Blended System Planning Process

- Capacity Analysis
- Service Plan / Operations Considerations
- Grade Crossing & Traffic Analysis

Blended System Service Plan Options

- Additional Infrastructure Need
- Additional Fleet Need
- Revenue / Cost

Decision-Making Matrix

Blended System Alternatives

Design & Environmental Review
Study Organization

• **Key Consultants**
  – LTK Engineering
  – CDM Smith

• **Outreach / Input**
  – Local Policy Maker Group (LPMG)
  – City/County Staff Coordination Group (CSCG)
  – Peninsula Working Group (9-Party MOU Signatories)
  – Cities/Counties as requested
  – Other stakeholder venues as requested
Service / Operations Considerations
Purpose

- Requested by stakeholders
- Consider service / operations variables not included in capacity analysis
- Inform definition of “Blended Service Plan Options”
Passing Tracks
Preliminary Findings
Tested Configurations

4 Track (Paired)

3 Track (Not Paired)

- HSR Use
- Caltrain Use
- Shared Use
## Analyzed Options

<table>
<thead>
<tr>
<th>Analyzed Locations</th>
<th>Approximate Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>North – 4 Track</td>
<td>Bayshore to Millbrae</td>
</tr>
<tr>
<td>Middle – 4 Track Long</td>
<td>Hayward Park to Redwood City</td>
</tr>
<tr>
<td>Middle - 4 Track Short</td>
<td>Hayward Park to Whipple Ave.</td>
</tr>
<tr>
<td>Middle - 3 Track</td>
<td>Hayward Park to California Ave.</td>
</tr>
<tr>
<td>South – 4 Track</td>
<td>San Antonio to Lawrence</td>
</tr>
</tbody>
</table>
Key Findings

- 3 - 5 station stops needed to pass
- Higher ridership stations preferred
- Middle options better performance
Other Analysis
## Different Service Patterns

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Base</th>
<th>Variable</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Peninsula HSR Station</td>
<td>Millbrae</td>
<td>Millbrae, Redwood City</td>
<td>• Feasible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• No significant operational impact</td>
</tr>
<tr>
<td>Baby Bullet Service</td>
<td>6 Skip Stop</td>
<td>4 Skip Stop, 2 Baby Bullet</td>
<td>• Feasible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• No significant operational impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Less station service</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Improved travel time</td>
</tr>
<tr>
<td>Longer Trains / Less Train Traffic</td>
<td>6 train/ph/pd</td>
<td>5 train/ph/pd, (6 car trains)</td>
<td>• Some challenges</td>
</tr>
<tr>
<td></td>
<td>(6 car trains)</td>
<td>(8 car trains)</td>
<td>• Platform lengths insufficient</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Potential lower ridership</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Gate down time / local traffic TBD</td>
</tr>
</tbody>
</table>
## Third Party Future Plans

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Base</th>
<th>Variable</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTX to TTC</td>
<td>North terminus 4&lt;sup&gt;th&lt;/sup&gt; and King</td>
<td>North terminus at TTC, All HSR at TTC, 2 Caltrain at TTC</td>
<td>Feasible</td>
</tr>
<tr>
<td>Dumbarton Rail Service</td>
<td>6 Caltrain, 4 HSR</td>
<td>6 Caltrain, 4 HSR, 1 DRS</td>
<td>Feasible</td>
</tr>
<tr>
<td>Future ACE, Capitol Corridor, Amtrak Service</td>
<td>Todays service levels</td>
<td>Increased service levels</td>
<td>No impact from Blended System, South terminal area not shared with HSR, Caltrain impacts TBD</td>
</tr>
</tbody>
</table>
Additional Analysis TBD

- Freight Coordination
  - Service levels
  - Hours of operation
  - Infrastructure changes

- HSR Storage/Maintenance Facility
  - Reassess location options/ size
  - Reduced number of HSR trains to be stored in the SF area
Grade Crossing and Traffic Analysis
Caltrain electrification & blended system impact on gate down time

Gate down time impact on traffic

Limited analysis
  - Schedule sensitivity
  - Traffic model limitations

Inform grade crossing improvements TBD
Improvement Options

40 at-grade Crossings

Considerations
- Train Operations
- Traffic Circulation
- Safety
- Regulatory/Agency practice & guidance

Improvements
- Grade Separations
- Street Closures
- At-grade Crossing Upgrades
- IT Traffic Management
- Train Operations Management
• Gate down time change not proportional to train service level increases

• Changing railroad conditions
  – Electrified Service
  – Advanced Signal System
  – EMU Performance
Key Gate Down Time Factors

Factors that Decrease Gate Down Time

- Advanced Signal System
  Double Gate Down Time Removed from Crossings near Stations
  *(Benefit increases with more station stops)*

- Multiple Trains Crossing
  *(Benefit increases with passing tracks)*

More Service Increases Gate Down Time
<table>
<thead>
<tr>
<th>Gate Down Time Change Compared to Existing Conditions</th>
<th>Number of Intersections</th>
<th>AM Peak Hour Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction</td>
<td>28</td>
<td>Up to -6.5 min / 60 min</td>
</tr>
<tr>
<td>Increase</td>
<td>12</td>
<td>Up to +1.5 min / 60 min</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Gate Down Time Change Compared to Existing Conditions</td>
<td>Number of Intersections</td>
<td>AM Peak Hour Change</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Reduction</td>
<td>10</td>
<td>Up to - 4.0 min / 60 min</td>
</tr>
<tr>
<td>Increase</td>
<td>30</td>
<td>Up to + 4.5 min / 60 min</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
Gate Down Time Change Compared to Existing Conditions

<table>
<thead>
<tr>
<th></th>
<th>Number of Intersections</th>
<th>AM Peak Hour Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction</td>
<td>5</td>
<td>Up to - 2.5 min / 60 min</td>
</tr>
<tr>
<td>Increase</td>
<td>35</td>
<td>Up to + 8.0 min / 60 min</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

*6/4 Scenario assume “Middle – 4 Track Long” Passing Track Option
Traffic Results – Level of Service (LOS)

- **SimTraffic** Analysis at Sample Intersections

- **Key Findings**
  - With no gate down time change, 2035 traffic exceeds LOS F
  - With blended system, delay proportional to gate downtime changes (+/-)
  - Delay ranges (seconds per vehicle)
    - “6/0” (-30 sec. to +15 sec.)
    - “6/2” (-15 sec. to +30 sec.)
    - “6/4” (-20 sec. to +80 sec.)
Next Steps
Complete Planning Efforts

• December/January
  – Stakeholder Outreach
  – Local Policy Maker Group
  – Other public meetings as requested

• February
  – Draft Report
  – Final Report