Caltrain Business Plan
DECEMBER 2018

LPMG

December 20, 2018
The 2040 Vision:
A Continued Focus on Service Planning
What is the Caltrain Business Plan?

What
Addresses the future potential of the railroad over the next 20-30 years. It will assess the benefits, impacts, and costs of different service visions, building the case for investment and a plan for implementation.

Why
Allows the community and stakeholders to engage in developing a more certain, achievable, financially feasible future for the railroad based on local, regional, and statewide needs.
What Will the Business Plan Cover?

Technical Tracks

Service
- Number of trains
- Frequency of service
- Number of people riding the trains
- Infrastructure needs to support different service levels

Business Case
- Value from investments (past, present, and future)
- Infrastructure and operating costs
- Potential sources of revenue

Community Interface
- Benefits and impacts to surrounding communities
- Corridor management strategies and consensus building
- Equity considerations

Organization
- Organizational structure of Caltrain including governance and delivery approaches
- Funding mechanisms to support future service
Where Are We in the Process?

We Are Here
Service Planning: High Growth
Review & Evaluate Concepts

- Off-Peak Service Planning
- Terminal Planning
- South San Jose & Gilroy Planning
Context: Different Ways to Grow

- **2018** Current Operations
- **2022** Start of Electrified Operations
- **2033** High Speed Rail Phase 1
- **2040** Baseline Growth Scenario
- **2040** Higher Growth Scenario
2040 Demand

The Caltrain corridor is growing
• Corridor expected to add 1.2 million people and jobs within 2 miles of Caltrain (+40%)¹
• 80% of growth expected in San Francisco and Santa Clara Counties

Major transit investments are opening new travel markets to Caltrain
• Downtown Extension and Central Subway to provide more direct connections to downtown San Francisco
• Dumbarton Rail, BART to San Jose, and improvements to Capitol Corridor and ACE to strengthen connectivity with East Bay
• HSR and Salinas rail extensions to increase interregional travel demand

With greatly improved service, 2040 Ridership demand could reach up to 240,000 riders per day²

¹Based on Plan Bay Area forecasts and approved projects by individual cities
²Derived from a rough order-of-magnitude sensitivity test using the C/CAG Model
2040 Land Use & Transportation Context

Indicates a station where substantial growth beyond Plan Bay Area forecasts is anticipated, but not yet approved.

1/2 Mile Station Area

1 million people and jobs within 1/2 mile of Caltrain stations

2 Mile Station Area

4.2 million people and jobs within 2 miles of Caltrain stations
To comfortably serve the potential market for rail in 2040, Caltrain would need to operate 8 trains per hour, per direction (TPHPD) with 10 car trains or 12 TPHPD with 8 or 10 car trains.
Selecting a “High Growth” Service Concept

Why

Last month we reviewed seven different “High Growth” service concepts. We now want to evaluate these concepts and select an option that provides the best illustrative example of a “High Growth” service strategy for the corridor. This will allow us to pursue a more detailed analysis and comparison with the “Baseline Growth” Scenario.

Next Steps

The selected “High Growth” concept will be further refined and expanded into a full day service plan including Gilroy service, off-peak service and terminal operations.

The “High Growth” and “Baseline” service plans will then be compared as part of a “business case” analysis that includes full ridership runs, operations simulation, infrastructure and operations costing, and economic benefit assessments.
## Service Concepts - Recap

### Zone Express

<table>
<thead>
<tr>
<th>A - 12 Trains</th>
<th>B - 16 Trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>4 4 4</td>
</tr>
<tr>
<td>22nd St</td>
<td>4 4 4</td>
</tr>
<tr>
<td>Bayshore</td>
<td></td>
</tr>
<tr>
<td>South San Francisco</td>
<td></td>
</tr>
<tr>
<td>San Bruno</td>
<td></td>
</tr>
<tr>
<td>Millbrae</td>
<td></td>
</tr>
<tr>
<td>Broadway</td>
<td></td>
</tr>
<tr>
<td>Burlingame</td>
<td></td>
</tr>
<tr>
<td>San Mateo</td>
<td></td>
</tr>
<tr>
<td>Hayward Park</td>
<td></td>
</tr>
<tr>
<td>Hillsdale</td>
<td></td>
</tr>
<tr>
<td>Belmont</td>
<td></td>
</tr>
<tr>
<td>San Carlos</td>
<td></td>
</tr>
<tr>
<td>Redwood City</td>
<td></td>
</tr>
<tr>
<td>Atherton</td>
<td></td>
</tr>
<tr>
<td>Menlo Park</td>
<td></td>
</tr>
<tr>
<td>Palo Alto</td>
<td></td>
</tr>
<tr>
<td>California Ave</td>
<td></td>
</tr>
<tr>
<td>San Antonio</td>
<td></td>
</tr>
<tr>
<td>Mountain View</td>
<td></td>
</tr>
<tr>
<td>Sunnyvale</td>
<td></td>
</tr>
<tr>
<td>Lawrence</td>
<td></td>
</tr>
<tr>
<td>Santa Clara</td>
<td></td>
</tr>
<tr>
<td>College Park</td>
<td></td>
</tr>
<tr>
<td>San Jose Diridon</td>
<td></td>
</tr>
</tbody>
</table>

