APPENDIX B

Basis of Design

MOTT MACDONALD

Antelope Valley Line Environmental & Technical Studies

Basis of Design

July 2021

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1 Project Background

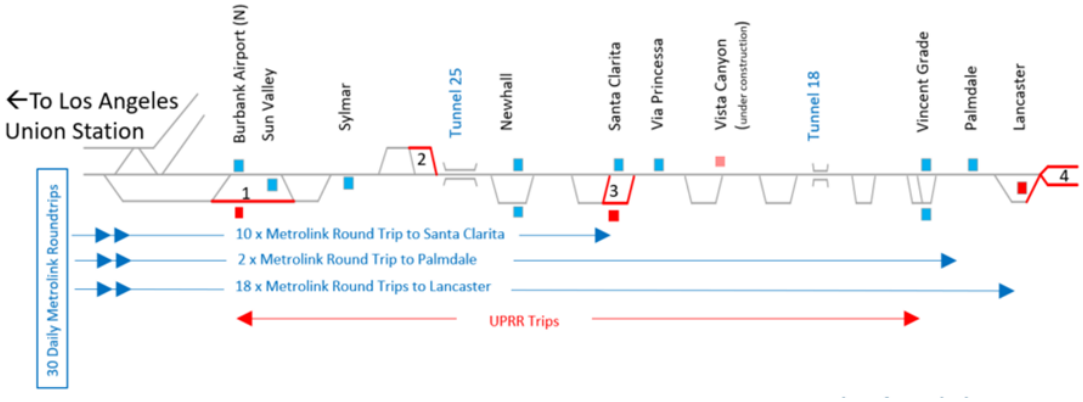
1.1 Introduction

The purpose of this Basis of Design (BoD) is to summarize and document the engineering design approach that supports the concept designs for the Antelope Valley Line (AVL) Capacity and Service Improvement Program. It includes a summarized description of the project goals, operational requirements, scope of work, and design standards.

1.2 Project Goals

The goal of the proposed capital improvements on the AVL is to enable a 30-minute bi-directional passenger rail service between Los Angeles Union Station (LAUS) and the Santa Clarita Valley and 60-minute bi-directional service between LAUS and Lancaster Station. Figure 1 below presents the operational requirements for this project.

Figure 1.1: Operational Requirements and Infrastructure Improvements



1.3 Scope of Work

The infrastructure improvements required to meet the operational requirements were studied and defined in the Antelope Valley Line Study Final Report dated October 22, 2019. The results of this study were subsequently verified by the service operator, Metrolink. The three required infrastructure improvement projects are:

i. The Balboa Double Track Extension
ii. The Canyon Siding Extension
iii. The Lancaster Terminal Improvements

A fourth infrastructure improvement, Brighton to Roxford, is being environmentally cleared under a different Metro-led project.

The Balboa Double Track improvements include an extension of the Sylmar Siding between CP Balboa MP 25.3 and Sierra Highway OH at MP 26.4. The Canyon Double Track improvements include an extension of the Saugus siding between CP Canyon MP 33.4 and Golden Oak Road at MP 34.96 with a second side platform at Santa Clarita Station. The Lancaster Terminal improvements include the addition of a layover facility north of Lancaster Station with capacity to store and service up to 4 x 5-car Metrolink trains.

1.4 Codes and Standards

The design of all elements associated with this scope aims to comply with all current, relevant, and prevailing engineering standards, codes, regulations, and ordinances. Where conflicts exist among criteria, standards, codes, regulations, or ordinances, the more stringent requirements have been applied.

