (Sq. Ft.)</td>
<td>SPG – WOR: 380,070</td>
<td>SPG – WOR: 380,070</td>
</tr>
<tr>
<td>Remaining At-Grade Crossings</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Non-Rail/ROW Land (Sq. Ft.)</td>
<td>PIT – SPG: 380,070</td>
<td>PIT – SPG: 380,070</td>
</tr>
<tr>
<td>Remaining At-Grade Crossings</td>
<td>WOR – BOS: 0</td>
<td>WOR – BOS: 0</td>
</tr>
<tr>
<td>Non-Rail/ROW Land (Sq. Ft.)</td>
<td>0</td>
<td>98</td>
</tr>
<tr>
<td>Existing At-Grade Crossings</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Remaining At-Grade Crossings</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
Benefit-Cost Analysis (BCA)

- Comparison of Baseline ("2040 Future No-Build") to Build Scenarios
  - 2040 Future No-Build Scenario = current E-W infrastructure and levels of service
  - Build Scenarios = Alternatives 3, 4, and 4/5 hybrid

- Monetization of benefits using values recommended by U.S. DOT, as well as other sources as required

- Evaluation of project costs relative to the economic value of social benefits generated by the project over an analysis period
  - Use discounting to account for inflation/"time value of money"
  - Bring future costs and benefits to "present value"

- Current Federal rules consider BCA as part of the evaluation criteria for project funding
## Alternatives Evaluation

### BCA - Project Benefits (U.S. DOT Methodology)

<table>
<thead>
<tr>
<th>Benefits Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel Time Savings</strong></td>
<td>• New Riders shifting from Auto to Rail&lt;br&gt;• Faster times for existing riders</td>
</tr>
<tr>
<td><strong>Vehicle Operating Cost Savings</strong></td>
<td>• Reduced vehicle operating costs for new riders shifting from auto to rail</td>
</tr>
<tr>
<td><strong>Emissions Reductions</strong></td>
<td>• Reduced auto emissions from mode shift from auto to rail&lt;br&gt;<strong>Minus</strong> increased train emissions from new rail service</td>
</tr>
<tr>
<td><strong>Safety Benefits</strong></td>
<td>• Reduced auto collisions from mode shift from auto to rail&lt;br&gt;<strong>Minus</strong> increased rail collisions from new rail service</td>
</tr>
<tr>
<td><strong>Pavement Damage Reductions</strong></td>
<td>• Reduced “wear and tear” on roadway pavement as a result of shift of trips from auto to rail</td>
</tr>
<tr>
<td><strong>Residual Value</strong></td>
<td>• Remaining value of project at end of analysis period, based on assumed asset useful life of 40 years</td>
</tr>
</tbody>
</table>

Note: For analysis purposes, capital costs assumed to take place over 10 years and the operations period follows for 30 years. Residual value calculation assumes 10 years of remaining value after the 30 years of operations.

Not included: Benefits to freight service; economic impacts of project, including increases in jobs, GDP, etc.; “transfers” in form of fares, tolls, etc.
# BCA - Project Costs

## Capital Costs

- Construction Elements
  - Rail and bridges
  - Stations
  - Support Facilities
  - Sitework & Special Conditions
  - Systems
- Property Acquisition (ROW)
- Rolling Stock/Vehicles
- Professional Services

## O&M Costs

- Net Annual Costs: Build Costs minus Future No-Build Costs
- Costs to operate new service
- Costs to maintain new infrastructure

Note: For analysis purposes, capital costs assumed to take place over 10 years. Operations period follows for 30 years.
**Benefit–Cost Analysis (BCA) Results**