### Local/Express (Minimal Passing Tracks)

<table>
<thead>
<tr>
<th>C - 12 Trains</th>
<th>D - 16 Trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 4 1 2 2</td>
<td>4 4 4 4</td>
</tr>
</tbody>
</table>

### Local/Express (Expanded Passing Tracks)

<table>
<thead>
<tr>
<th>E - 12 Trains</th>
<th>F - 16 Trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 4 4</td>
<td>4 4 4</td>
</tr>
</tbody>
</table>

### Skip Stop

<table>
<thead>
<tr>
<th>G - 16 Trains</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 4 4 4</td>
</tr>
</tbody>
</table>

---

* Assumes standardized HSR service; the 2018 HSR Business Plan expects 2 trains per hour, per direction at Millbrae.

Station service level TBD through further analysis.
**B - Zone Express 16 Trains**
- Infrastructure needs are extensive and incompatible with other service options
- Increased train throughput does not result in additional service at most stations

**E - Local/Express 12 Trains (More Passing Tracks)**
- Requires significantly more infrastructure to achieve the same throughput as other 12-train concepts
- Infrastructure is compatible with and builds toward Local/Express 16-train concept (option F). Can be considered as a variant of this option.

**G - Skip Stop 16 Trains**
- Challenging internal connectivity and service legibility
- Increased train throughput does not result in additional service at most stations
- Similar to and compatible with Local/Express 16 Train pattern with less passing tracks (option D) - can be considered as a variant of this option

Assumes standardized HSR service; the 2018 HSR Business Plan expects 2 trains per hour, per direction at Millbrae.
Initial Screening Results

Zone Express
A - 12 Trains
B - 16 Trains

San Francisco
22nd St
Bayshore
South San Francisco
San Bruno
Millbrae
Broadway
Burlingame
San Mateo
Hayward Park
Hillsdale
Belmont
San Carlos
Redwood City
Atherton
Menlo Park
Palo Alto
California Ave
San Antonio
Mountain View
Sunnyvale
Lawrence
Santa Clara
College Park
San Jose Diridon

Local/Express
(Minimal Passing Tracks)
C - 12 Trains
D - 16 Trains

Removed through Screening Process

Local/Express
(Expanded Passing Tracks)
E - 12 Trains
F - 16 Trains

Removed through Screening Process

Skip Stop
G - 16 Trains

Assumes standardized HSR service; the 2018 HSR Business Plan expects 2 trains per hour, per direction at Millbrae
Service Goals

1. **Maximize Ridership** - with fast and frequent service between major markets

2. **Improve Coverage and Connectivity** - by ensuring that most stations are connected with frequent service

3. **Enhance Capacity and Convenience** - with service that is comfortable and easy to understand

4. **“Right Size” New Infrastructure** - by investing strategically to provide corridor-wide benefits
## Service Concept Evaluation

### 1. Maximize Ridership

<table>
<thead>
<tr>
<th>Goal</th>
<th>Metric</th>
<th>Existing</th>
<th>Minimal Passing Tracks</th>
<th>Expanded Passing Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide high frequency service</td>
<td>Number of stations served every 10 minutes or more</td>
<td>0 Stations</td>
<td>A - 12 TPH Zone Express&lt;br&gt;C - 12 TPH Local/Express&lt;br&gt;D - 16 TPH Local/Express</td>
<td>F - 16 TPH Local/Express</td>
</tr>
<tr>
<td>Improve travel times between major markets</td>
<td>Average travel times plus wait times between major stations&lt;sup&gt;1&lt;/sup&gt;</td>
<td>55 Minutes</td>
<td>28 Minutes&lt;br&gt;31 Minutes&lt;br&gt;28 Minutes</td>
<td>24 Minutes</td>
</tr>
</tbody>
</table>

<sup>1</sup>Averaged matrix of travel times between the eight busiest stations accounting for approximately ¾ of existing ridership (4th & King, Millbrae, Hillsdale, Redwood City, Palo Alto, Mountain View, Sunnyvale, and San Jose). Includes travel time riding the train plus half of train headway.