2 Survey Data and Asset Information

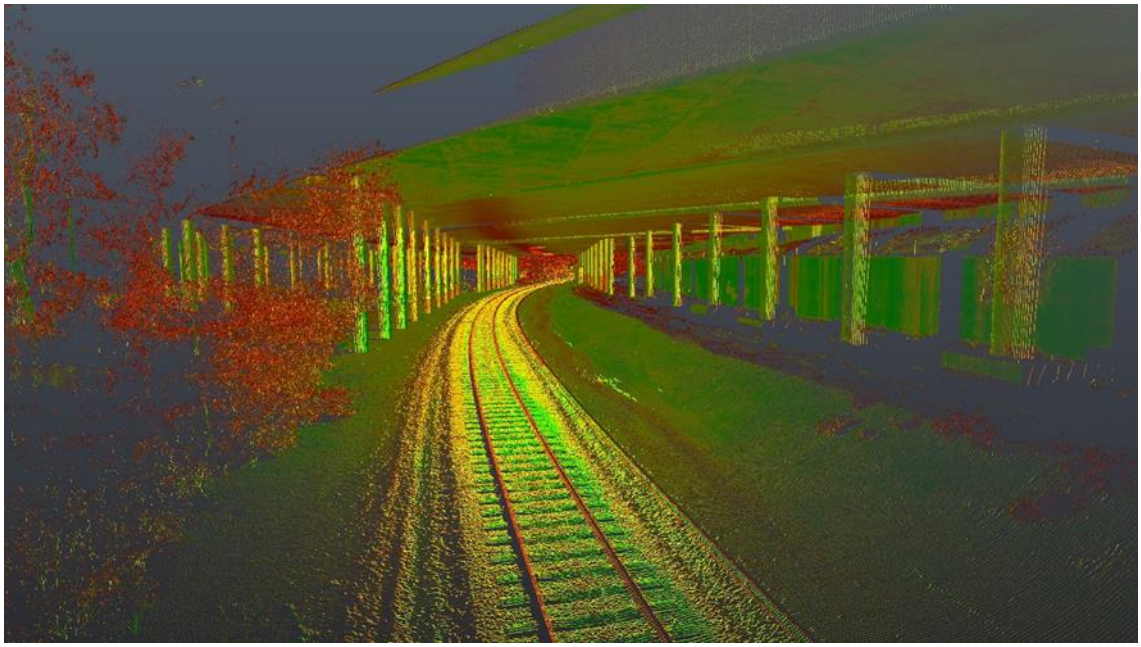
2.1 Metrolink Survey Data

The Mott MacDonald team were provided with Metrolink's network survey information on March 12th, 2020. The data includes.

i. Archived Geometry Runs
ii. Aerial Imagery
iii. RangeCam Data
iv. Georeferenced Point Clouds
v. Track Charts
vi. Track bed Condition Reports

The Georeferenced Point Clouds were particularly useful to determine the existing clearance between the I-5 over-bridge columns and the existing tracks within the Balboa site, see Figure 2.1. It was also used to verify the resultant clearance to the proposed second track and to support the design of the pier protection adjacent to the proposed double track.

Figure 2.1: Georeferenced Point Cloud (LIDAR) Survey at I-5 Over-Bridge



2.2 Metrolink Track Charts for Valley Subdivision

The Metrolink Valley Subsection Track Charts dated 2019 were used to determine all MP references and all CP names and locations. The charts also identify the location and alignment of Metrolink communication cables and any other railroad related utilities within the corridor.

2.3 Project Specific Survey Data

The Metrolink survey data only included ortho aerial data that had not been developed into a Digital Terrain Model (DTM) or a contour model. Therefore, given the anticipated amount of

grading needed, a decision was made at the beginning of the design process in spring 2020 to undertake supplemental aerial surveys to support the engineering design. Aerial surveys using drone technology were undertaken to support the design at each of the improvement sites, Lancaster, Canyon and Balboa. These were performed on May 21 & May 22, 2020. This information was then used to create ortho rectified aerial imagery and also to develop the DTM and contour models.

2.4 Geological and Geotechnical Reference Data

A desk top assessment of the existing geological and geotechnical conditions at each of the three improvement project sites has been conducted using a range of reference material.

3 Design Approach

3.1 Overall Design Approach

The design of each of the three improvement projects has followed the same design approach.

i. Each design has aimed to minimize the potential disruption of the operational railroad during construction. To achieve this, the new second track has been designed as parallel and offset from the existing track, enabling the existing track to remain undisturbed during construction, to the maximum extent practicable.
ii. Where existing SCRRA/Metro civil assets do not meet current standards or codes, and their modification or replacement is not required as part of the service improvement work, the designs have not been included any improvement.
iii. Earthworks, grading, and civil works associated with widening the track bed to accommodate two tracks will remain within the existing railroad right-of-way wherever possible and the need to acquire additional right-of-way parcels or news easements has been be minimized.
iv. Where new track design speeds are not specified, the existing track design speed has been applied.
v. The depth of drainage ditches varies and has been designed to provide a flow line that meets SCRRA design criteria. A future hydrology study will be needed to determine the hydraulic capacity of the ditches based on actual local conditions.

