



## *Corridor Crossings*

### STRATEGY





# AGENDA

- **4-Track Analysis**  
Purpose & Initial Approach
- **Operations** Considerations
- **4-Track Analysis**  
Corridor and Palo Alto Segments
- **4-Track and Crossings**  
Preliminary Review
- **Next Steps** and Engagement

# Meeting Objectives



Review 4-Track Analysis  
approach considerations and  
trade-offs



Review operations  
considerations  
and analysis



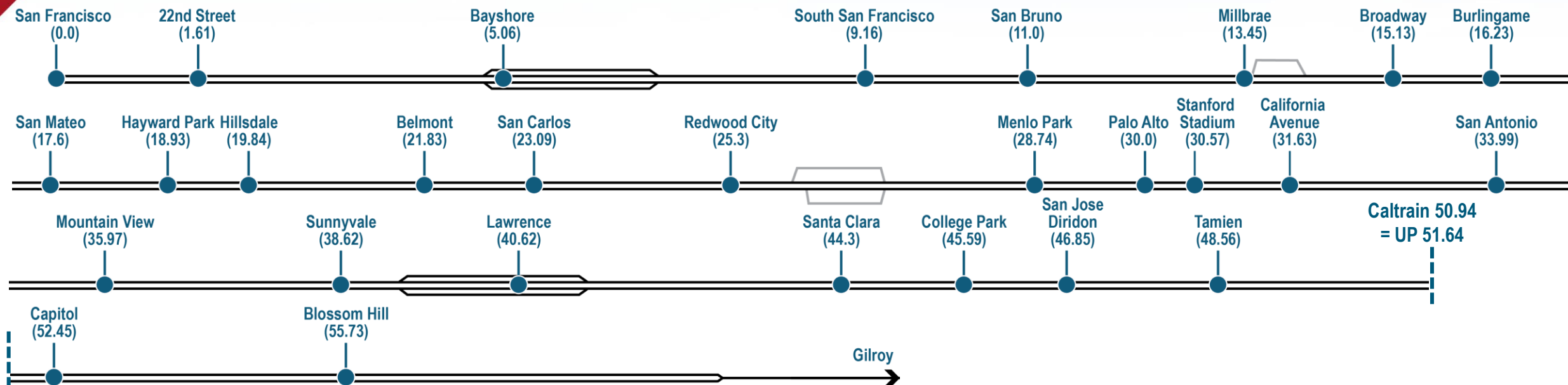
Outline N. Santa Clara  
Adopted Service Vision  
segments



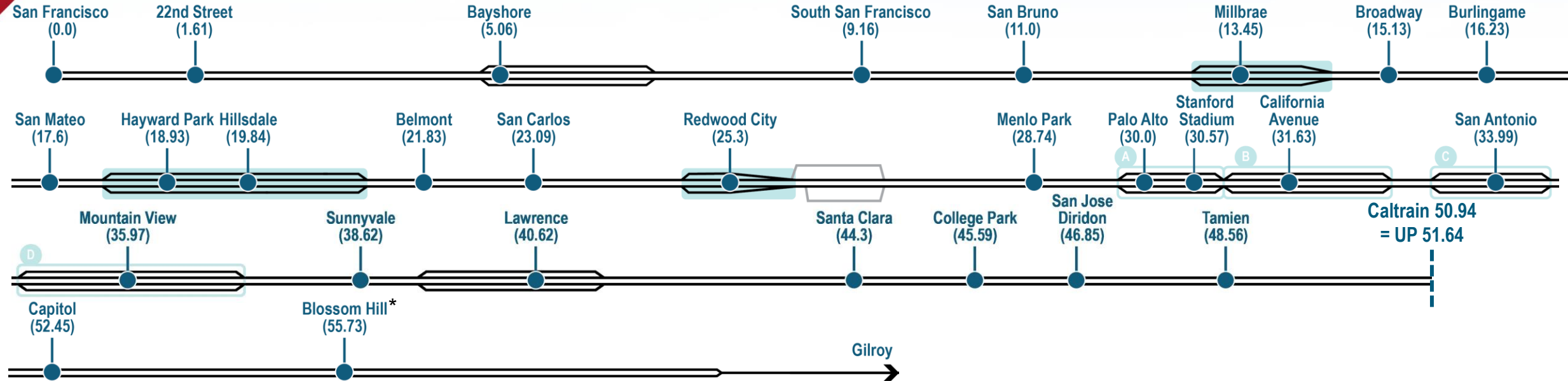
Discuss N. Santa Clara  
Adopted Service Vision  
segment observations and  
constraints

# Track Configuration Today

- Main Track Line
- Controlled Siding
- Station (Milepost)



# Adopted Service Vision 4-Track Segments



Notes:  
\* Identified in Business Plan

# 4-Track Analysis

*Purpose & Initial Approach*



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# 4-Track Analysis Purpose

## Purpose



**Provide location, length, and mile post limits based on 4-track segments identified in the Caltrain Business Plan**



**Define required infrastructure to meet the 2040 Long Range Service Vision (Adopted Service Vision) for Caltrain and HSR service**



**Utilize analysis of 4-track segments to guide grade separation projects**

# Business Plan (2017-2019): Growth Scenarios Recap

## Moderate Growth (Adopted Service Vision)

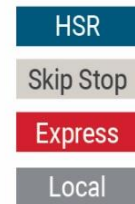
- 8 Caltrain trains + 4 HSR trains phpd

## High Growth (Higher Growth Service)

- 12 Caltrain trains + 4 HSR trains phpd

PCJPB agrees that it **shall not take action** ... that PCJPB knows or reasonably should have known at the time of the action **would effectively preclude or make materially more complicated or expensive CHSRA's future operation in the Peninsula Rail Corridor...**  
– PFMA Section 5.3.1