---

All metrics include Broadway and Atherton stations but exclude College Park station.
## Service Concept Evaluation

### 2. Improve Coverage and Connectivity

<table>
<thead>
<tr>
<th>Goal</th>
<th>Metric</th>
<th>Existing</th>
<th>Minimal Passing Tracks</th>
<th>Expanded Passing Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieve 15-minute frequencies at most stations during peak</td>
<td>Number of stations without service every 15 minutes&lt;sup&gt;2&lt;/sup&gt;</td>
<td>17 Stations</td>
<td>A - 12 TPH Zone Express</td>
<td>F - 16 TPH Local/Express</td>
</tr>
<tr>
<td>Maintain connectivity between stations</td>
<td>Percentage of stations directly connected by local trains without a transfer</td>
<td>83%***</td>
<td>C - 12 TPH Local/Express</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D - 16 TPH Local/Express</td>
<td></td>
</tr>
</tbody>
</table>

<sup>2</sup>Stations that do not receive 4 TPHPD are served with 2 TPHPD except Atherton (1 TPHPD) and Menlo Park (3 TPHPD)

All metrics include Broadway and Atherton stations but exclude College Park station.
## Service Concept Evaluation

### 3. Enhance Capacity and Convenience

<table>
<thead>
<tr>
<th>Goal</th>
<th>Metric</th>
<th>Existing</th>
<th>Minimal Passing Tracks</th>
<th>Expanded Passing Track</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 TPH</td>
<td>A - 12 TPH Zone Express</td>
<td>F - 16 TPH Local/Express</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C - 12 TPH Local/Express</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D - 16 TPH Local/Express</td>
<td></td>
</tr>
</tbody>
</table>

**Provide capacity responsive to 2040 demand**
- Percent demand served relative to seated capacity\(^3\)
- Existing: 35% 2040 demand
- Minimal Passing Tracks: 80% 2040 demand
- Expanded Passing Track: 100% 2040 demand

**Provide legible service structure**
- Complexity of stopping pattern
- Existing: High Complexity 5+ patterns per hour
- Minimal Passing Tracks: Moderate Complexity 2 patterns without connected local service
- Expanded Passing Track: Low Complexity 2 patterns with fully connected local service

\(^3\)Assumes 10 car trains and 2040 peak demand of approximately 10,000 passengers per hour in the peak direction

All metrics include Broadway and Atherton stations but exclude College Park station.
## Service Concept Evaluation

### 4. “Right Size” Infrastructure

<table>
<thead>
<tr>
<th>Goal</th>
<th>Metric</th>
<th>Existing</th>
<th>Minimal Passing Tracks</th>
<th>Expanded Passing Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize mainline track expansions</td>
<td>5 TPH</td>
<td>0</td>
<td>A - 12 TPH Zone Express</td>
<td>F - 16 TPH Local/Express</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B - 12 TPH Local/Express</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C - 12 TPH Local/Express</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D - 16 TPH Local/Express</td>
<td></td>
</tr>
<tr>
<td>Miles of new passing track</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See appendix slides for additional detail on infrastructure needs and options (excerpted and repeated from November presentation)

All metrics include Broadway and Atherton stations but exclude College Park station
# Evaluation Results

<table>
<thead>
<tr>
<th>Goal</th>
<th>Metric</th>
<th>Existing</th>
<th>Minimal Passing Tracks</th>
<th>Expanded Passing Track</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>5 TPH</strong></td>
<td><strong>A - 12 TPH Zone Express</strong></td>
<td><strong>C - 12 TPH Local/Express</strong></td>
</tr>
<tr>
<td>1. Maximize Ridership</td>
<td>Provide high frequency service</td>
<td>0 Stations</td>
<td>6 Stations</td>
<td>10 Stations</td>
</tr>
<tr>
<td></td>
<td>Number of stations served every 10 minutes or more</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improve travel times between major markets</td>
<td>55 Minutes</td>
<td>37 Minutes</td>
<td>34 Minutes</td>
</tr>
<tr>
<td></td>
<td>Average travel times plus wait times between major stations¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Improve Connectivity</td>
<td>Achieve 15-minute frequencies at most stations</td>
<td>17 Stations</td>
<td>4 Stations</td>
<td>7 Stations</td>
</tr>
<tr>
<td></td>
<td>Number of stations without service every 15 minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintain connectivity between stations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage of stations directly connected by local train without a transfer</td>
<td>83%*** (at 60 min headways)</td>
<td>66%</td>
<td>95%</td>
</tr>
<tr>
<td>3. Enhance Convenience</td>
<td>Provide capacity responsive to 2040 demand</td>
<td>35%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>% 2040 demand relative to seated capacity²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide legible service structure</td>
<td>High Complexity</td>
<td>Moderate Complexity</td>
<td>Moderate Complexity</td>
</tr>
<tr>
<td></td>
<td>Complexity of stopping pattern</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. “Right Size” Infrastructure</td>
<td>Minimize mainline track expansions</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Miles of new passing track</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### A - Zone Express 12 TPH
- Insufficient capacity to fully meet future demand
- Longest average travel times
- Least stations with high-frequency service

