



CITY OF  
**PALO  
ALTO**

# Connecting Palo Alto Projects

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## Caltrain Technical Review

# Purpose

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- Rail Committee's review of comments to provide guidance to staff on specific elements.
- Direct staff to proceed coordination with Caltrain Staff or their Consultants and/or City's project consultant for material changes to alternatives

# Background

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## Goal

- Select Preferred Alternative to Proceed with Preliminary Engineering and Environmental Phase

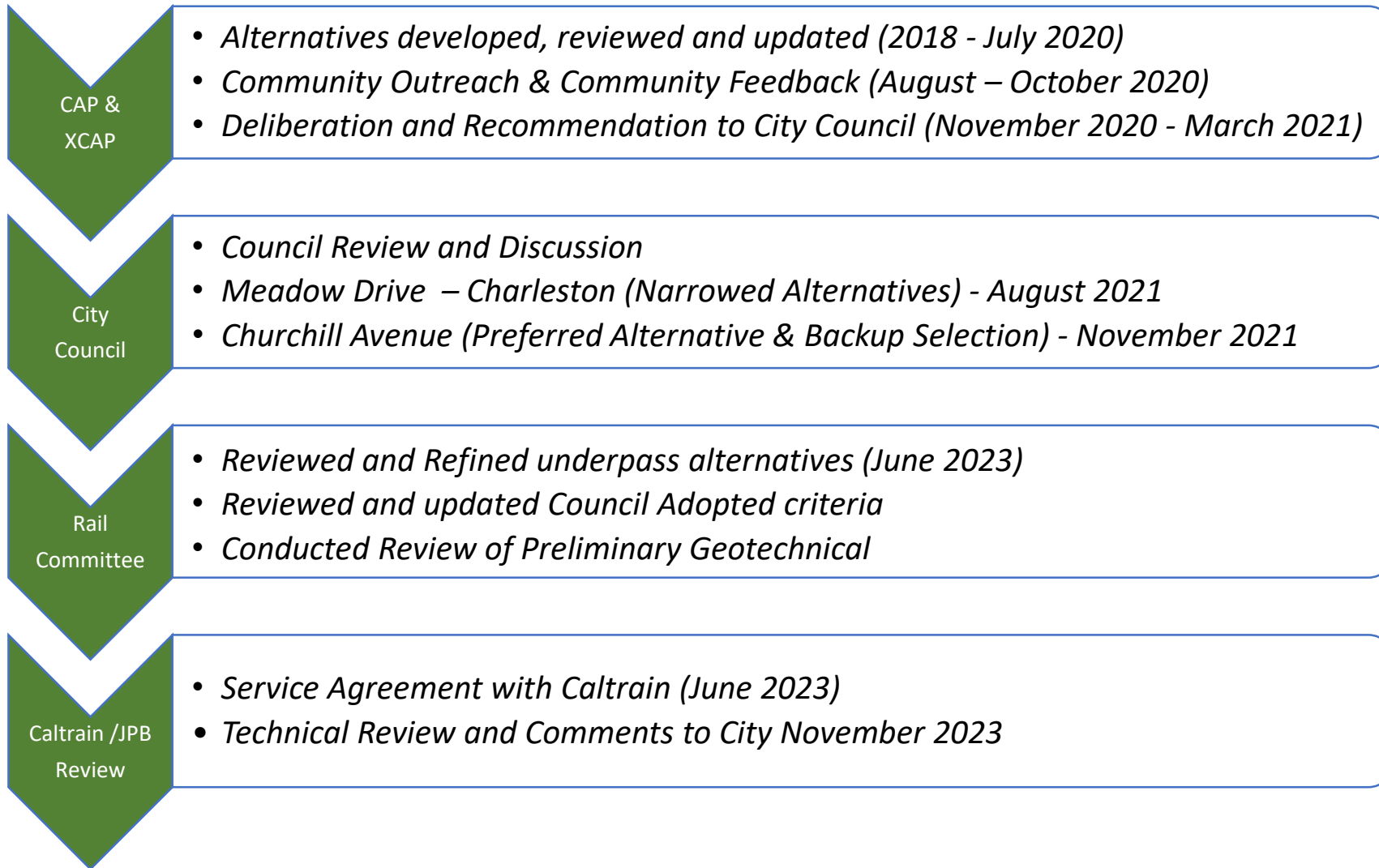
## Objective

- Federal Railroad Administration (FRA) Grant Funding Agreement in place by July 1, 2024.

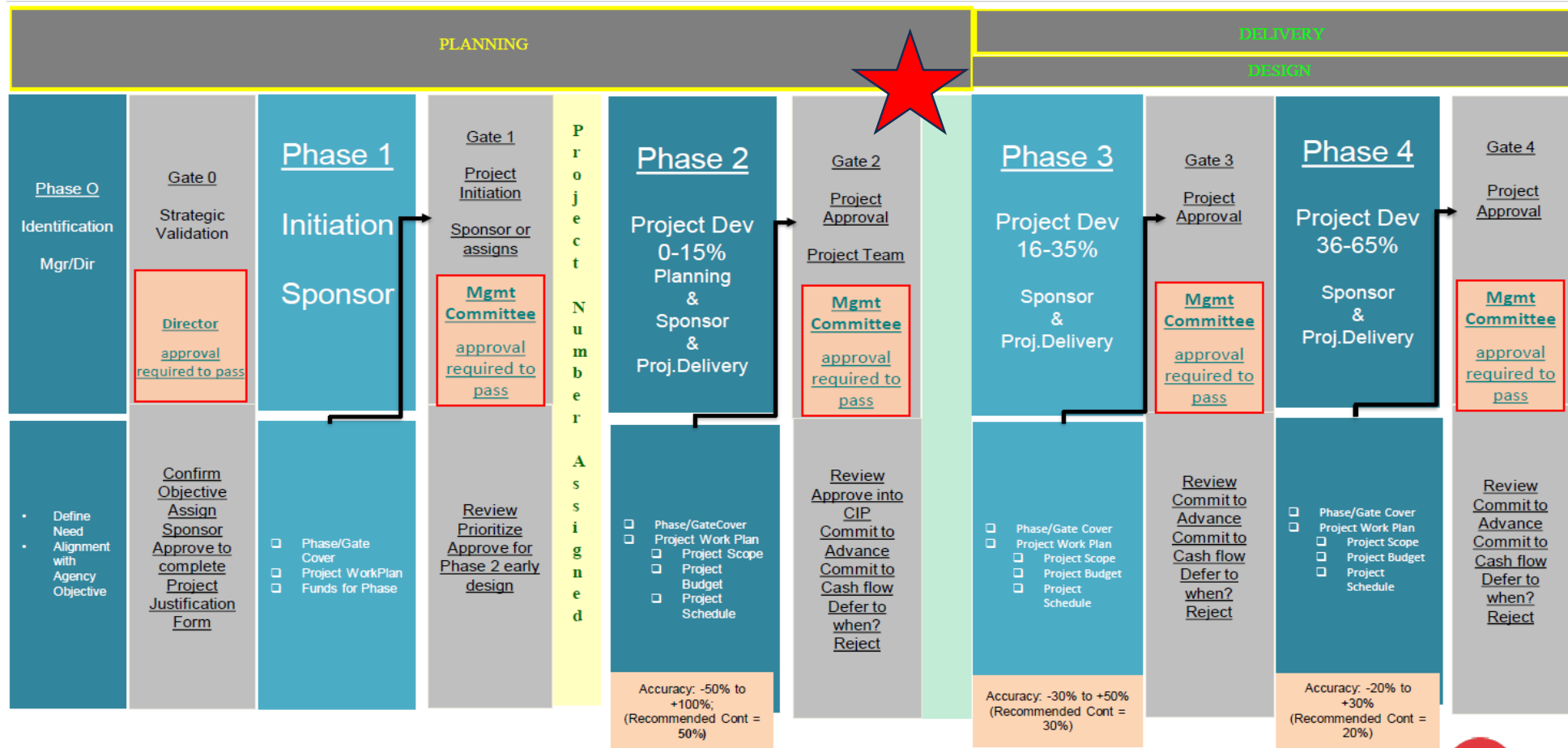
## Guidance

- Rail Committee to provide guidance to on implementing design changes sufficient to support the goal.