### Service Type

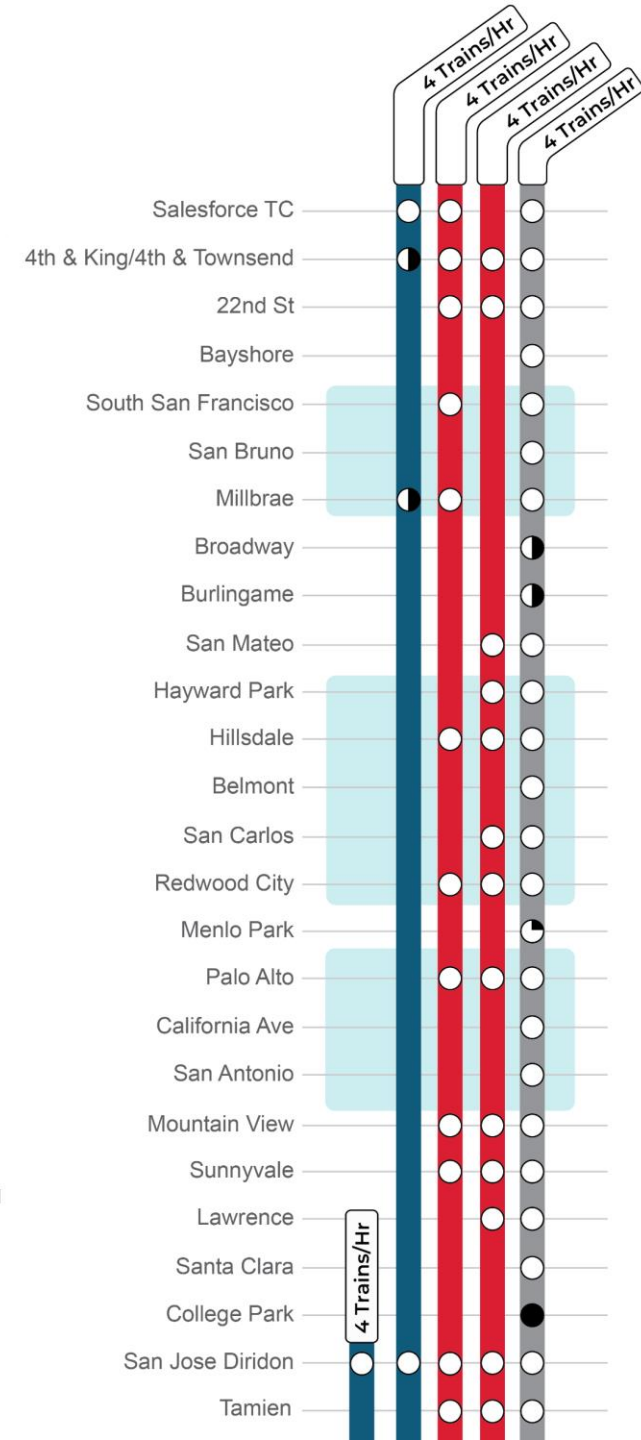


### Service Level (Trains per Hour)



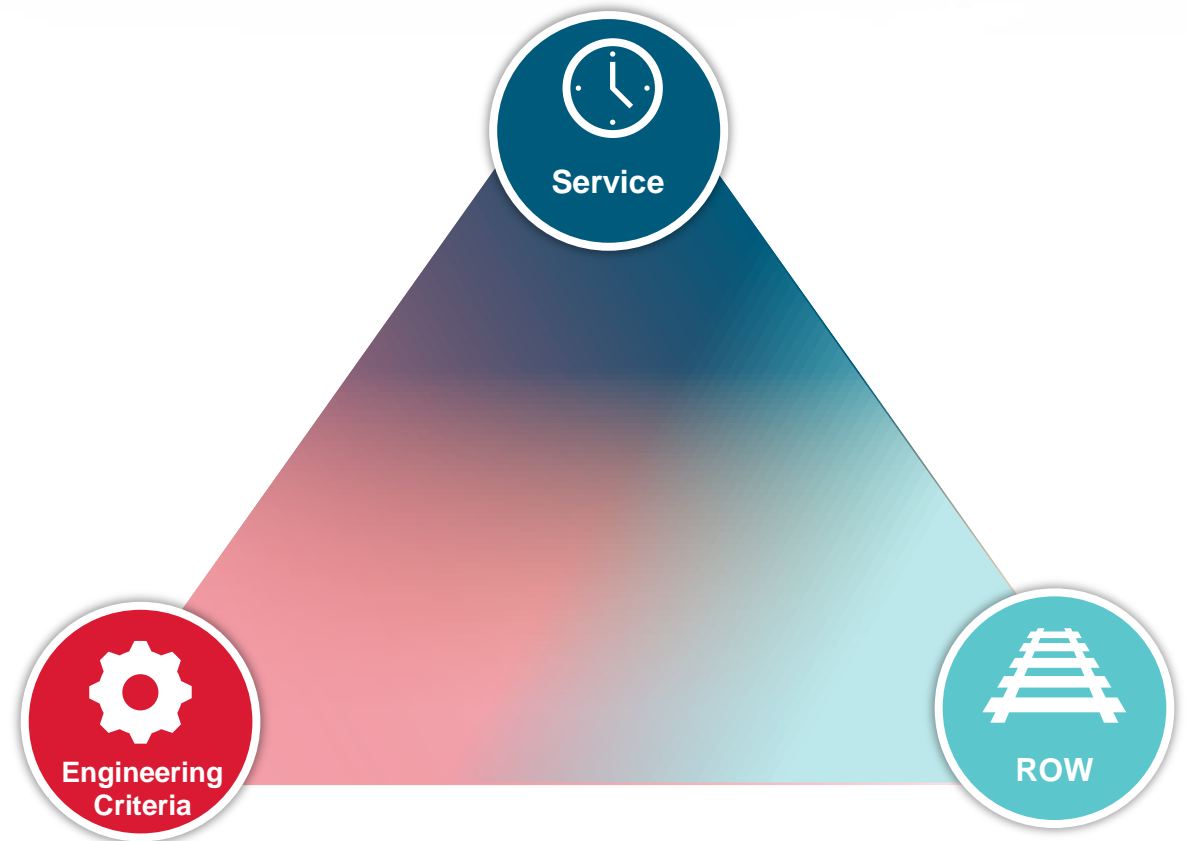
### Peak Direction Trains/Hour

Conceptual 4 Track Segment or Station to be refined through further analysis and community engagement.



# 4-Track Initial Planning Approach

- **Tested** 4-track layouts using Caltrain, CPUC, and HSR engineering criteria
- **Evaluated** and simulated service parameters of 4-track layouts
- **Refined** and validated 4-track limits through service operations and engineering analysis



# 4-Track Initial Evaluation Process

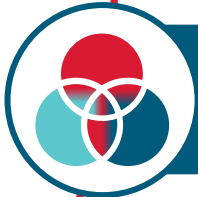
## *North Santa Clara County Segments*



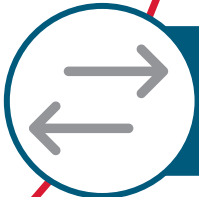
Focused on trade-offs between operations, ROW, and design



Worked towards reducing potential impacts to the surrounding environment (i.e., at-grade crossings, adjacent land use, buildings, and infrastructure)



Identified interdependencies between platform configuration, express/high-speed services (110mph), and turnout design and configuration



Focused on horizontal layout, but considered vertical opportunities and constraints