### D – Local/Express 16 TPH
- High complexity and poor connectivity
- 15% of stations are not connected at all due to skip stop service
Evaluation Results

Zone Express

Local/Express (Reduced Passing Tracks)

Local/Express

Skip Stop

Removed through Evaluation Process

Removed through Screening Process

Removed through Evaluation Process

Removed through Screening Process

Removed through Evaluation Process

Removed through Screening Process

Station service level TBD through further analysis

High Speed Rail

Conceptual 4-track segment

San Francisco 22nd St
Bayshore
South San Francisco
San Bruno
Millbrae
Broadway
Burlingame
San Mateo
Hayward Park
Hillsdale
Belmont
San Carlos
Redwood City
Atherton
Menlo Park
Palo Alto
California Ave
San Antonio
Mountain View
Sunnyvale
Lawrence
Santa Clara
College Park
San Jose Diridon
Evaluation Results

**Local/Express (Reduced Passing Tracks)**

12 Trains

- Features
  - Regional Express serves all Major Activity Centers at 15-minute headways
  - Most stations served by local service at 15 minute headways
  - Closely-spaced mid-Peninsula stations served at 30 minute headways (Broadway, Burlingame, San Mateo, Belmont, and San Carlos)
  - Timed local-express transfer at Redwood City

- Passing Track Needs
  - 3 miles of new passing tracks: Hayward Park to Hillsdale, at Redwood City, and at a station in northern Santa Clara county- either Palo Alto, California Ave (shown), San Antonio or Mountain View

- Options with Service Structure
  - Each local pattern can only stop once Millbrae to Hillsdale
  - Each local pattern can only stop once Hillsdale to Redwood City
  - Flexible station overtake location in northern Santa Clara County

**Local/Express**

16 Trains

- Features
  - Complete local stop service
  - Two express lines serving major markets
  - All stations receive at least 4 TPH, with many receiving 8 or 12 TPH

- Passing Track Needs
  - 15 miles of new passing tracks: South San Francisco to Millbrae, Hayward Park to Redwood City, and northern Santa Clara County (shown: California Avenue to north of Mountain View)

- Options with Service Structure
  - Second express pattern must run non-stop from 22nd St to San Mateo, but has some flexibility in number and location of stops along mid-Peninsula
  - Flexible 5 mile passing track location in northern Santa Clara County
**Evaluation Results**

### Local/Express 12 Summary with Minimal Passing Tracks

- Provides good travel times, frequency, and connectivity for most markets, though with some shortcomings
- Insufficient capacity to fully meet projected demand
- Minimizes extent of overtakes required
- **Recommended for further analysis**

### Local/Express 16 Summary with Expanded Passing Tracks

- Provides fastest, most frequent, most reliable service to the most people
- Strong connectivity
- Appropriate capacity to serve future demand
- However, passing tracks needs represent major infrastructure challenge
- **Recommended for further analysis**

---

**Local/Express (Reduced Passing Tracks)**

**12 Trains**

<table>
<thead>
<tr>
<th>Station</th>
<th>4</th>
<th>4</th>
<th>2</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22nd St</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bayshore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South San Francisco</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Bruno</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millbrae</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burlingame</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Mateo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hayward Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hillsdale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belmont</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Carlos</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redwood City</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Atherton</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>California Ave</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>San Antonio</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Mountain View</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Lawrence</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>College Park</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>San Jose Diridon</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
</tbody>
</table>

---

**Local/Express (Expanded Passing Tracks)**

**16 Trains**

<table>
<thead>
<tr>
<th>Station</th>
<th>4</th>
<th>4</th>
<th>4</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22nd St</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bayshore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South San Francisco</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Bruno</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millbrae</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burlingame</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Mateo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hayward Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hillsdale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belmont</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Carlos</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Redwood City</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Atherton</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Menlo Park</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Palo Alto</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>California Ave</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>San Antonio</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Mountain View</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Lawrence</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>College Park</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
<tr>
<td>San Jose Diridon</td>
<td>△</td>
<td>△</td>
<td>△</td>
<td>△</td>
</tr>
</tbody>
</table>
Recommendation

1. Analyze a Local/Express service in the Business Plan as the “High Growth” Scenario

2. Carry forward and evaluate two "high growth" service scenarios
   • A 12-train local / express service using limited passing tracks
   • A 16 train local / express using full passing tracks

3. Continue dialogue with project partners and local jurisdictions to understand interests and concerns with each variant
Context: Different Ways to Grow

- **2018**: Current Operations
- **2022**: Start of Electrified Operations
- **2033**: High Speed Rail Phase 1
- **2040**: Baseline Growth Scenario
- **2040**: High Growth Scenarios

**Design Year**
Do you have any questions about the evaluation process or scoring criteria?

How do you feel about the findings of the evaluation?