3.2 Balboa - Specific Design Approach

The existing Sylmar Siding terminates at the Balboa Boulevard road bridge at CP Balboa MP 25.3. The Balboa double track extension extends this siding north by approximately 1.1 miles to the Sierra Highway road bridge (just south of Tunnel #25), terminating at MP 26.4., as shown in Figure 3.1.

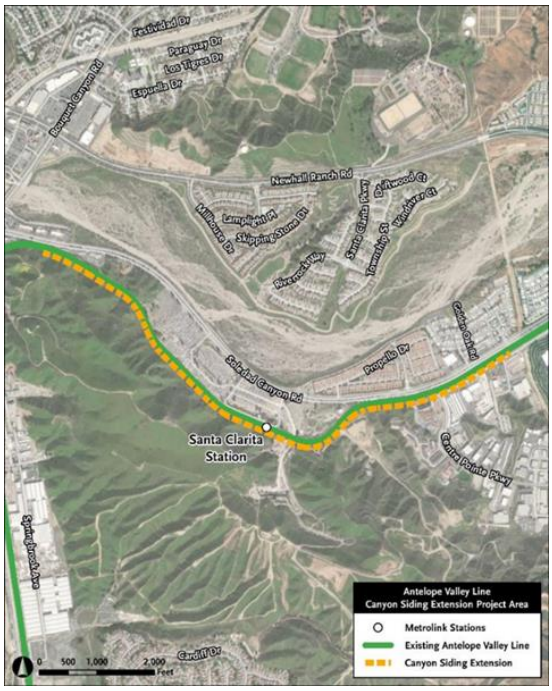
To provide the minimum required horizontal clearance of 25’ between the new second track and the existing Balboa Boulevard bridge columns, the re-alignment of both the existing Main Track and the existing Sylmar Siding (new second track) is necessary. The existing turnout will be removed, and the proposed new second track will be located using 15’ track centers.

The existing track bed narrows as it passes under the I-5 freeway bridge at MP 25.8 and it is not possible to accommodate the existing Main Track and a new second track using 25’ horizontal side clearances to the existing I-5 columns. As a result, the existing Main Track will be re-aligned under the I-5 to balance side clearances for both tracks. Also, pier protection is proposed adjacent to the I-5 columns where the 25’ clearance requirement cannot be achieved.

The proposed second track will terminate just before the Sierra Highway road bridge. The existing spur track (high-rail take-off track at MP 26.1) at this location will need to be repositioned south and east of the new double track tie-in point and CP. This localized three track configuration will also require the re-alignment of the existing property access road on the eastern side of the rail tracks and will require extensive associated Caltrans I-5 embankment slope regrading. This will result in an encroachment into Caltrans right-of-way however, retaining walls are proposed to minimize this extent encroachment.