# Operations Considerations

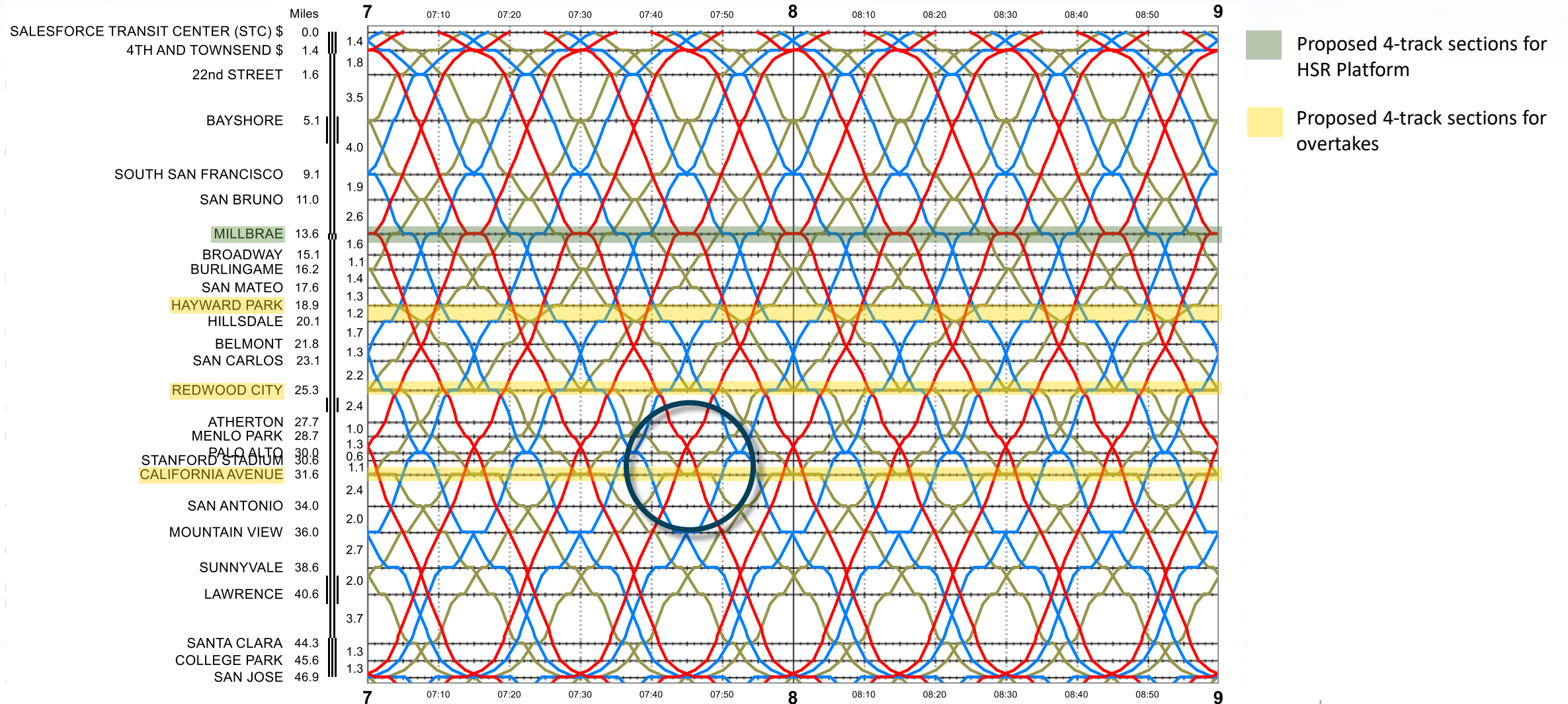


**Corridor Crossings**  
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# Planning Parameter Assumptions

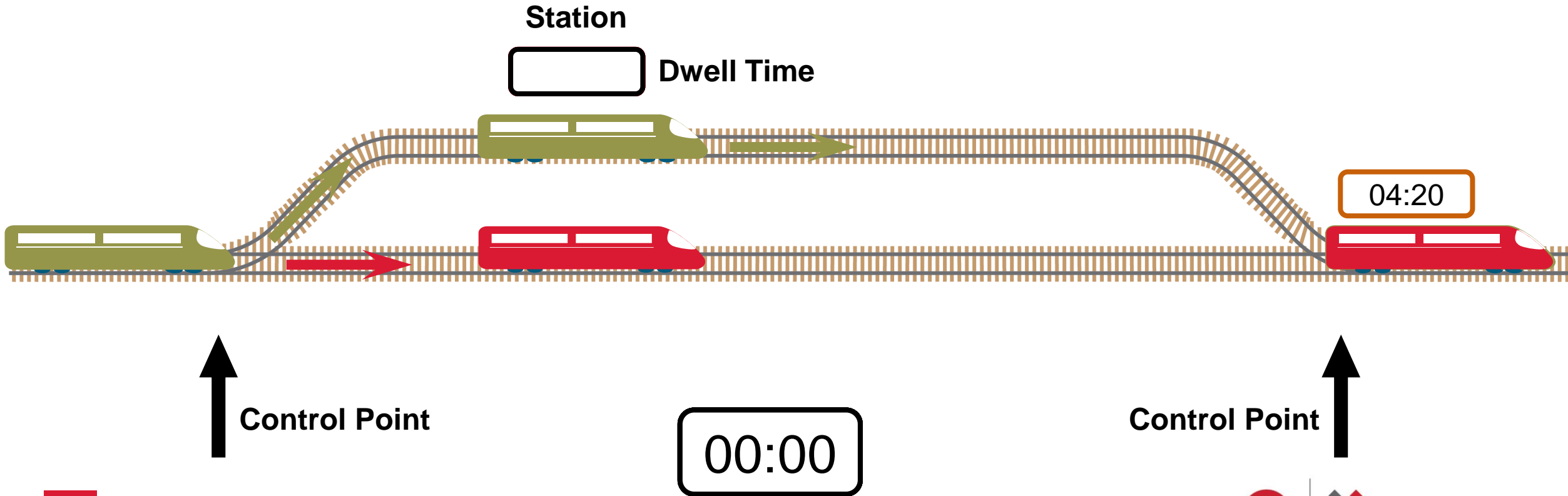
Planning Parameter	Assumption
Headway / Separation	2-minute minimum corridor separation time
Minimum Turnaround Time	HSR: 20 min Caltrain: 20 min
Minimum Dwell Time	HSR: 2 min Caltrain: 1 min at major stations, 0.7 min at minor stations
Rolling Stock	HSR: Generic High-Speed Trainset Caltrain: KISS EMU Freight: Dash9
Speed Limit	110 mph (Class 6 Passenger Track) 50 mph (Freight Speed)
Recovery Time	10% Distributed

# Adopted Service Vision - 12 TPH (8 Caltrain + 4 HSR)



# Two Minute Separation: In & Out of a 4-Track Segment

2-minute separation between trains



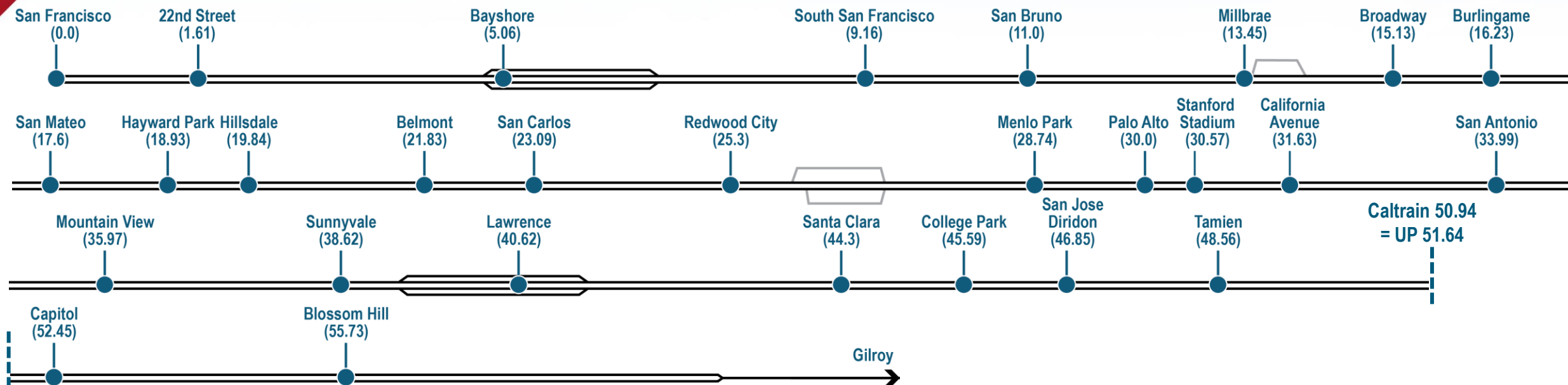
# 4-Track Segment Analysis



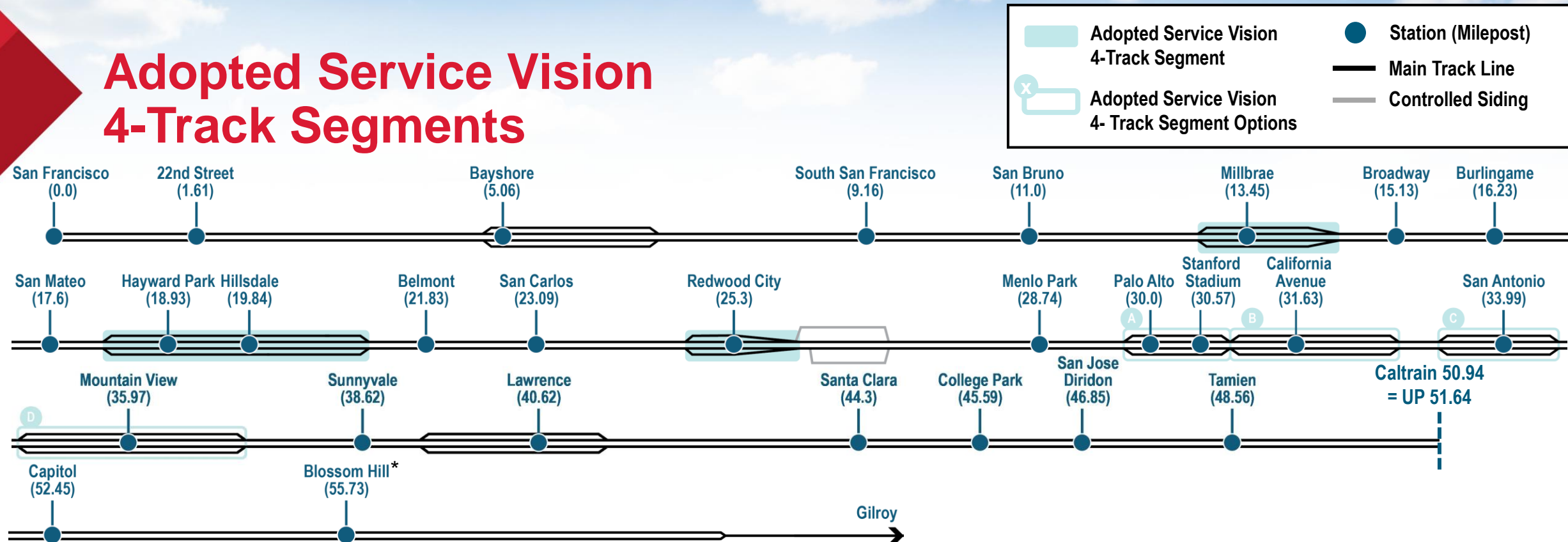
**Corridor Crossings**  
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# Track Configuration Today

- Main Track Line
- Controlled Siding
- Station (Milepost)