# Background



# Overview of Caltrain Capital Project Management Process



# Major Elements

- **Vertical Alignment**

- Vertical Clearance
- Bridge Structure Elevation (Viaduct Only)
- Railroad Grade Profile
- Pedestrian and Bicycle Path Clearance

- **Horizontal Alignment**

- Roadway Encroachment into Caltrain ROW
- Pedestrian & Bicycle Facilities Encroachment into Caltrain ROW
- Railroad Encroachment into City's ROW
- Retaining Wall offset/clearance from structures and roadways
- Maintenance Access requirement along the railroad tracks
- Clearance for MSE Wall construction during construction and maximize use of ROW

- **Four Track Segment**

- Four Track segments and Roadway encroachment into Caltrain ROW
- Four Tracking Alignment

- **Roadway Design**

- Road Profile, Sag Curves, Grades etc.
- Offset from Barriers
- Acceleration/Deceleration Lanes, Lane drops, weaving distance, etc.
- Roundabout Design
- Curved bridges

- **Construction Technology**

- Shoofly vs Box Jacking

- **Culverts**

- Reconstructing and extending culverts

- **Cost Estimates**

- Preliminary Cost Estimates

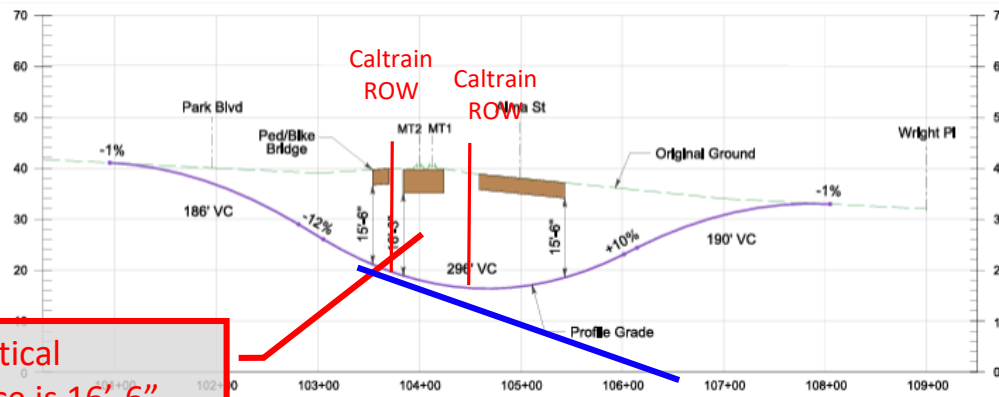
- **Cumulative Concerns**

- Compounded impacts from above comments

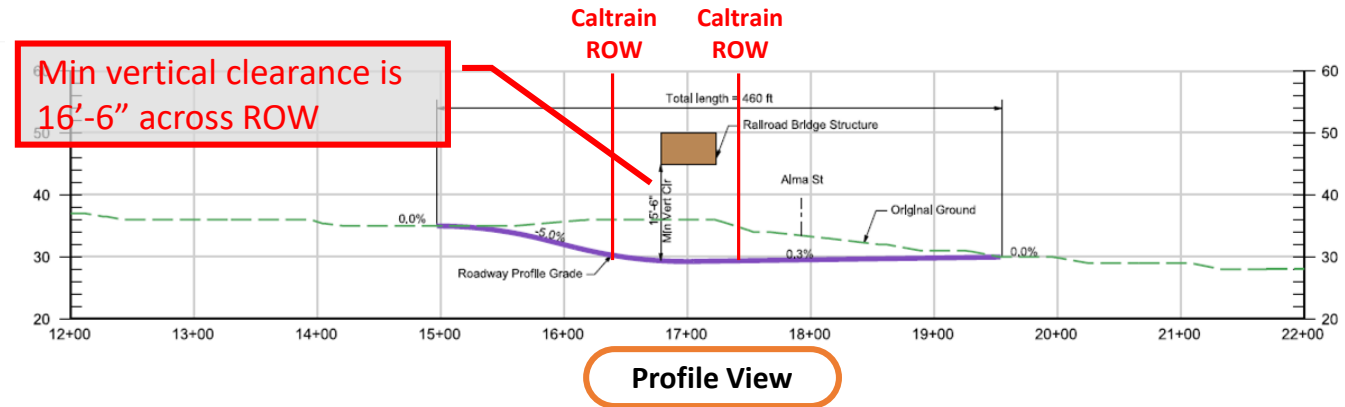
# Vertical Alignment (Correction)

## 1. Vertical Dimensions (Roadway Vertical Clearance required across Caltrain ROW )

- Vertical Clearance for vehicular traffic under the Railroad (Increase from 15.5' to 16.5')



**Charleston Rd Profile**  
**Meadow Drive Underpass**

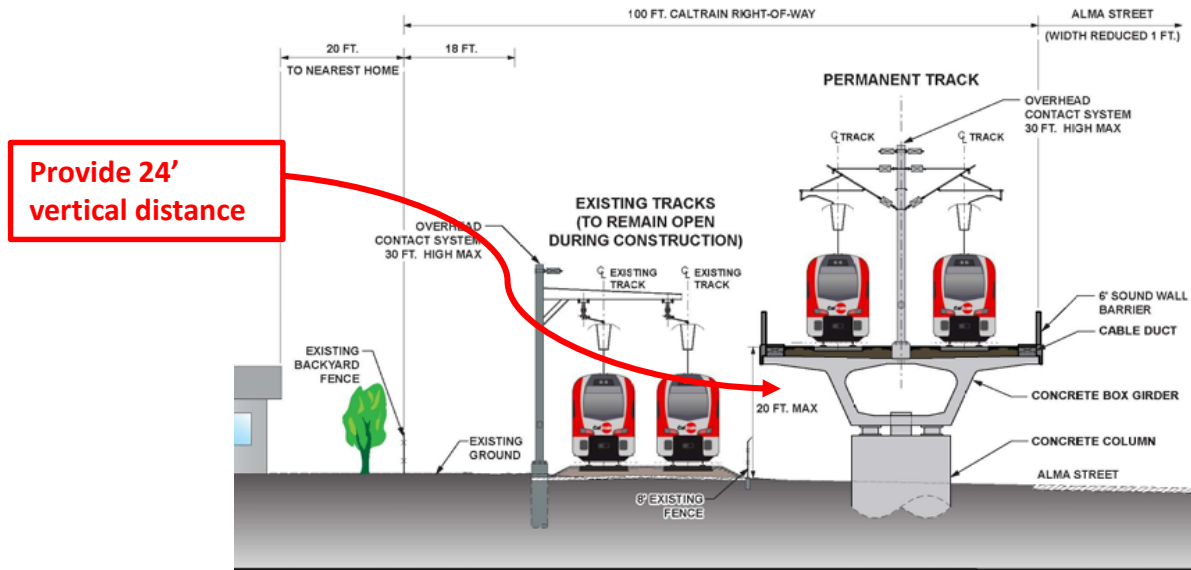


**Meadow Charleston - Hybrid**

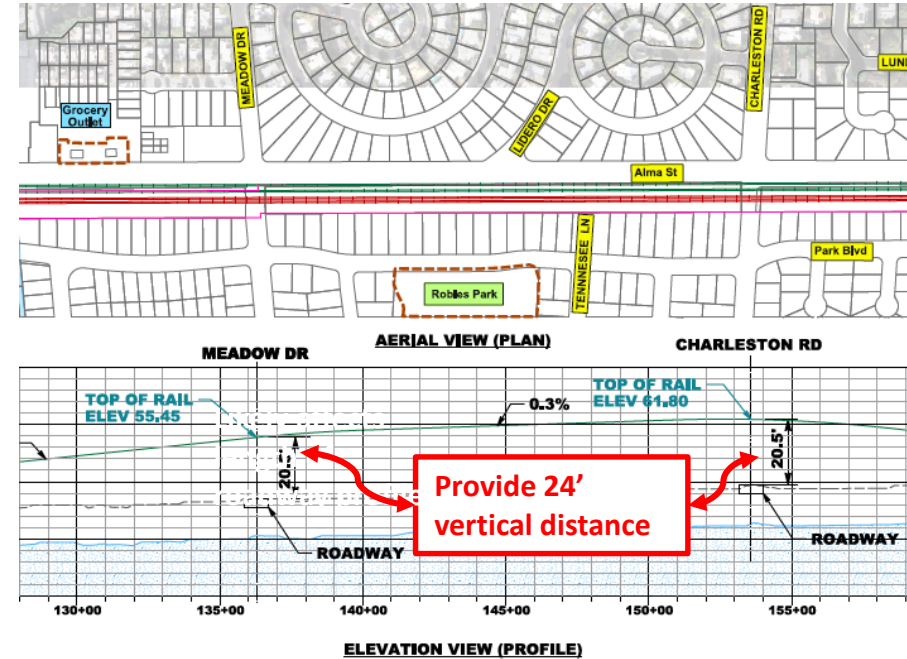
# Vertical Alignment (Correction)

## 2. Vertical Dimensions (Top of Rail to Top of Roadway – Viaduct Alternative only)

- Vertical Clearance for vehicular traffic under the Railroad (Increase from 20.5' to 24.0')