Do you agree with the recommendation to evaluate two "high growth" scenarios?
Off-Peak & Weekend Service Planning
Considerations

Off-peak and weekend service provides unique opportunities and challenges for Caltrain

- The Caltrain corridor has very high all-day travel demand, 7 days a week
- Demand for off-peak service may increase overtime along with corridor development and densities
- Early morning, midday, evening, and weekend periods all present different challenges and opportunities related to operating costs and work windows for construction and maintenance

These slides illustrate options of how Caltrain may respond to these factors over time
Off-Peak & Weekend Demand

Existing Off-Peak Service
• Most Caltrain service and ridership occurs during the morning and evening periods. Hourly midday and evening service captures a very small market share
• US-101 experiences a 14-hour bidirectional peak period from 6 AM to 8 PM

Existing Weekend Service
• Hourly weekend service that primarily serves long-distance trips and captures a very small market share
• US-101 experiences a 12-hour peak period from 9 AM to 9 PM with volumes near weekday levels

Based on US-101, BART, and Caltrain person trip volumes at San Francisco County line. Volumes are comparable along most of Caltrain corridor.
Off-Peak Demand: BART vs. Caltrain

**Transbay Corridor**
BART serves about 20-30% of midday and weekend travel on the Transbay corridor, whereas Caltrain serves about 2-3% of travel on the Peninsula.

**Caltrain Corridor**
Assuming similar peaking patterns to BART, Caltrain may serve approximately 4,000-5,000 passengers per hour during the midday and evening periods.

2040 potential based on unconstrained ridership forecast and assumed similar peaking patterns to BART service in San Mateo County. BART provides approximately 3-6 more service compared to Caltrain.
Weekend Demand: BART vs. Caltrain

Transbay Corridor
BART serves about 20-30% of weekend travel on the Transbay corridor, whereas Caltrain serves about 3-4% of travel on the Peninsula.

Caltrain Corridor
Assuming similar weekend service to BART, Caltrain may serve approximately 4,000-5,000 passengers per hour during most of the day on weekends.
Caltrain may serve Early Morning, Midday, Evening, and Weekend periods with various potential service types depending on demand and construction/maintenance needs.

**8 TPHPD with Local and Express**
- Maximizes mobility by mirroring all-day corridor demand; potential to carry highest mode share
- Highest operating and maintenance cost
- Best suited for midday service

**6 TPHPD with Reduced Express or Reduced Local**
- Prioritizes either station coverage or maximizing ridership between major markets
- Moderate operating and maintenance cost

- Or -

**4 TPHPD with Local Only**
- Prioritizes coverage while sacrificing ridership between major markets
- Lower operating and maintenance cost
- Best suited for evening and weekend service
What sorts of off-peak service improvements are most important to your community?

Do you have any thoughts about the specific mix of service types and frequencies that would work at different times of day?
South San Jose & Gilroy Planning

Review & Evaluate Concepts

Off-Peak Service Planning

Terminal Planning

South San Jose & Gilroy Planning
What’s Different South of San Jose?

North of San Jose
• Corridor between San Francisco and Tamien owned by Caltrain
• Electrification under construction
• Caltrain will share corridor with HSR

South of San Jose
• Union Pacific owns existing corridor between Tamien and Gilroy
• HSR and State of California negotiating with UP
• 2018 HSR Business Plan contemplates building two electrified tracks alongside non-electrified freight track
• Creates an opportunity to extend electrified Caltrain service south to Gilroy
Opportunities & Constraints

Track Capacity is Constrained
• Caltrain service is limited by operational constraints of a two track corridor
• HSR plans to operate up to 8 trains per hour, per direction south of San Jose

Demand is Unevenly Distributed
• Southern San Jose stations serve densely populated area with bidirectional demand
• Morgan Hill, San Martin, and Gilroy serve fewer people with directionally peaked demand
• HSR provides more competitive travel times between Gilroy and San Francisco/ Millbrae
Indicates a station where substantial growth beyond Plan Bay Area forecasts is anticipated, but not yet approved.
2040 Land Use & Transportation Context

Indicates a station where substantial growth beyond Plan Bay Area forecasts is anticipated, but not yet approved.
Weekday Demand
- Caltrain’s serves about 2% of existing peak period travel
- US-101 experiences a morning and evening peak periods, with lower reverse-peak travel
- Potential 2040 demand of about 1,000 passengers per hour in the peak direction and 500 passengers per hour in the reverse-peak direction

Weekend Demand
- Volumes on US-101 are comparable to weekday periods, with the highest demand between 9 AM and 7 PM
- Potential 2040 demand of about <500 passengers per hour, per direction
Peak Period Service Concepts

1. Two Track Corridor
   - 8-12 TPH at Tamien, depending on mainline service levels
   - 2 TPH south of Tamien except San Martin