# Adopted Service Vision 4-Track Segments



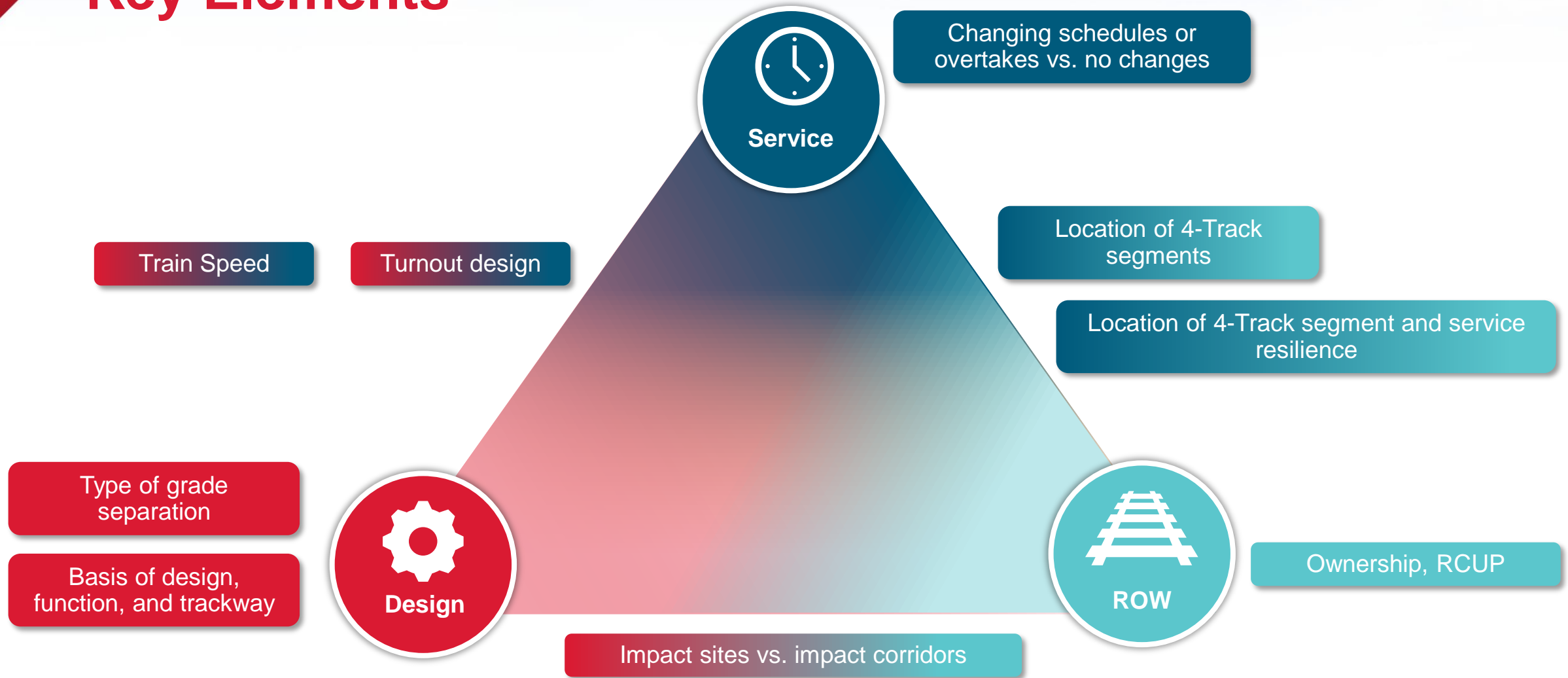
Notes:

\* Identified in Business Plan

The Mountain View Transit Center was identified as a potential 4-track segment for the adopted Service Vision. The segment was removed prior to the 4-track analysis process due to:

- 4-track capacity further north better supports blended service patterns
- Not operationally preferred in the adopted Service Vision for a 4-track capacity because it would not support service patterns developed under the Service Plan

# Initial Trade-Offs & Key Elements

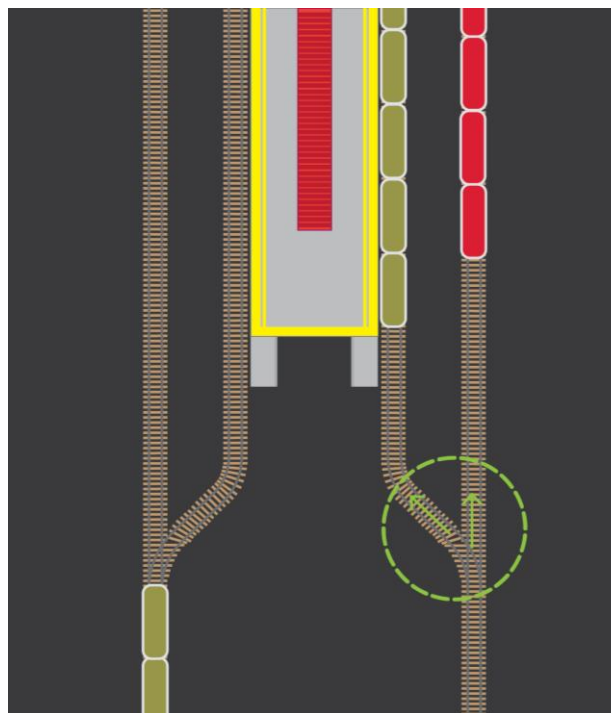


# Influence of Turnout Design on Service

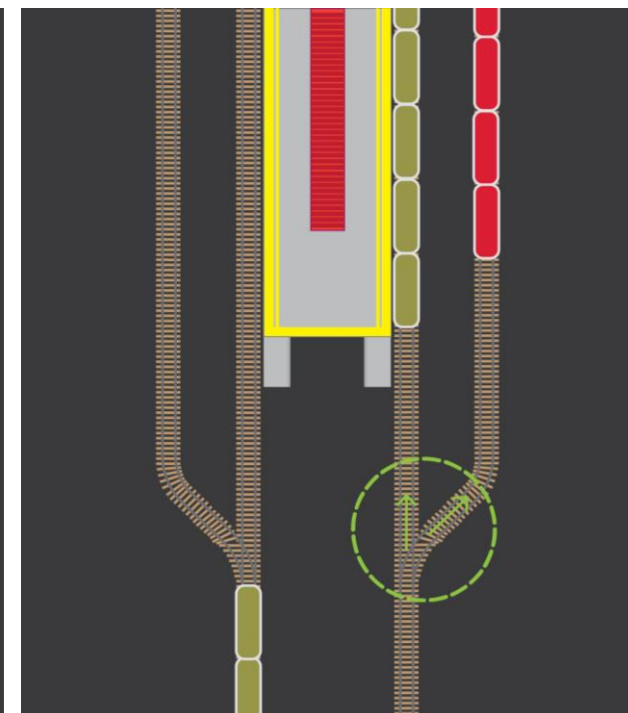
Maximum Allowable Speed	Transition Length to Center Platform with Left Hand Turnout (Approximate)	Transition Length to Center Platform with Right Hand Turnout (Approximate)
79 mph	1200 ft.	1800 ft.
110 mph	1500 ft.	2200 ft.