**Example Section - Viaduct - Looking North**  
(Typical Between Meadow Dr & Charleston Rd)

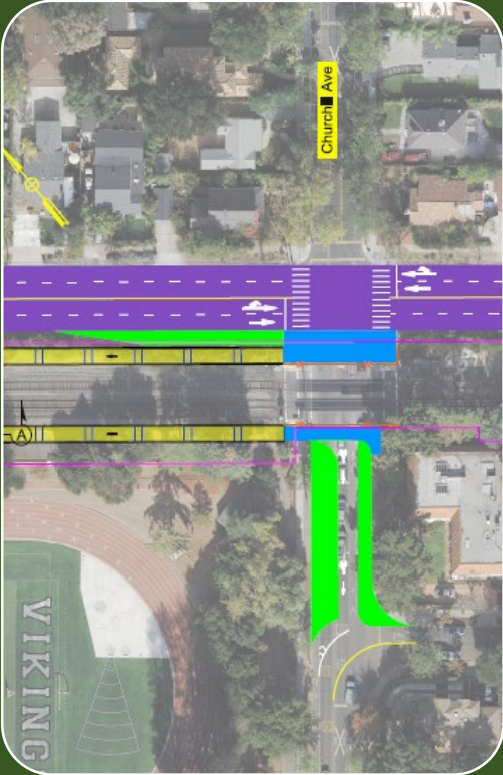


**Meadow Charleston - Viaduct Alternative**



# Summary of Comments - Churchill Avenue

## Churchill Closure with Mitigations - Option 1

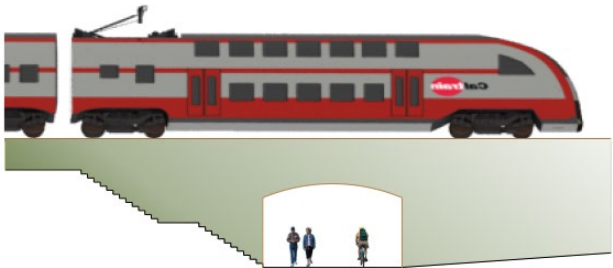
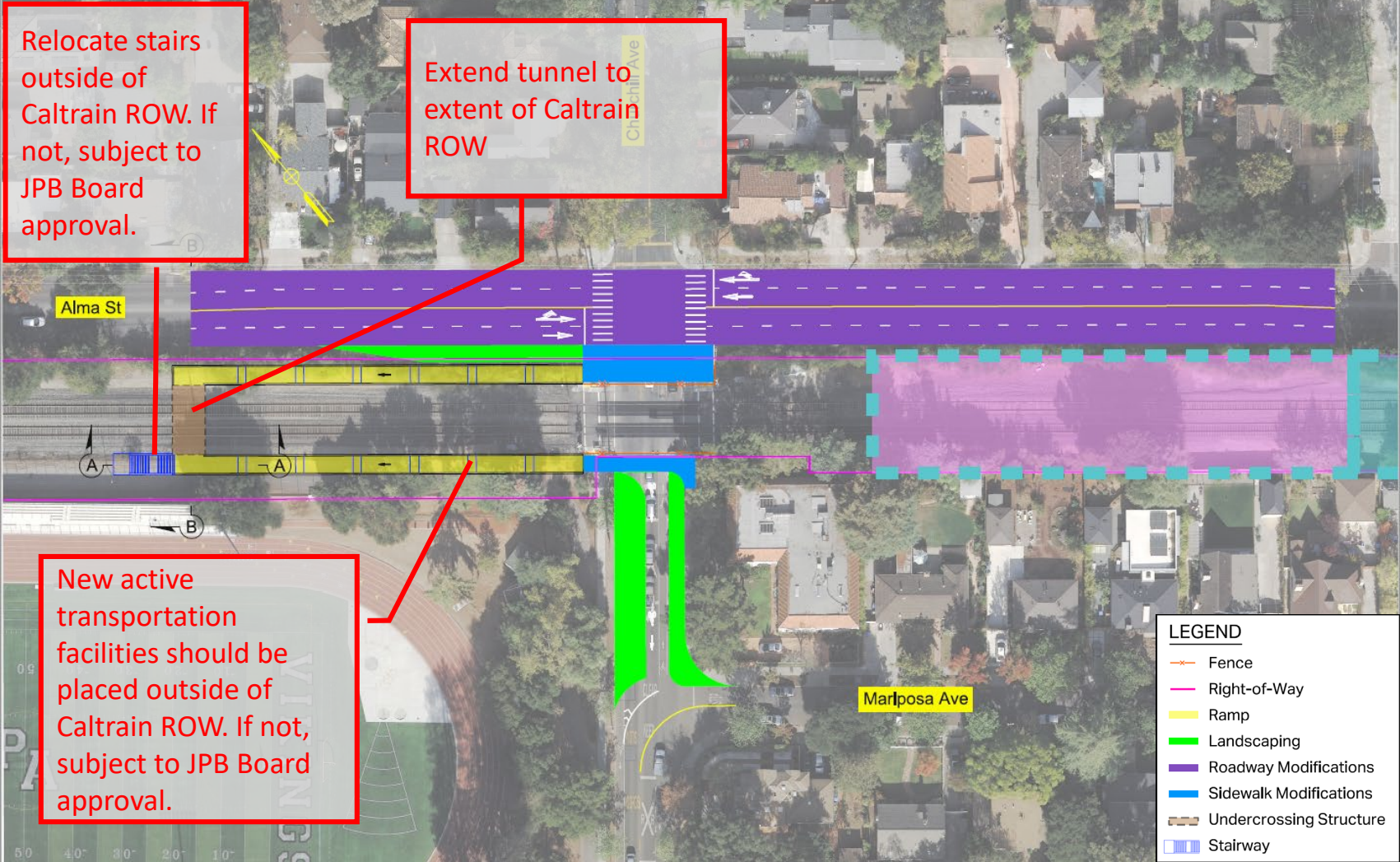


- New active transportation facilities should be placed outside of Caltrain ROW. If not, they are subject to JPB Board approval

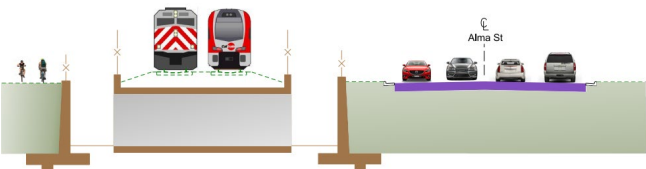
\* No Changes for Churchill Avenue Closure with Mitigations Option 2

# Summary of Comments - Churchill Avenue – Closure Option 1

Plan View



Section A-A

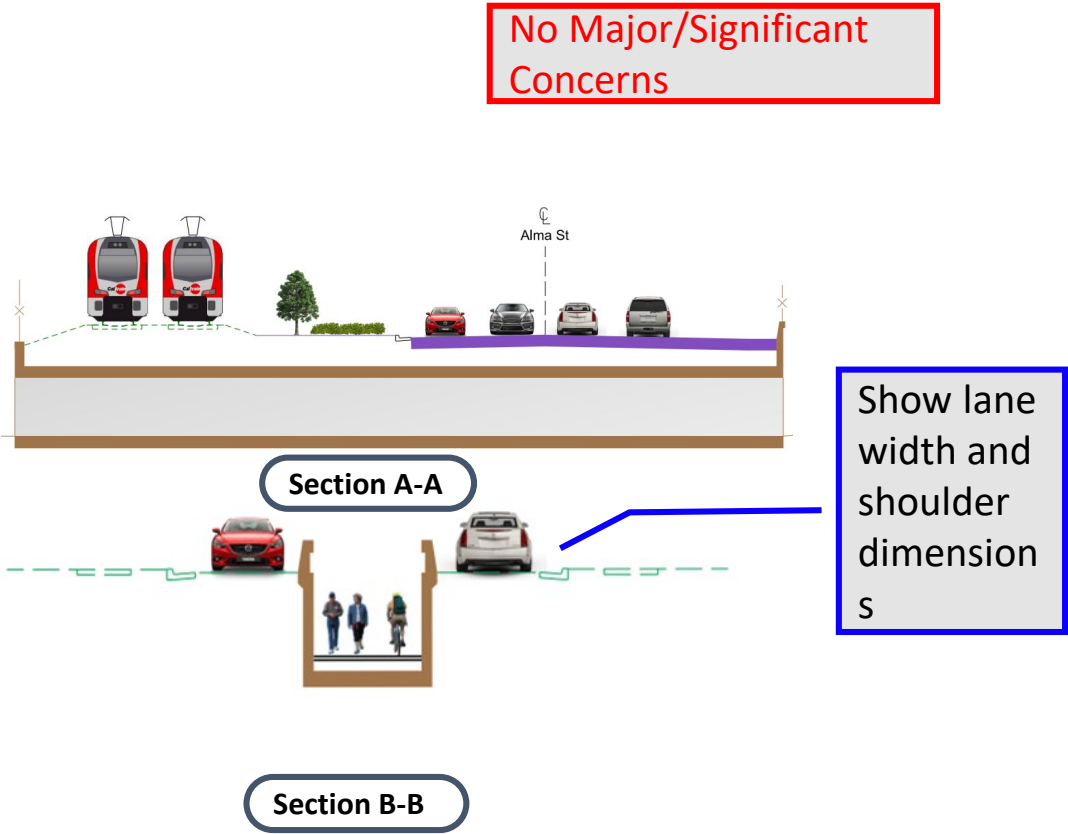
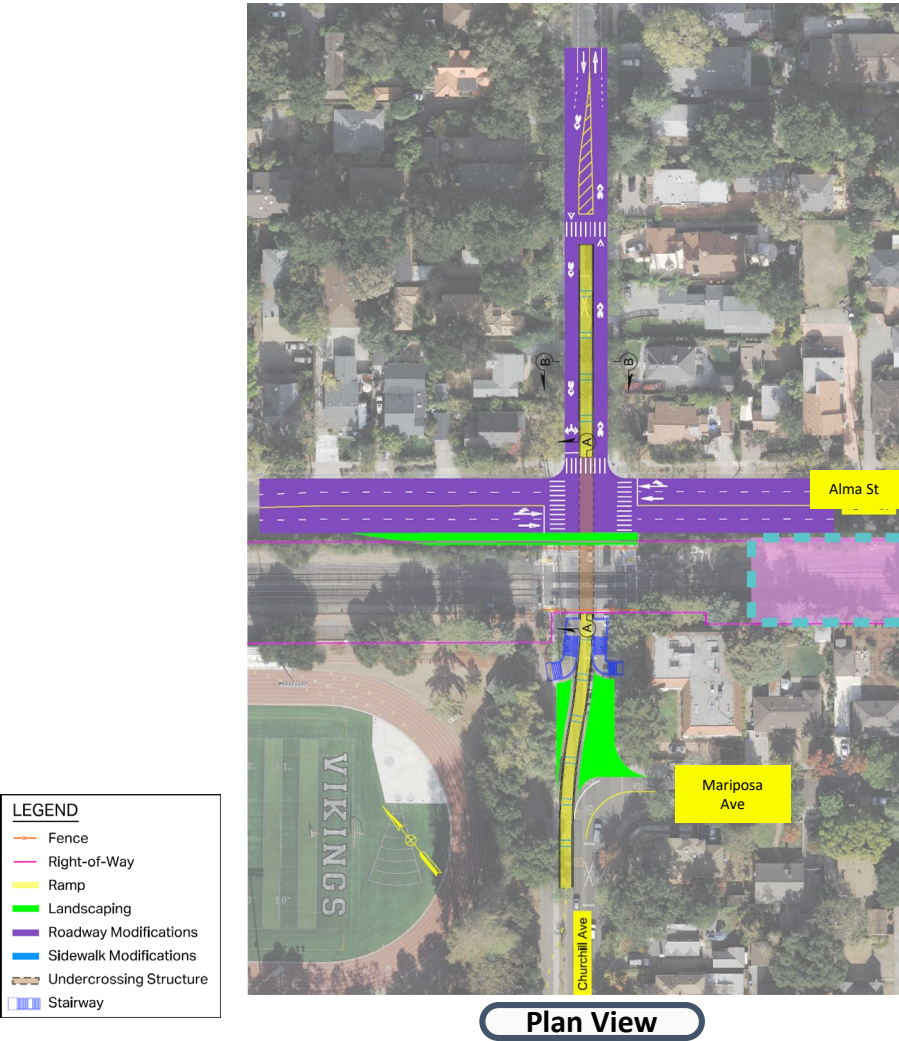