2. Conceptual Turn Tracks at Blossom Hill
   - 8-12 TPH at Tamien, depending on mainline service levels
   - 4 TPH at Capitol and Blossom Hill
   - 2 TPH at Morgan Hill and Gilroy

3. Conceptual Four Track Corridor
   - 8-12 TPH at Tamien, depending on mainline service levels
   - 8 TPH at Capitol and Blossom Hill
   - 2 TPH at Morgan Hill and Gilroy

All scenarios subject to further analysis to confirm compatibility with planned HSR service
1. Two Track Corridor
- 4-8 TPH at Tamien, depending on mainline service levels
- 1 TPH at each station except San Martin
- Subject to further analysis to assess compatibility with HSR service

2. Conceptual Turn Tracks at Blossom Hill
- 4-8 TPH at Tamien, depending on mainline service levels
- 4 TPH at Capitol and Blossom Hill
- 1 TPH at Morgan Hill and Gilroy

3. Conceptual Four Track Corridor
- 4-8 TPH at Tamien, depending on mainline service levels
- 4-8 TPH at Capitol and Blossom Hill, depending on mainline service levels
- 1 TPH at Morgan Hill and Gilroy
Do you understand the service options shown south of San Jose?

Are there particular options that seem better or worse to you? Why?
Service Planning:
2040 Baseline
Context: Different Ways to Grow

- 2018: Current Operations
- 2022: Start of Electrified Operations
- 2033: High Speed Rail Phase 1
- 2040: Baseline Growth Scenario
- 2040: High Growth Scenarios

Design Year

DRAFT
2040 Baseline

Operational Parameters
• Blended service with 10 trains per hour, per direction north of San Jose (6 Caltrain, 4 HSR)
• Blended operations with existing/committed levels of Caltrain service assumed south of San Jose (equivalent of 4 round trip Caltrain trains per day)

Service Pattern
• Historically, Caltrain has planned to operate a skip stop service after electrification
  • Emphasizes increasing service for high ridership origin-destination pairs
  • No service differentiation within Caltrain service
• Blended service planning with HSR has carried forward this concept
• There is some flexibility in service levels and stopping patterns at individual stations
### 2040 Baseline Service Plan

#### Features
- Six skip stop patterns with 60-65 minute run times
- Most stations receive 2 or 4 TPHPD, with a few stations receiving 6 TPHPD in both directions
- Schedule varies by direction with 10 minute frequencies at San Francisco and San Jose

#### Passing Tracks
- Uses existing locations at Bayshore and Lawrence stations

#### Options with Service Structure
- Flexibility in service levels at individual stations

---

Caltrain Electrification EIR (6 TPHPD)

<table>
<thead>
<tr>
<th>Northbound AM</th>
<th>Southbound AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco 22nd St</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Bayshore</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>South San Francisco</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>San Bruno</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Millbrae</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Broadway</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Burlingame</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>San Mateo</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Hayward Park</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Hillsdale</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Belmont</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>San Carlos</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Redwood City</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Atherton</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Menlo Park</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Palo Alto</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>California Ave</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>San Antonio</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Mountain View</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Lawrence</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>College Park</td>
<td>1 1 1 1 1</td>
</tr>
<tr>
<td>San Jose Diridon</td>
<td>1 1 1 1 1</td>
</tr>
</tbody>
</table>

HSR EIR (10 TPHPD)

<table>
<thead>
<tr>
<th>Northbound AM</th>
<th>Southbound AM</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Francisco 22nd St</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Bayshore</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>South San Francisco</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>San Bruno</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Millbrae</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Broadway</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Burlingame</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>San Mateo</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Hayward Park</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Hillsdale</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Belmont</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>San Carlos</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Redwood City</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Atherton</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Menlo Park</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Palo Alto</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>California Ave</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>San Antonio</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Mountain View</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>Lawrence</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>2 2 2 2</td>
</tr>
<tr>
<td>College Park</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>San Jose Diridon</td>
<td>2 2 2 2</td>
</tr>
</tbody>
</table>

---

2Includes minor modifications to standardize Caltrain and HSR service patterns
Off-Peak & Weekend

**Features**
- Same skip stop patterns at hourly headways
- Most stations receive service every 30 or 60 minutes

**Features**
- Skip stop pattern equivalent to 4 northbound AM trains and 4 southbound PM trains
- Replicates committed service levels within parameters of new, Blended infrastructure
- Gilroy Station served by 2 Caltrain trains per hour and 2 HSR trains per hour
- Connection to Central Coast rail service at Gilroy
- No off-peak or weekend service south of Tamien

**Passing Tracks**
- None

**Options with Service Structure**
- Service levels between Morgan Hill and San Martin could be varied based on further demand analysis
Do you understand the 2040 “Baseline” service pattern shown and how it relates to prior planning work and policy commitments?
Terminal Planning

- Review & Evaluate Concepts
- Off-Peak Service Planning
- Terminal Planning
- South San Jose & Gilroy Planning
Proposed Process

- North and South Terminal working sessions with relevant partner and city staff
- Define key outcomes and constraints
- Identify range of acceptable planning-level analysis and assumptions that can serve as basis for continued Business Plan development including completion of service plans, ridership modeling and costing
- Define operations simulation parameters, methodology and process. Simulation completion required to confirm terminal assumptions
Community Interface Assessment Update
Business Plan Website is Up!