Turnout No.	Passenger Train Speed Through Turnout
20	50 mph
24	60 mph

Left Hand Turnout

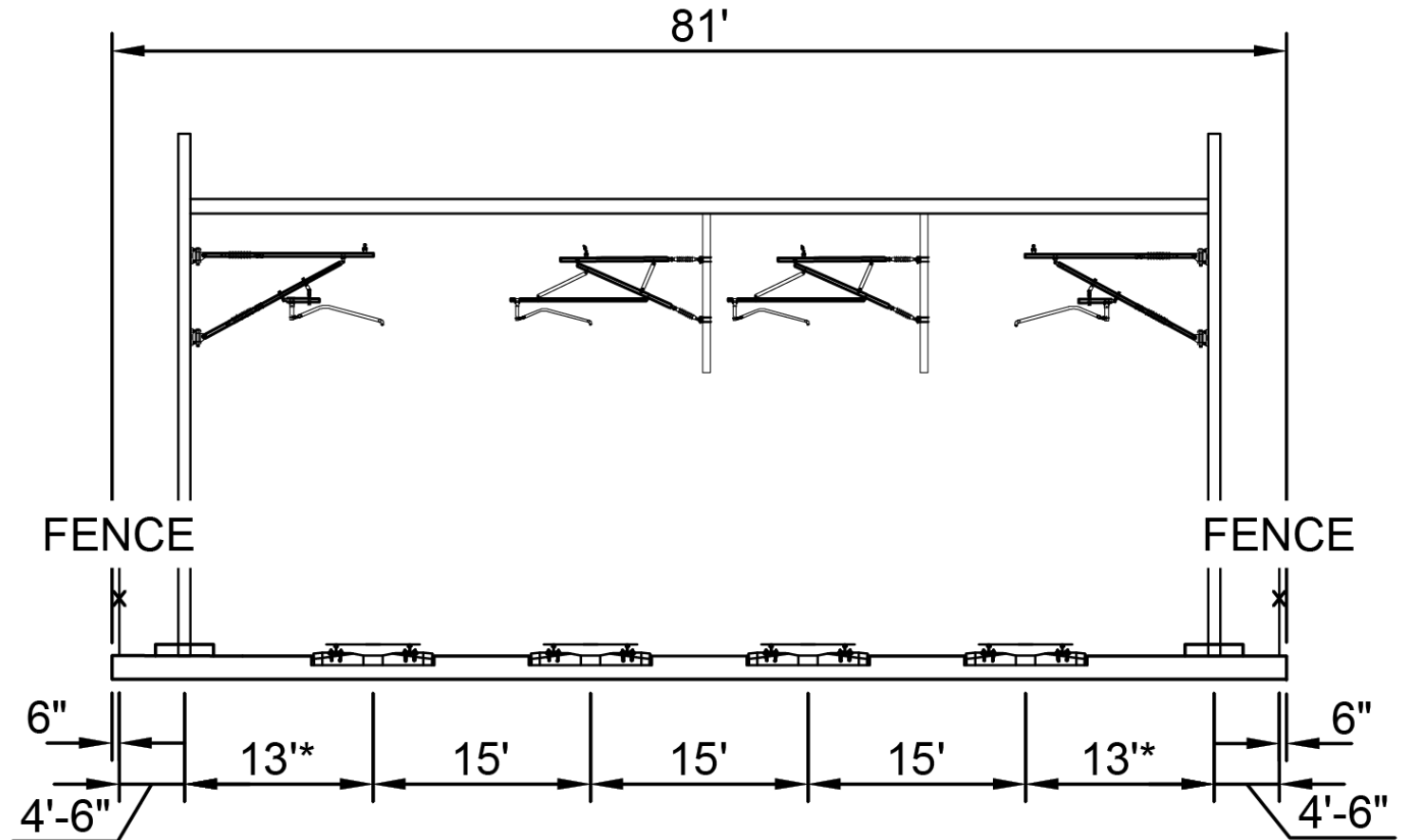


Right Hand Turnout



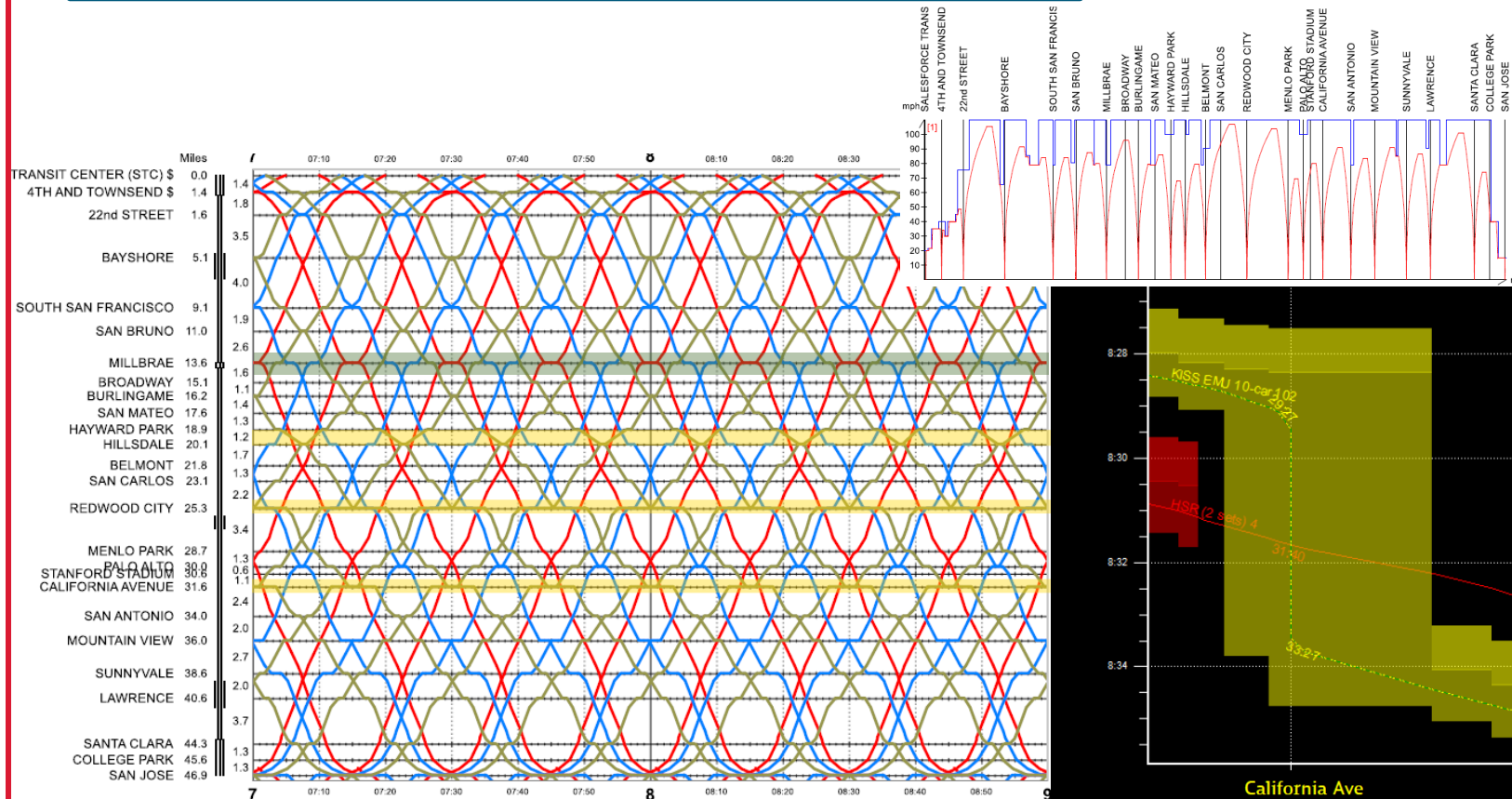
# Typical Section for Running Track

- Parameter assumptions presented in Basis of Design
- Tangent 4-track running track section
- Reusing existing OCS equipment where possible