Section B-B

- 4-Track Influence Area
- Transition between 2-Track and 4-Track



# Summary of Comments - Churchill Avenue – Closure Option 2




# Summary of Comments - Churchill Avenue

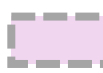
## Churchill - Partial Underpass

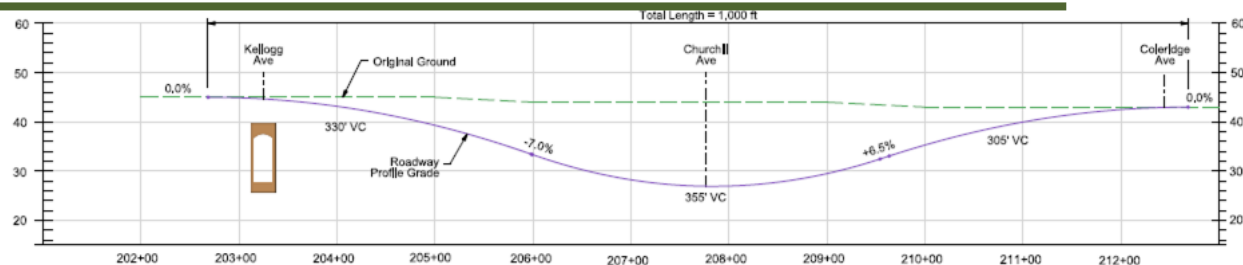


- New active transportation facilities should be placed outside of Caltrain ROW. If not, they are subject to JPB Board approval.
- Adjust retaining walls outside of Caltrain ROW.
- Provide 16'6" vertical clearance requirement for the extent of the Caltrain ROW—will require reprofiling of roadway
- Bridge width to provide access for Caltrain maintenance and emergency vehicles.
- Roadway design to meet Caltrans HDM/AASHTO 'Greenbook' /AASHTO 'Highway Safety Manual'

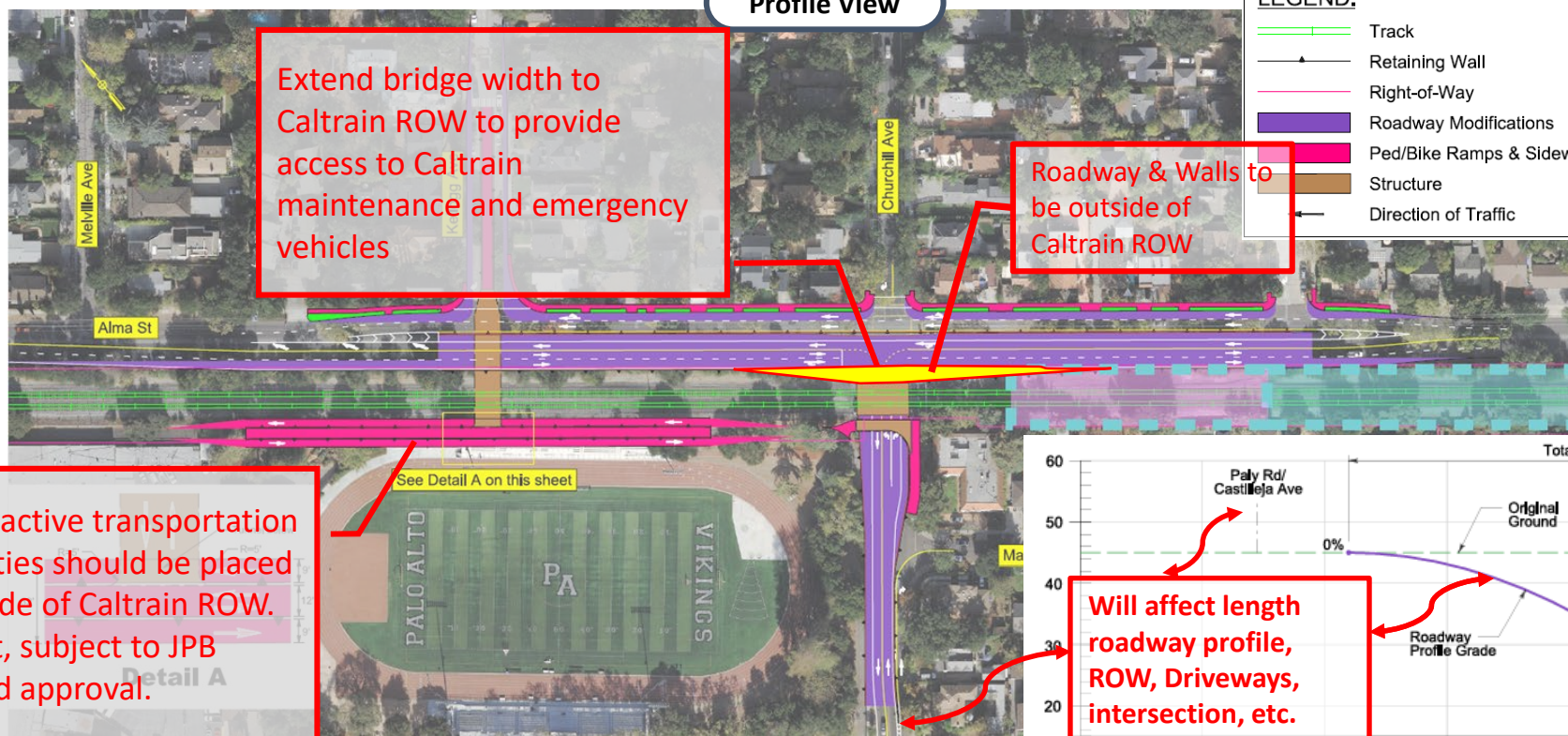
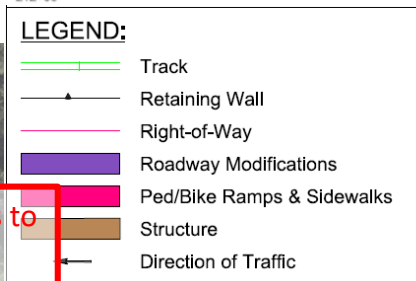
# Summary of Comments - Churchill Avenue – Partial Underpass

 4-Track Influence Area

 Transition between 2-Track and 4-Track



Profile View



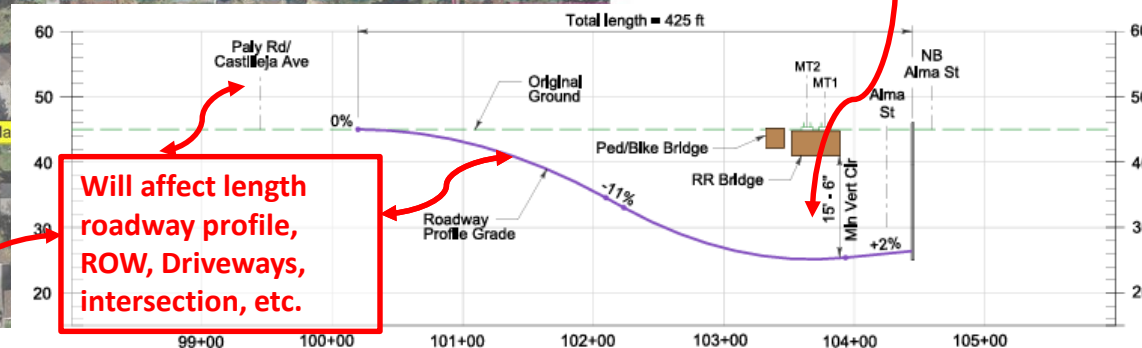
Extend bridge width to Caltrain ROW to provide access to Caltrain maintenance and emergency vehicles

Roadway & Walls to be outside of Caltrain ROW

Provide 16'-6" vertical clearance

New active transportation facilities should be placed outside of Caltrain ROW. If not, subject to JPB Board approval.