- Project timeline
- Project summary
- Corridor-wide factsheet
- Jurisdiction-specific factsheets
- Monthly presentations
- Glossary of key terms
- FAQs

www.caltrain2040.org
Round 1 Community Interface Meetings

Purpose
Introduce Business Plan and understand breadth of community interface concerns

Attendees
City and county staff representing public works, planning, economic development, and city managers offices + Caltrain Community Interface team

When
September – October 2018
Community Interface Meeting Results
Service Priorities

Prioritized Caltrain Service Improvements

- More Commute Service
- Increased Frequency
- Reduced Travel Times
- Multimodal access
- Regional Connections
- Better off-peak service midday/evenings

Number Responses

Most Important
Moderately Important
Community Interface Meeting Results

Key Themes

**Service Levels & Schedules**
Travel demand and mode split goals in relation to existing and anticipated roadway congestion

**Physical Corridor**
Grade crossings, grade separations, and the stretches of fencing, walls, and vegetation in between

**Land Development**
Placemaking, jobs-housing balance, transit-oriented development, and zoning changes

**Station Connectivity & Access**
Local first/last mile solutions, multi-modal access, and equitable incentive programs
Next Steps
Next Steps

Upcoming Work

• Finalize recommendations for high growth and baseline growth service plans to be studied further
• Terminal planning working sessions with Caltrain partners
• Capital costing, ridership projections and business model integration
• Ongoing organizational assessment and community interface work
Appendix:
Land Use Details & Service Concept Stringlines
### Land Use Planning Along Caltrain Corridor

<table>
<thead>
<tr>
<th>Station</th>
<th>Major Projects Included in Forecasts (Approved or consistent with Plan Bay Area projections)</th>
<th>Major Projects Noted but Not Quantified in Forecasts (Not yet approved and potentially inconsistent with Plan Bay Area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th &amp; King</td>
<td>Central SoMa Plan, Mission Bay &amp; Mission Rock</td>
<td>The Hub Plan</td>
</tr>
<tr>
<td>22nd St</td>
<td>Pier 70, Potrero Power Plant, India Basin</td>
<td></td>
</tr>
<tr>
<td>Bayshore</td>
<td>Hunters Point, Candlestick Point, Schlage Lock, Sierra Point buildout, Brisbane Baylands</td>
<td></td>
</tr>
<tr>
<td>South SF</td>
<td>6 MSF of approved East of 101 developments and the Downtown Station Area Specific Plan</td>
<td>Other employment projects in pipeline such as Genentech Master Plan</td>
</tr>
<tr>
<td>San Bruno</td>
<td>Transit Corridors Plan</td>
<td>Bayhill Specific Plan (Youtube)</td>
</tr>
<tr>
<td>Millbrae</td>
<td>Station Plan</td>
<td></td>
</tr>
<tr>
<td>Burlingame</td>
<td>Burlingame Point (Facebook)</td>
<td></td>
</tr>
<tr>
<td>San Mateo</td>
<td>Downtown Area Plan</td>
<td>General Plan/Downtown Plan Update</td>
</tr>
<tr>
<td>Hayward Park</td>
<td>Nearby TOD projects under construction</td>
<td></td>
</tr>
<tr>
<td>Hillsdale</td>
<td>Bay Meadows, Hillsdale Station Plan</td>
<td></td>
</tr>
<tr>
<td>Belmont</td>
<td>General Plan Update, Belmont Village Specific Plan</td>
<td></td>
</tr>
<tr>
<td>San Carlos</td>
<td>Meridian 25, Downtown TOD projects</td>
<td></td>
</tr>
<tr>
<td>Redwood City</td>
<td>Downtown Precise Plan, Stanford Redwood City Campus</td>
<td>Facebook campus expansion in Menlo Park (Caltrain connection via Dumbarton Rail)</td>
</tr>
<tr>
<td>Menlo Park</td>
<td>El Camino Real Downtown Specific Plan</td>
<td>Stanford General Use Permit</td>
</tr>
<tr>
<td>Palo Alto</td>
<td>Stanford Hospital Expansion</td>
<td></td>
</tr>
<tr>
<td>California Ave</td>
<td>Stanford Research Park redevelopment</td>
<td></td>
</tr>
<tr>
<td>San Antonio</td>
<td>San Antonio Precise Plan</td>
<td></td>
</tr>
<tr>
<td>Mountain View</td>
<td>El Camino Real Precise Plan, North Bayshore Precise Plan, Moffett Field redevelopment</td>
<td>East Whistman Specific Plan, additional Moffett Field redevelopment</td>
</tr>
<tr>
<td>Lawrence</td>
<td>Lawrence Station Plan, City Place</td>
<td></td>
</tr>
<tr>
<td>San Jose Diridon</td>
<td>Google Campus, Downtown Strategy 2040</td>
<td></td>
</tr>
<tr>
<td>Morgan Hill</td>
<td>Downtown Specific Plan</td>
<td></td>
</tr>
<tr>
<td>Gilroy</td>
<td>Station Plan</td>
<td></td>
</tr>
</tbody>
</table>
How to Read a Stringline