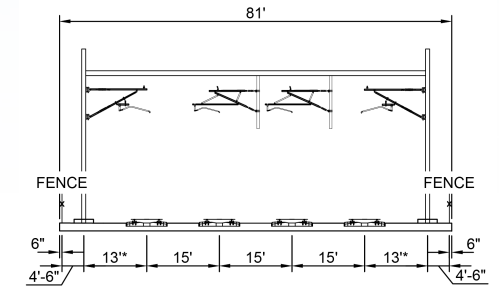


# Technical Analysis

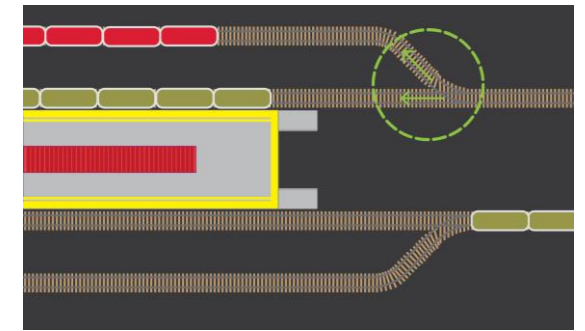
## Operations



## Cross-sections



## Turnouts

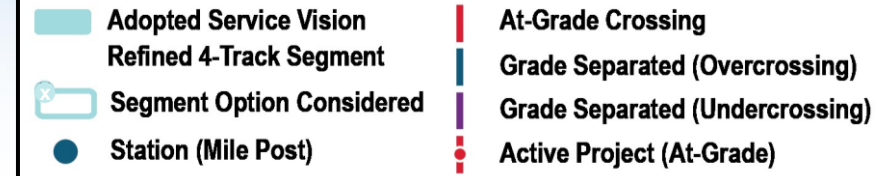


## Alignment Concept



# Palo Alto Station Segment

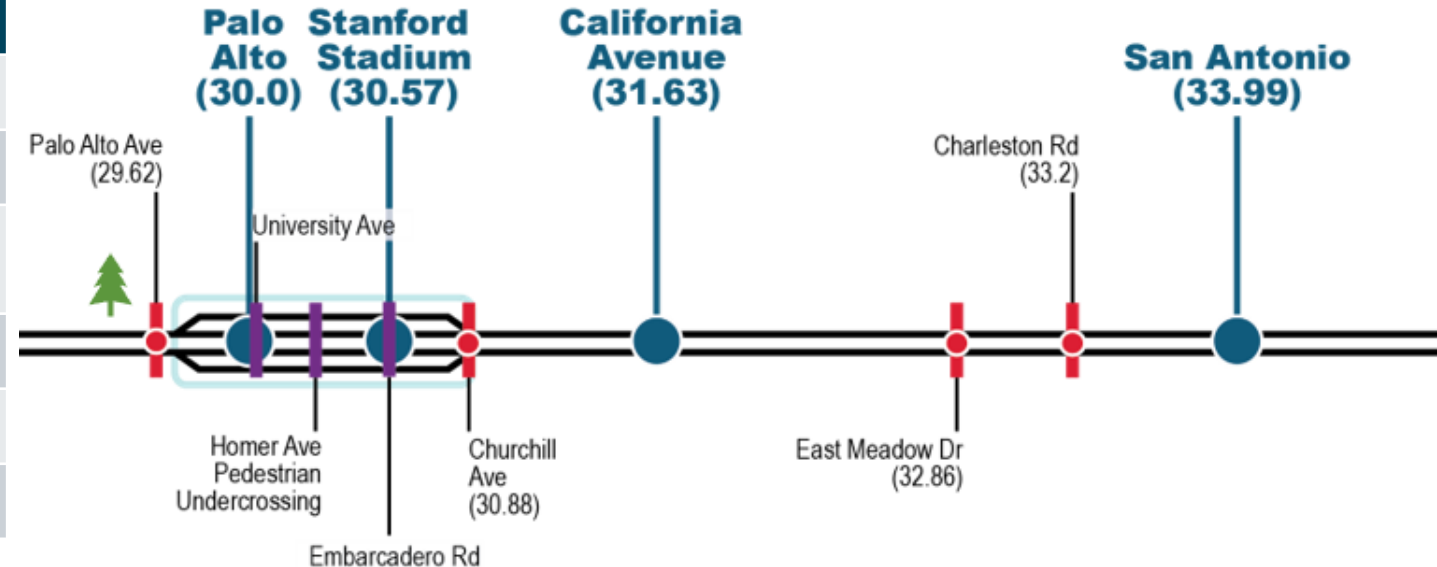
## High Community & Infrastructure Impacts



### Segment Location



Segment Characteristics	
MP Limits	MP 29.7 - 30.9
Length (miles)*	1.2
Stations Impacted	Palo Alto & Stanford Stadium
At-Grade Crossings Impacted	2
Grade Separations Impacted	3
Active Projects	Connecting Palo Alto



\*Length includes 2- to 4-track transitions

# Palo Alto Station Segment



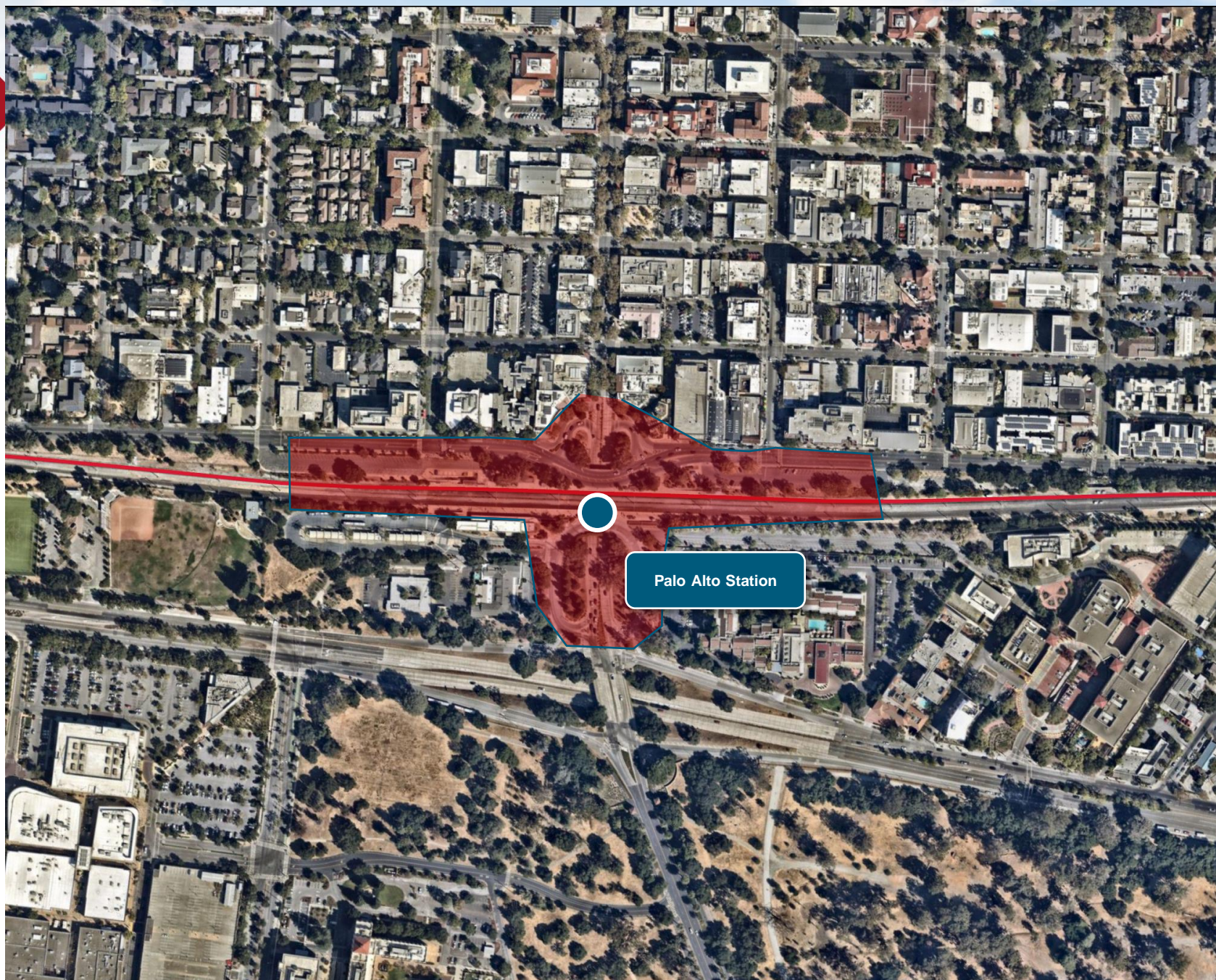
# Palo Alto Station Segment





**Legend**    - - - Caltrain ROW    - - - Area of Influence

*\*Illustrative – Tracks can shift, and/or elevated, as concept is further developed.*

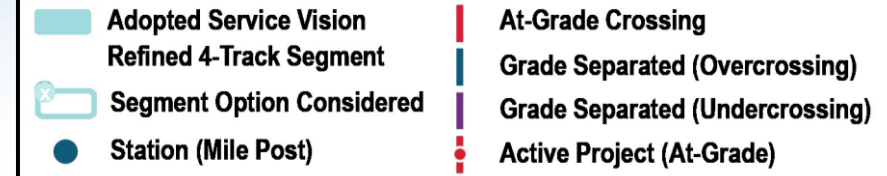
# Palo Alto Station Infrastructure Impacts