Will affect length roadway profile, ROW, Driveways, intersection, etc.



Churchill Ave (Profile)

Other elements:

- Merging taper/median design
- Offset from barriers
- Lane width etc.
- Curved bridges



# Summary of Comments – Meadow Drive & Charleston Road

## Meadow Charleston - Underpass



- Provide 16'6" vertical clearance requirement for the extent of the Caltrain ROW—will require reprofiling of roadway.
- Provide bridge width to provide access for Caltrain maintenance and emergency vehicles.
- Adjust retaining walls outside of Caltrain ROW to accommodate 4-track and 4-track transitions, provide sufficient space (10' min) for maintenance vehicle access, and maximize utility of Caltrain ROW.
- Roadway design to meet Caltrans HDM/AASHTO 'Greenbook'/AASHTO 'Highway Safety Manual'

# Summary of Comments – Meadow Dr - Underpass

## Plan View (Meadow Drive)

Adjust wall/foundation design and location to be outside of the Caltrain ROW. Additional width is not needed for turning lane sight distance.

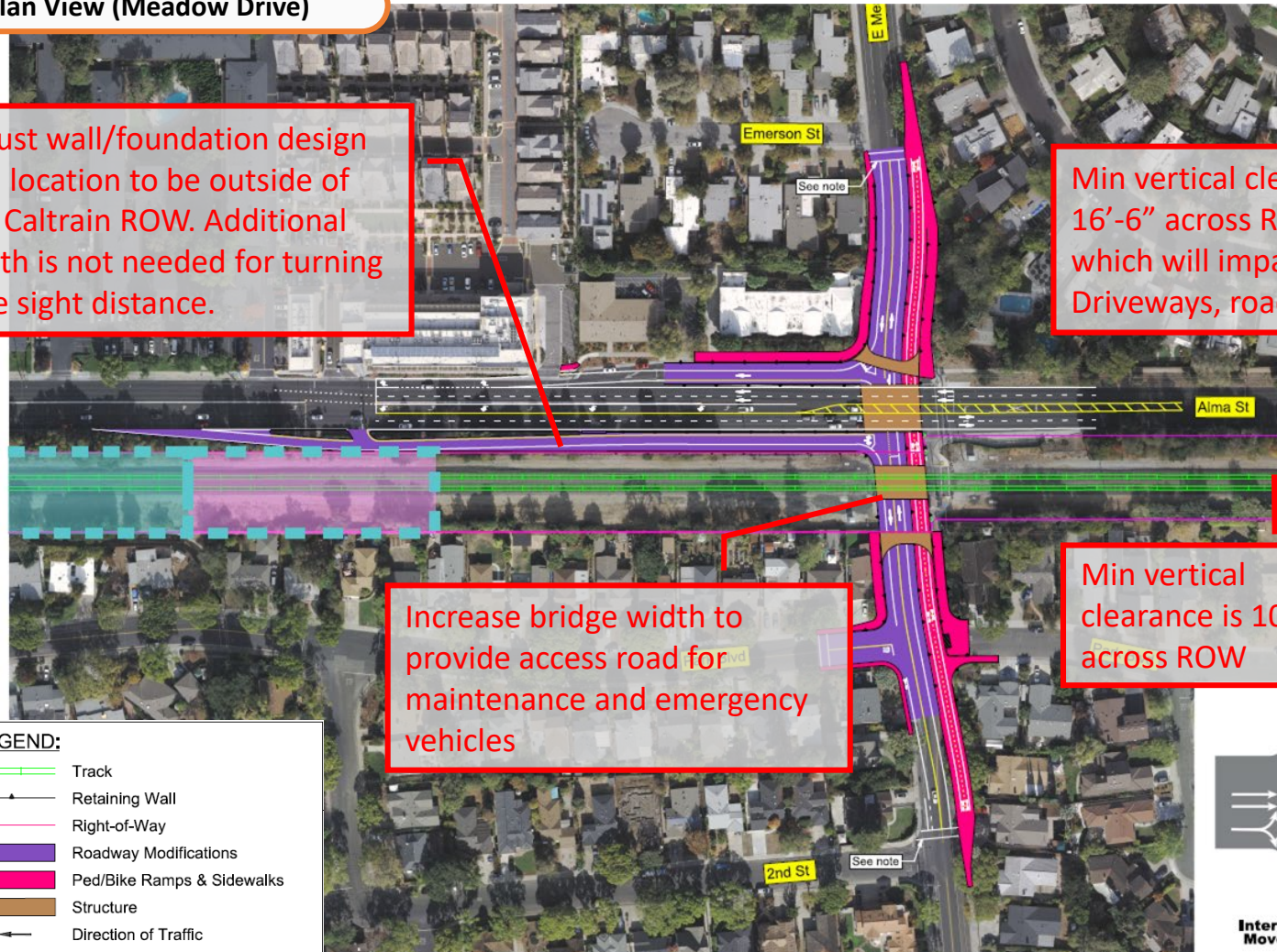
Min vertical clearance is 16'-6" across ROW, which will impact ROW, Driveways, road profile.

Increase bridge width to provide access road for maintenance and emergency vehicles

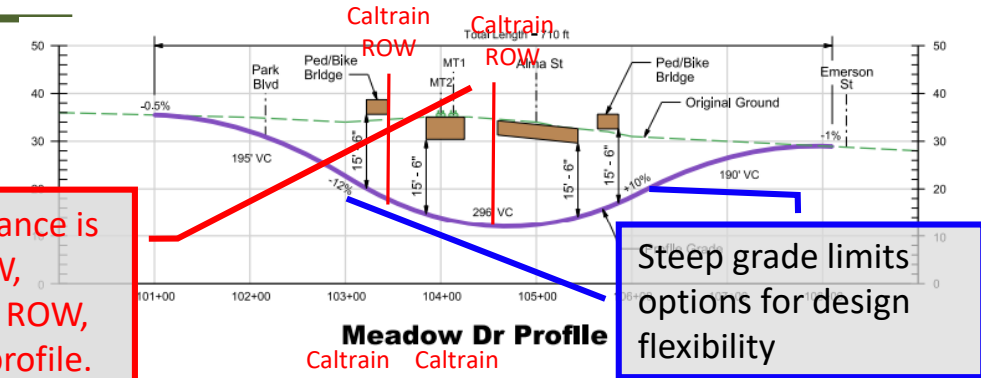
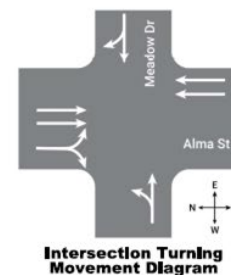
Min vertical clearance is 10' across ROW

**LEGEND:**

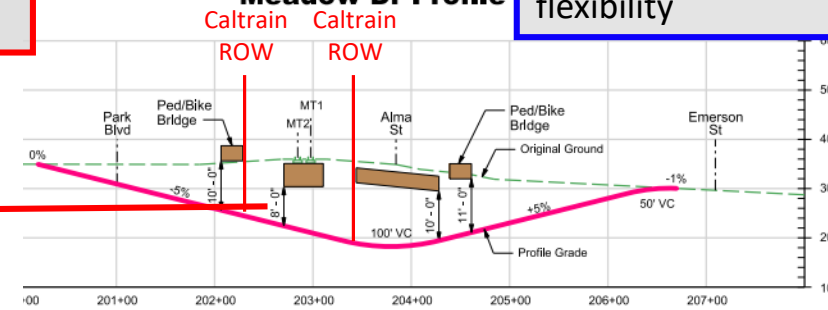
- Track
- Retaining Wall
- Right-of-Way
- Roadway Modifications
- Ped/Bike Ramps & Sidewalks
- Structure
- Direction of Traffic



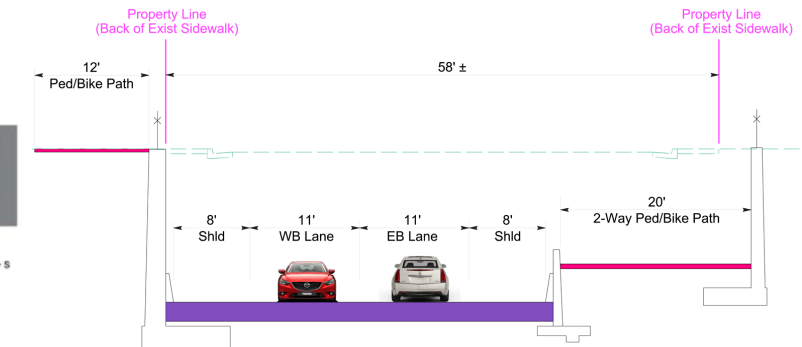
4-Track Influence Area      Transition between 2-Track and 4-Track