- Shallow lines show slower trains (Local)
- Steep lines show faster trains (Express)
- Horizontal lines show station dwell (Time but no distance)
Zone Express: 12 Trains

Features

• Provides 15-minute service to all stations except Broadway/Burlingame with two semi express zone patterns
• Major activity centers receive 8 TPH
• Direct service from all markets to major activity centers, but transfer required between minor stations in different zones

Passing Track Needs

• 2 new miles of passing track between Hayward Park to Hillsdale and at a station in northern Santa Clara county (shown: California Ave)

Options with Service Structure

• Each pattern can at only stop at 2 of the 4 stations north of Millbrae
• Middle-zone train needs to stop at two stations south of California Ave
• Flexible station overtake location in northern Santa Clara County
Zone Express: 16 Trains

Features
- Provides 15-minute service to all stations except Broadway/Burlingame with three semi express zone patterns (with major activity centers receiving 12 TPH)
- Direct service from all markets to major activity centers, but transfer required between minor stations in different zones

Passing Track Needs
- 15 miles of new passing track: south of Bayshore to San Bruno, mid-Peninsula (shown: Hillsdale to San Carlos), northern Santa Clara County (shown: California Avenue to north of Mountain View), and south of Lawrence to Santa Clara

Options with Service Structure
- Flexible location for 3 mile passing track in mid-Peninsula and 5 mile passing track in northern Santa Clara County
Local/Express: 12 Trains

**Features**
- Regional Express serves all Major Activity Centers at 15-minute headways
- All stations receive local service at 15-minute headways except Broadway and Burlingame
- Timed local-express transfer at Redwood City

**Passing Track Needs**
- 10 miles of new passing tracks: Hayward Park to Redwood City and northern Santa Clara County (shown: California Avenue to north of Mountain View)

**Options with Service Structure**
- One stop on Express Train between Millbrae and Redwood City
- One or two stops on express south of Palo Alto
- Flexible 5 mile passing track location in northern Santa Clara County
## Features
- Regional Express serves all Major Activity Centers at 15-minute headways
- Most stations served by local service at 15 minute headways
- Closely-spaced mid-Peninsula stations served at 30 minute headways (Broadway, Burlingame, San Mateo, Belmont, and San Carlos)
- Timed local-express transfer at Redwood City

## Passing Track Needs
- 3 miles of new passing tracks: Hayward Park to Hillsdale, at Redwood City, and at a station in northern Santa Clara county (shown: California Ave)

## Options with Service Structure
- Each local pattern can only stop once Millbrae to Hillsdale
- Each local pattern can only stop once Hillsdale to Redwood City
- Flexible station overtake location in northern Santa Clara County
Local/Express: 16 Trains, Less Passing Tracks

**Features**
- Local service becomes skip-stop service
- All stations receive 15 minute headways with major stations receiving 8 or 12 trans per hour
- Many station pairs require transfer at regional hubs
- Half of station OD pairs between 22nd Street and Redwood City are not served at all

**Passing Track Needs**
- 3 miles of new passing tracks: Hayward Park to Hillsdale, at Redwood City, and at a station in northern Santa Clara county (shown: California Ave)

**Options with Service Structure**
- Generally need each pattern to stop at every other station
- Pattern overtaken by express must stop at Hayward Park & Hillsdale; other pattern cannot stop at these stations
- Flexible station overtake location in northern Santa Clara County
Local/Express: 16 Trains

Features
- Complete local stop service
- Two express lines serving major markets
- All stations receive at least 4 TPH, with many receiving 8 or 12 TPH

Passing Track Needs
- 15 miles of new passing tracks: South San Francisco to Millbrae, Hayward Park to Redwood City, and northern Santa Clara County (shown: California Avenue to north of Mountain View)

Options with Service Structure
- Express B pattern must run non-stop from 22nd St to San Mateo, but has some flexibility in number and location of stops along mid-Peninsula
- Flexible 5 mile passing track location in northern Santa Clara County
- Passing tracks between Lawrence and San Jose may enhance reliability and save 1-2 min of travel time for HSR and Caltrain (for passengers traveling south of Diridon)