-  Infrastructure Modifications
-  Caltrain Corridor

# California Ave Station Segment

## Limited Community & Infrastructure Impacts



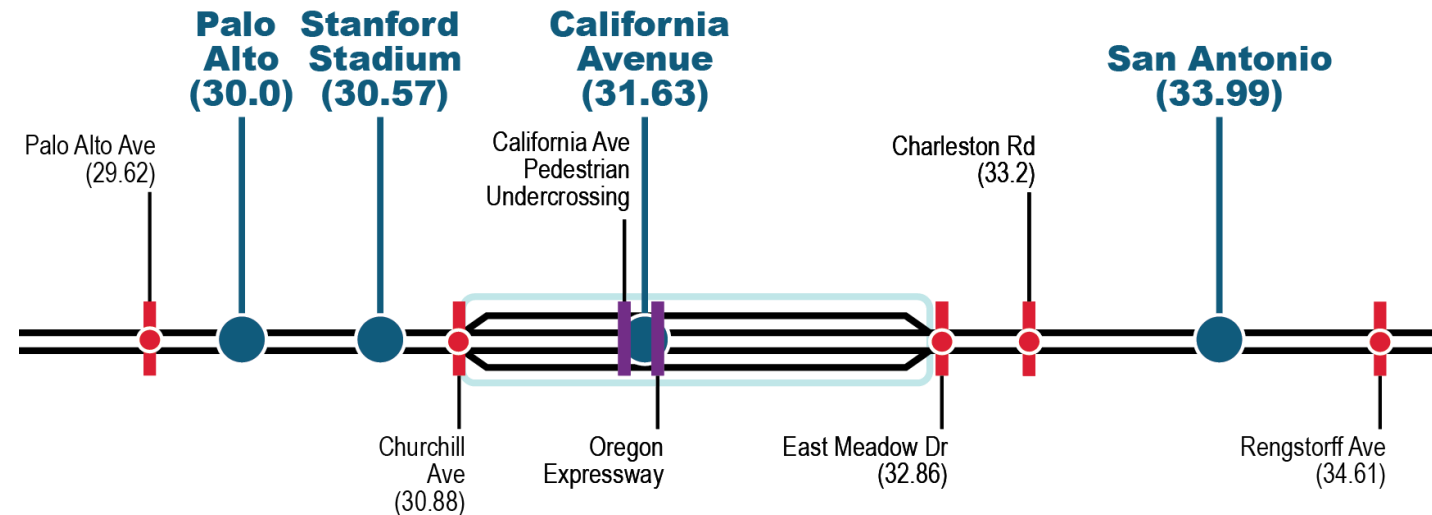
### Segment Location



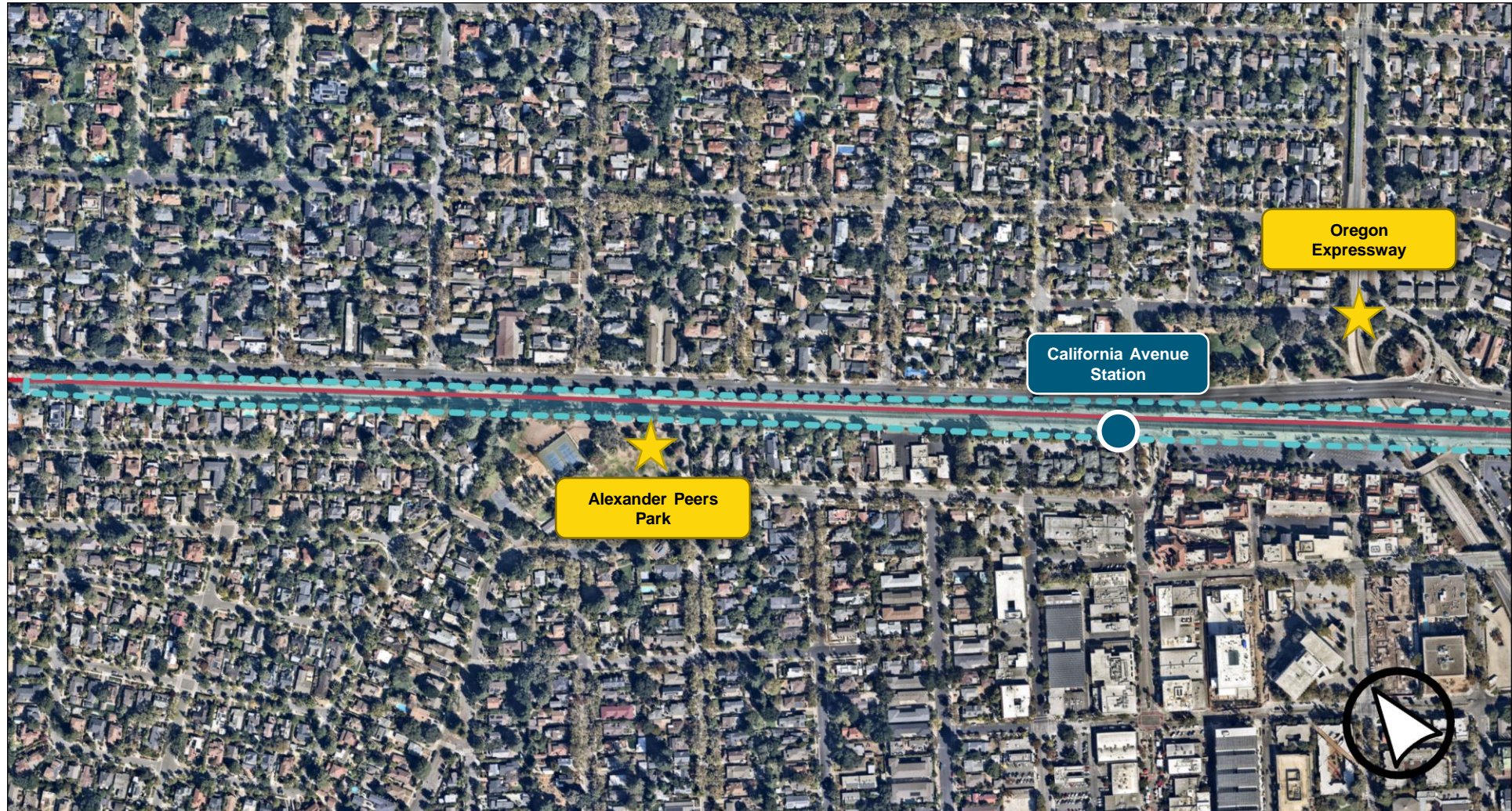
### Segment Characteristics

MP Limits	MP 30.9 - 32.8
Length (miles)*	1.9
Stations Impacted	California Avenue
At-Grade Crossings Impacted	2
Grade Separations Impacted	2
Active Projects	Connecting Palo Alto

\*Length includes 2- to 4-track transitions



# California Avenue Station Segment



# California Ave Station Segment



**Legend**    - - - Caltrain ROW    - - - Area of Influence

*\*Illustrative – Tracks can shift towards Alma Street, and/or elevated, as concept is further developed.*

# California Ave Station Segment





**Legend**    - - - Caltrain ROW    - - - Area of Influence

*\*Illustrative – Tracks can shift, and/or elevated, as concept is further developed.*