Steep grade limits options for design flexibility



**Ped/Bike Profile from Park Blvd to Emerson St**

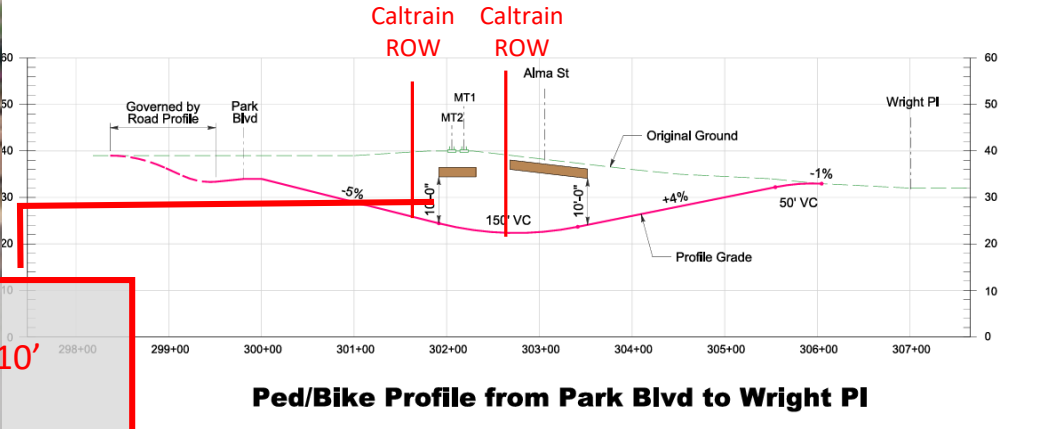
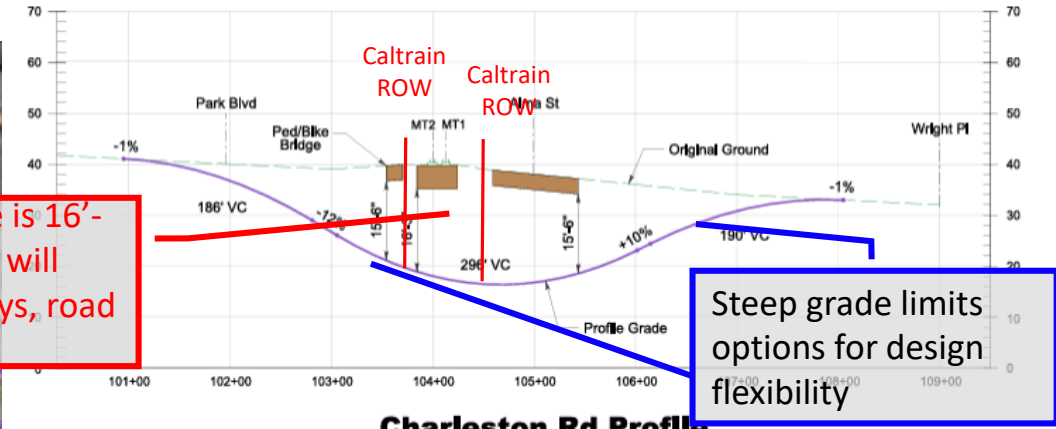
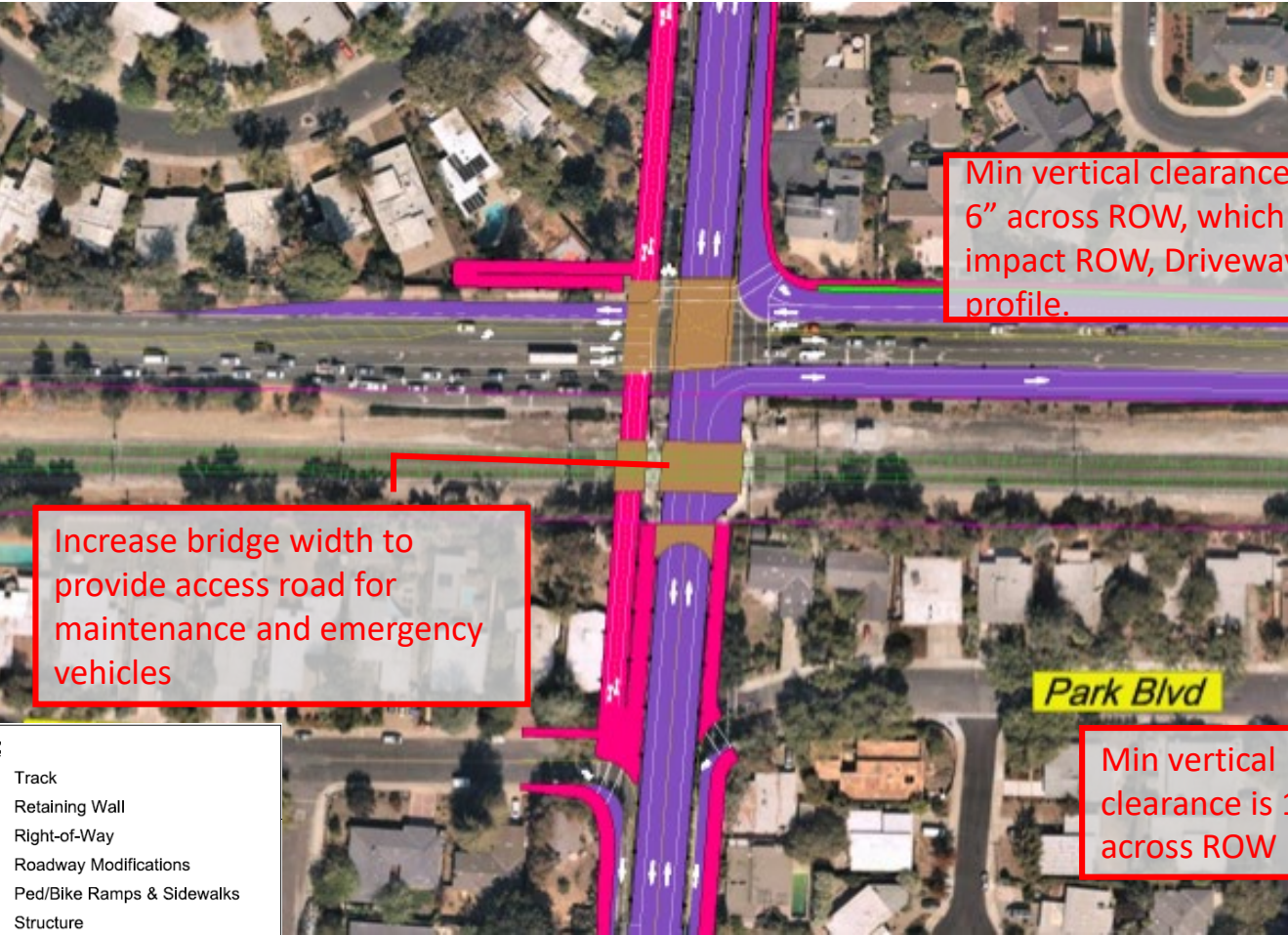


**Typical Section Meadow Dr Underpass**



# Summary of Comments –Charleston Rd - Underpass

Plan View (Meadow Drive)



 4-Track Influence Area     Transition between 2-Track and 4-Track



# Summary of Comments – Meadow Drive & Charleston Road

## Meadow Charleston - Hybrid



- Provide 16'6" vertical clearance requirement for the extent of the Caltrain ROW.
- Adjust retaining walls to accommodate 4-track and 4-track transitions.
- Provide sufficient space (10' min) for maintenance vehicle access and maximize utility of Caltrain ROW.
- Provide sufficient space (10' min) clearance from the walls to the roadway or structures
- Construction of permanent MSE walls to be at 20' from center of shoofly track—constructability clearance from OCS and active railroad.

# Summary of Comments – Meadow Dr & Charleston Rd - Hybrid

 4-Track Influence Area     Transition between 2-Track and 4-Track

Provide additional width on the bridge to accommodate access road for maintenance and emergency vehicles

Fill retaining walls to accommodate 4-track and transition between 2-track and 4-track

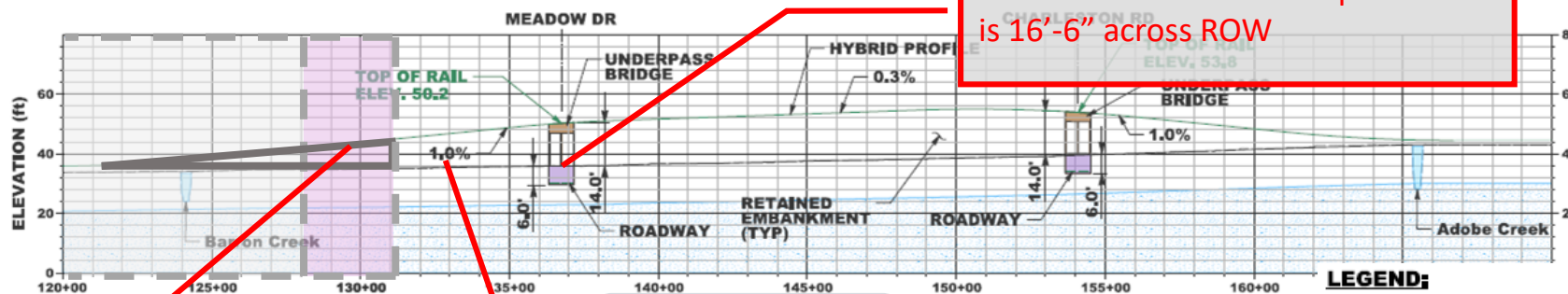


Plan View

Min vertical clearance requirement is 16'-6" across ROW

Design speed is 110 mph for passenger rail

Transition segment should be tangent as special trackwork should stay outside of vertical curves