**BCA Summary, Millions of 2020 Dollars, Discounted 7%**

<table>
<thead>
<tr>
<th>BCA Metric</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
<th>Alternative 4/5 Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>'Enhanced' Hartford Line</td>
<td>Downeaster</td>
<td>'Enhanced' Hartford Line</td>
</tr>
<tr>
<td><strong>Total Benefits</strong></td>
<td>$167</td>
<td>$212</td>
<td>$224</td>
</tr>
<tr>
<td>Travel Time Savings</td>
<td>$19</td>
<td>$20</td>
<td>$31</td>
</tr>
<tr>
<td>Safety</td>
<td>$64</td>
<td>$87</td>
<td>$81</td>
</tr>
<tr>
<td>Vehicle Operating Cost Savings</td>
<td>$62</td>
<td>$83</td>
<td>$79</td>
</tr>
<tr>
<td>Reduced Pavement Damage</td>
<td>$0.1</td>
<td>$0.2</td>
<td>$0.2</td>
</tr>
<tr>
<td>Reduced Emissions</td>
<td>($19)</td>
<td>($18)</td>
<td>($30)</td>
</tr>
<tr>
<td>Residual Value</td>
<td>$40</td>
<td>$40</td>
<td>$64</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>$1,778</td>
<td>$1,778</td>
<td>$2,836</td>
</tr>
<tr>
<td>Capital Costs</td>
<td>$1,666</td>
<td>$1,666</td>
<td>$2,675</td>
</tr>
<tr>
<td>O&amp;M Costs</td>
<td>$112</td>
<td>$112</td>
<td>$161</td>
</tr>
<tr>
<td><strong>Net Present Value (NPV)</strong></td>
<td>($1,611)</td>
<td>($1,566)</td>
<td>($2,612)</td>
</tr>
<tr>
<td>Ratio Produced by BCA</td>
<td>0.09</td>
<td>0.12</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Note: A ratio of 1.0 or higher makes a project more competitive for discretionary grants under current federal rules.
General comments or questions about the Alternatives Evaluation?
Advisory Committee Discussion

Upon completion of the East-West Passenger Rail Study, what next steps would you recommend?

Study Alternatives

• Are there any alternatives that you would prioritize or deprioritize?
• What phasing approaches, if any, should be considered?
Advisory Committee Discussion

Upon completion of the East-West Passenger Rail Study, what next steps would you recommend?

Potential items for further analysis to consider
• Examples: indirect economic benefits, impacts to freight service, electrification of the alternatives, life-cycle cost analysis, disposition/condition of CSX infrastructure
Advisory Committee Discussion

Upon completion of the East-West Passenger Rail Study, what next steps would you recommend?

Potential operational items to consider
• Safety issues associated with grade crossings
• Discussions with CSX
Advisory Committee Discussion

Upon completion of the East-West Passenger Rail Study, what next steps would you recommend?

Governance and funding items to consider

• Proposed operating entity (e.g., Amtrak or other railroad)
• Legislative actions that may be required
• Funding sources (including federal funding under new proposed legislation)

Note: A project proponent, funding source(s), and an agreement with the host railroad (CSX) are needed for project development.
Advisory Committee Comment

• Press the “Raise Hand” button. Please wait for the moderator to recognize and unmute you before speaking.

• To access the Raise Hand button:

  1. Click on the **Participants** button

  2. Click “Raise Hand”

• After you speak, we will lower your hand and you will be muted to allow the team to respond and provide opportunities for others to participate.
Study Process and Next Steps

- Existing Conditions & Market Analysis
- Alternatives Development
- Preliminary Alternatives Evaluation (6 Alternatives)
- Final Alternatives Evaluation (3 Alternatives)
- Findings, Recommendations, Next Steps
- Draft Report
- Final Report

Community and Stakeholder Engagement
Full Study Process – 3 Public Meetings * 6 Study Advisory Committee Meetings * Online Input * Briefings
Solicit Advisory Committee Feedback on Final Analysis

- Accepting written recommendations through October 7, 2020
  - Written recommendations can be sent to Makaela Niles, MassDOT Project Manager, at Makaela.Niles@dot.state.ma.us

Draft Report – October 16, 2020

- Will include Findings and Advisory Committee Recommendations
- Released for 30-Day public comment period

Public Meeting – October 22, 2020

- Present analysis of 3 Final Alternatives
- Solicit feedback on analysis and draft report

Final Report by November 30, 2020
Public Comment

• Please share only one question or comment at a time

• Use the “Q+A” button to submit a typed question or comment

• Press the “Raise Hand” button to share your question or comment verbally. Wait for the moderator to recognize and unmute you before speaking.

• If you have joined by phone only, you may “raise your hand” by pressing the star button and then nine (*9)

• After you speak, we will lower your hand and you will be muted to allow the team to respond and provide opportunities for others to participate

• Comments may also be sent to Makaela Niles, MassDOT Project Manager, at Makaela.Niles@dot.state.ma.us