# California Avenue Station Infrastructure Impacts

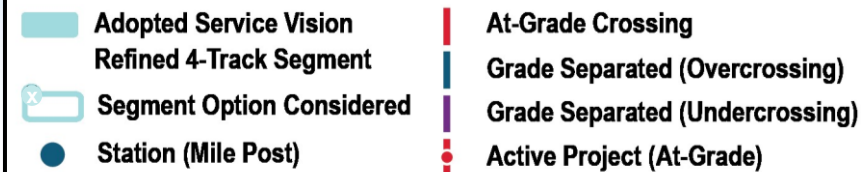


-  Infrastructure Modifications
-  Caltrain Corridor

# San Antonio Station Segment

## High Community & Infrastructure Impacts – Major Reconstruction

### North Santa Clara Segment – Option C



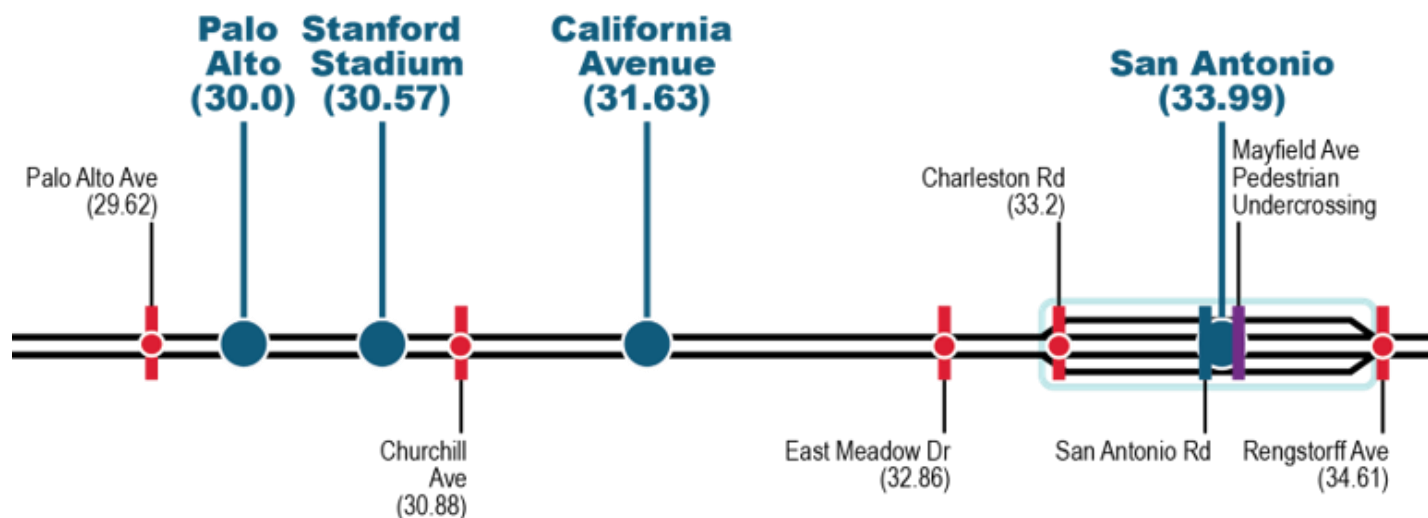
#### Segment Location



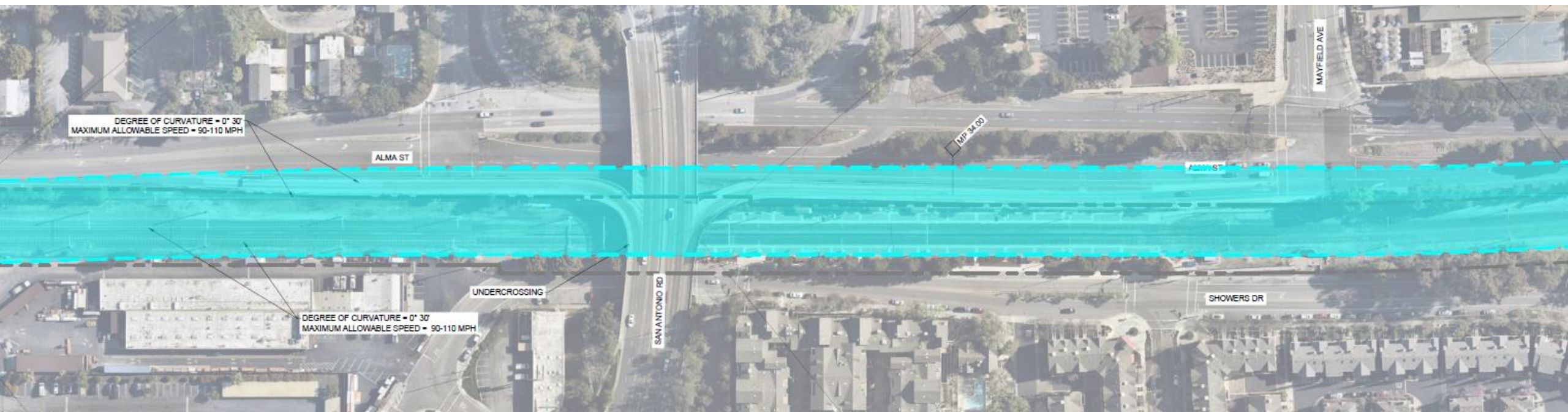
#### Segment Characteristics

MP Limits	MP 33.25 - 34.60
Length (miles)*	1.35
Stations Impacted	San Antonio
At-Grade Crossings Impacted	3
Grade Separations Impacted	2
Active Projects	Connecting Palo Alto & Rengstorff Grade Separation

\*Length includes 2- to 4-track transitions



# San Antonio Station Segment



**Legend**    - - - Caltrain ROW    — — — Area of Influence

*\*Illustrative – Tracks can shift, and/or elevated, as concept is further developed.*

# San Antonio Station Segment



# San Antonio Road Overpass



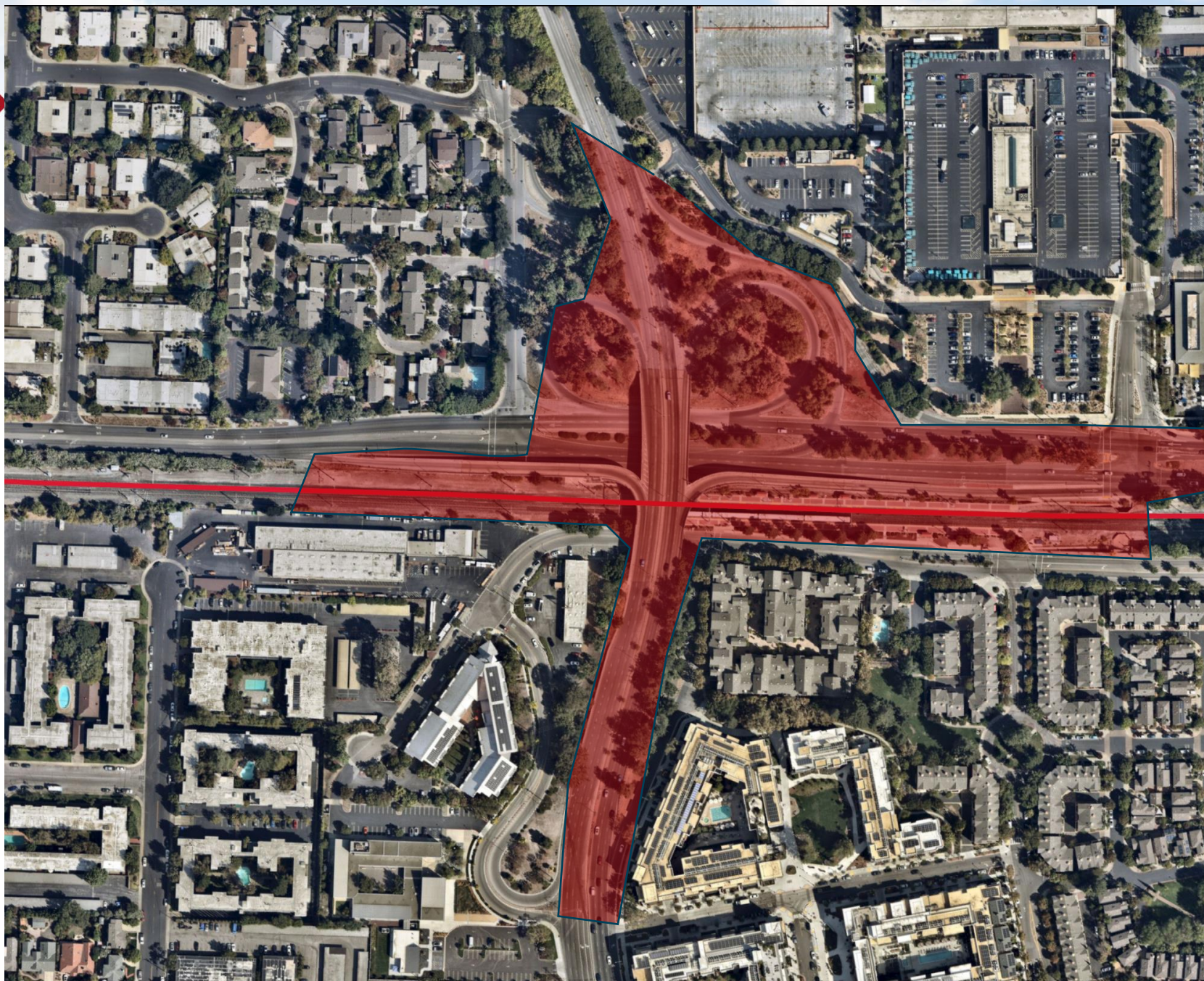
# San Antonio Road Overpass





# San Antonio Road Overpass



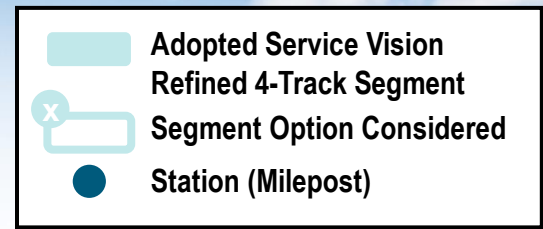
# San Antonio Station Infrastructure Impacts



-  Infrastructure Modifications
-  Caltrain Corridor



# Northern Santa Clara County



Northern Santa Clara County Segment







	Palo Alto (A)	California (B)	San Antonio (C)
<b>Constraints</b>	<ul style="list-style-type: none"> <li>Palo Alto Southern Pacific Station (SHPO - Cultural Resource)</li> <li>University Ave/Alma Street Interchange and Underpass</li> <li>San Francisquito Creek Bridge and El Palo Alto Tree</li> <li>El Camino Park</li> <li>Homer Avenue pedestrian undercrossing</li> <li>Sutter Health Center</li> <li>Palo Alto High School</li> </ul>	<ul style="list-style-type: none"> <li>Residential areas surrounding Caltrain ROW</li> <li>Alexander Peers Park</li> <li>Oregon Expressway – “T” intersections for ramp exits/entrances</li> </ul>	<ul style="list-style-type: none"> <li>San Antonio Road Interchange and Overpass</li> <li>Residential areas surrounding Caltrain ROW</li> <li>Existing curve south of San Antonio Station (Speed Constraint below 110 mph)</li> </ul>

# Northern Santa Clara County Preliminary Understanding

4-Track Segments in Northern Santa Clara County were analyzed to evaluate trade-offs and determine the most viable option to meet the needs of the Adopted Service Vision goals and Caltrain's obligations for blended service in the corridor.

Caltrain will continue to coordinate with the city to **not preclude future 4-track**, as the city develops their Connecting Palo Alto alternatives

## Operations Simulation of Segments

-  Validated 4-Track segment lengths
-  Assumes upgraded signaling system for 2-minute buffer between trains (current signal system allows for 4-minute buffer)
-  Supports and provides operational flexibility for the service in the Adopted Service Vision
-  Local train dwells 4 minutes (3 minutes more than standard 1-minute station dwell)

# Comments/Questions



**Corridor Crossings**  
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