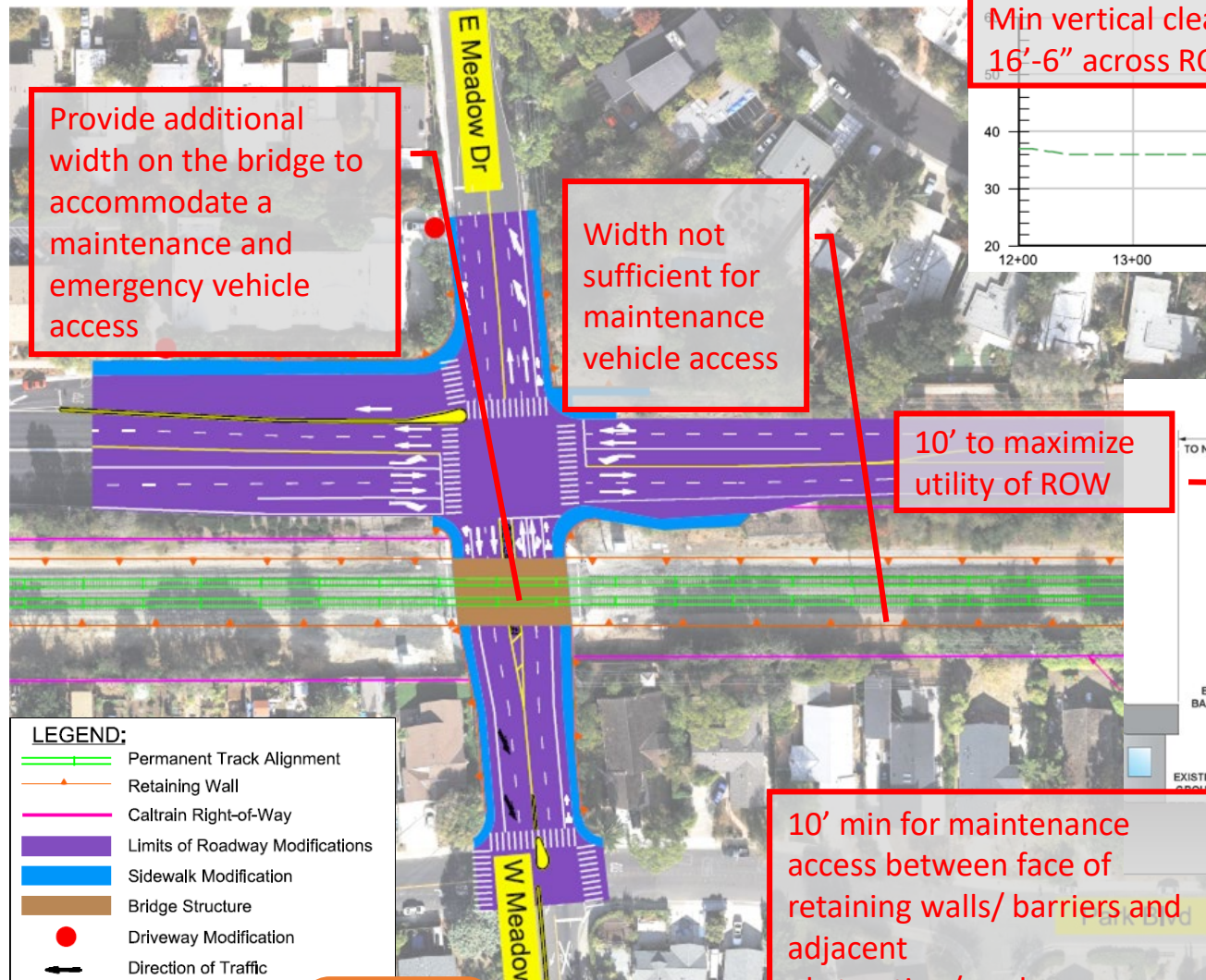
Profile

1% grade is the current maximum without variance. 1% to 2% grade requires review and approval by the Director of Engineering

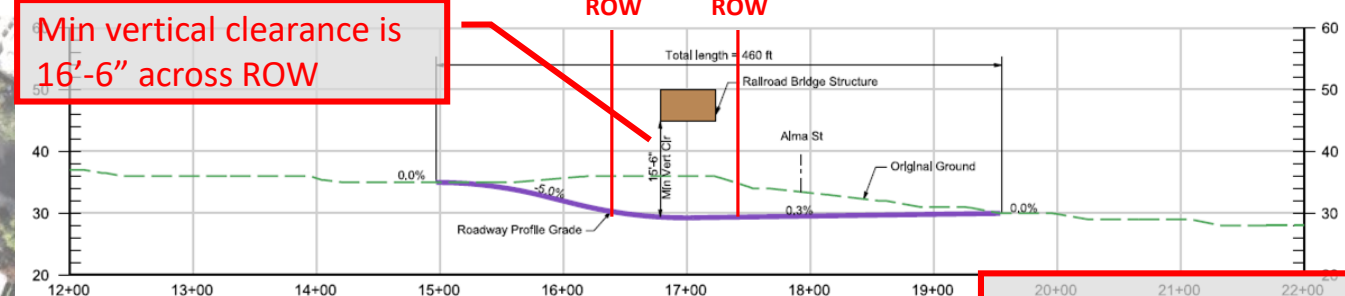




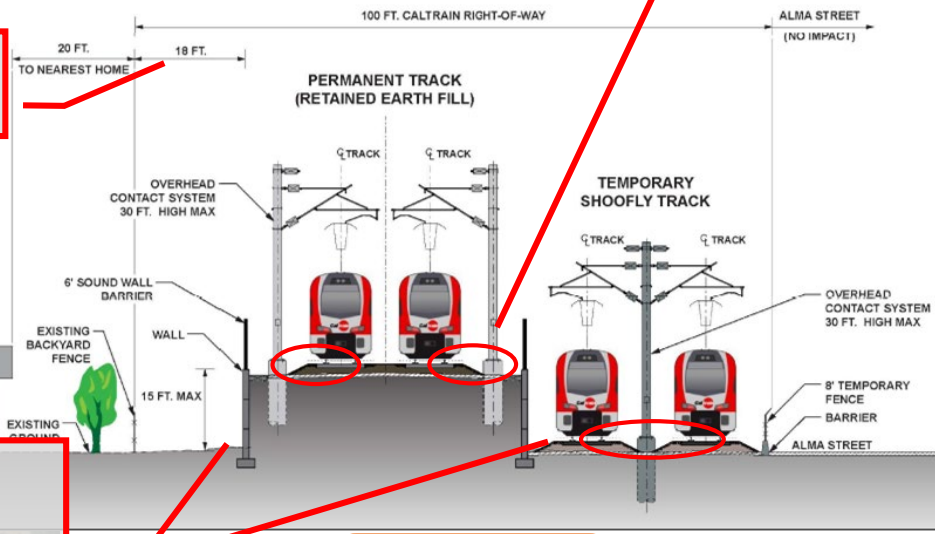
# Summary of Comments – Meadow Dr - Hybrid



Min vertical clearance is 16'-6" across ROW

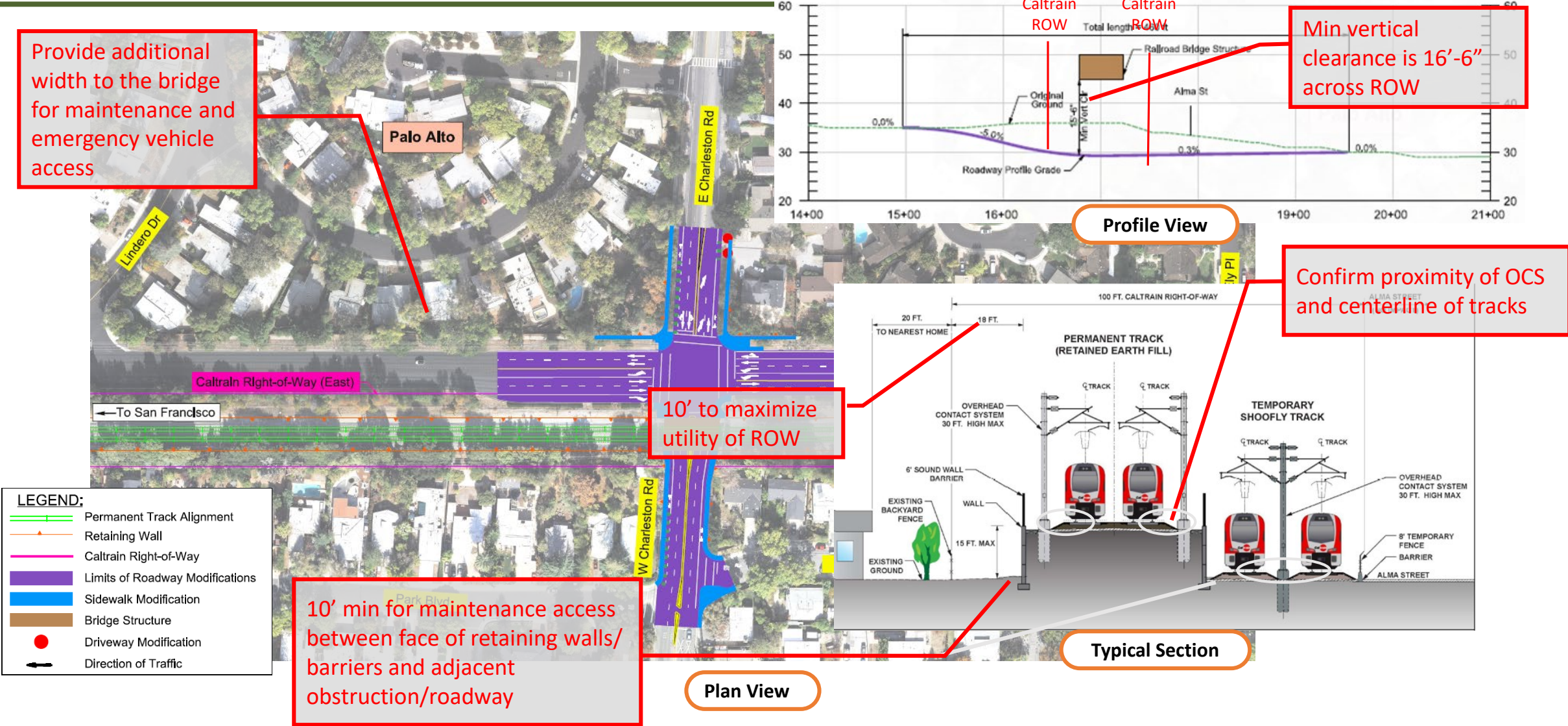


Confirm proximity of OCS and centerline of tracks





# Summary of Comments – Charleston Rd - Hybrid



# Summary of Comments – Meadow Drive & Charleston Road

## Meadow Charleston - Viaduct



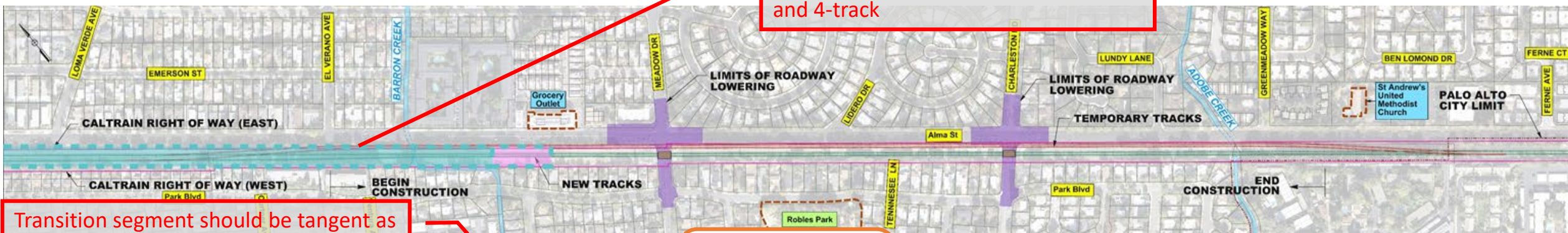
- Provide 16'6" vertical clearance requirement for the extent of the Caltrain ROW—will require reprofiling of roadway and/or Caltrain tracks.
- The vertical dimension from the top of the roadway to the top of the rail should be 24' instead of 20' to accommodate 5-foot bridge depth and 2'-6" Rail.
- Provide bridge width to provide access for Caltrain maintenance and emergency vehicles.
- Adjust retaining walls to accommodate 4-track and 4-track transitions.
- Provide sufficient space (10' min) for maintenance vehicle access and maximize utility of Caltrain ROW.
- Construction of permanent MSE walls to be at 20' from center of shoofly track—constructability clearance from OCS and active railroad.
- Roadway design to meet Caltrans HDM/AASHTO 'Greenbook'/AASHTO 'Highway Safety Manual'



# Summary of Comments – Meadow Dr & Charleston Rd - Viaduct

 4-Track Influence Area     Transition between 2-Track and 4-Track

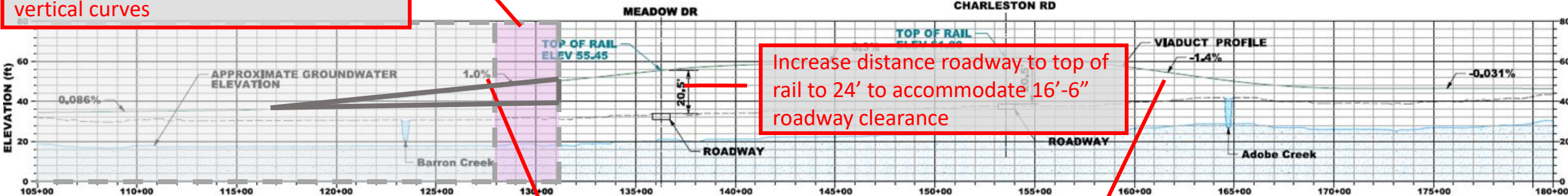
Fill retaining walls to accommodate 4-track and transition between 2-track and 4-track



Plan View

Transition segment should be tangent as special trackwork should stay outside of vertical curves

Increase distance roadway to top of rail to 24' to accommodate 16'-6" roadway clearance












Profile

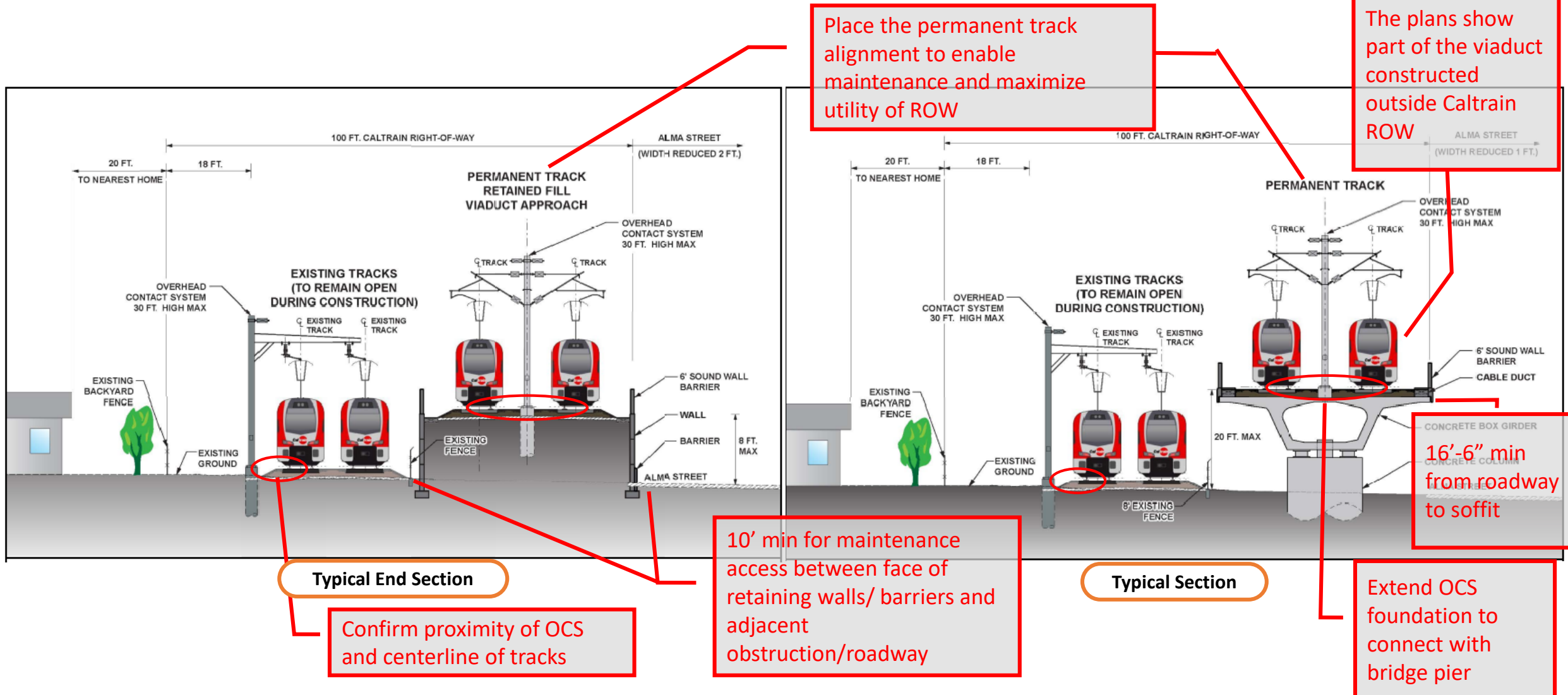
Design speed is 110 mph for passenger rail

1% grade is the current maximum without variance. 1% to 2% grade requires review and approval by the Director of Engineering

**LEGEND:**

-  New Permanent Track
-  Existing Tracks
-  Viaduct Track Profile
-  Existing Ground Level
-  Caltrain Right Of Way
-  Landmark
-  Creek
-  Bridge
-  Groundwater

# Summary of Comments – Meadow Dr & Charleston Rd - Viaduct



# Next Steps

## Next Steps



The goal is to provide sufficient information for Rail Committee to evaluate alternatives and make recommendation to the City Council. Therefore, Staff is seeking

- Rail Committee's review of comments to provide guidance to staff on specific elements.
- Direct staff to proceed coordination with Caltrain Staff or their Consultants and/or City's project consultant for material changes to alternatives





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