Figure 3.1: Balboa Project Limits

Figure 3.2: Canyon Project Limits



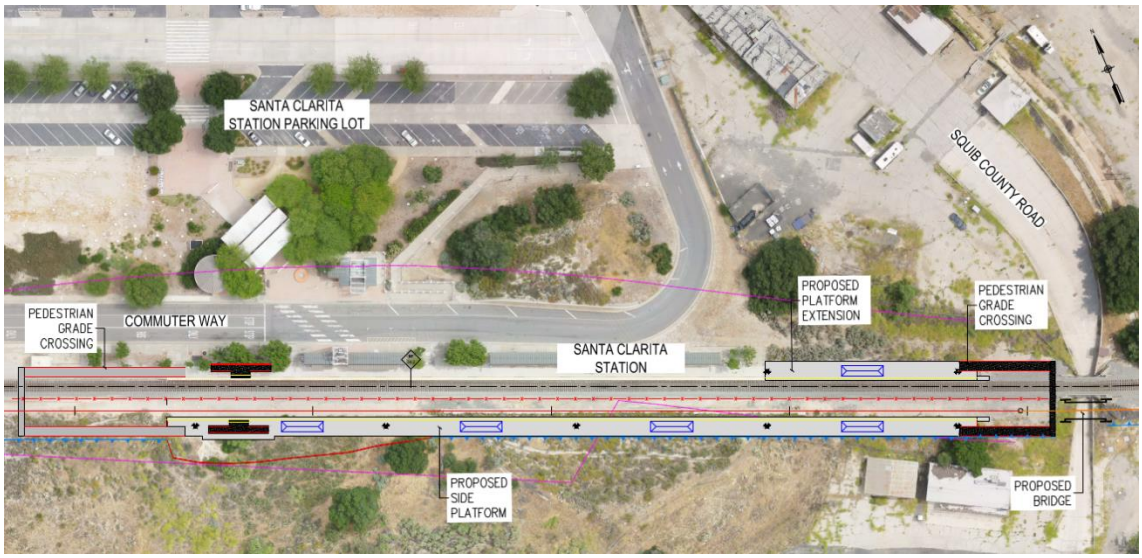
3.3 Canyon - Specific Design Approach

The Saugus Siding extension at Canyon is similar to the Balboa segment however re-alignment of the existing Main Track has largely been avoided. The existing CP Canyon turnout at MP 33.4 will be removed as a result of the siding extension and a new crossover will be installed at this location. The function of the new crossover will be to facilitate improved operational flexibility for future turnback services in the Santa Clarita Valley. The siding extension will run parallel to, and on the east side of the existing Main Track until reverting back to a single-track at a new CP at MP 35.0, just north of the existing Golden Oak Road grade crossing. The project limits are shown in Figure 3.2.

A new, second platform is proposed at Santa Clarita Station as shown in Figure 3.3. A fully compliant side platform is proposed parallel to the existing platform. Also, the existing platform will be extended by approximately 180’ and upgraded to meet current Metrolink standards.

An at-grade pedestrian crossing is proposed at the south (west) end of the platforms and an additional at grade crossing is also proposed at the north end of the platform to meet Metrolink and NFPA 130 emergency egress requirements.

Figure 3.3: Santa Clarita Station Base Design



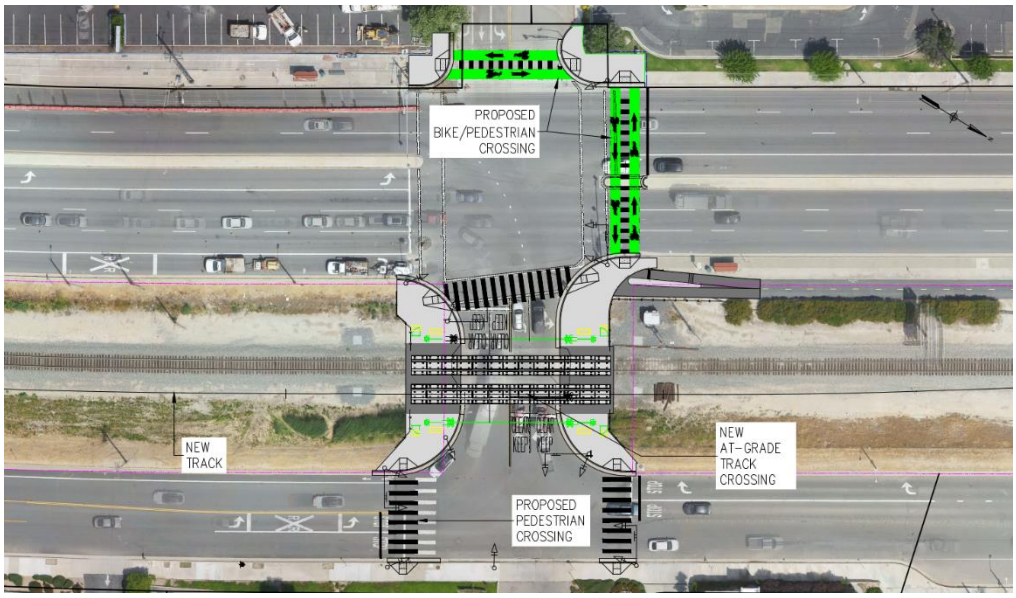
There is an existing single-track over-bridge just north (west) of the station platforms. To minimize the impact to the operational track during construction, a 20’ track center is proposed locally at the bridge to minimize operational impact during construction.

The extension of the existing Saugus Siding through the Golden Oak Road grade crossing will preclude space for vehicle storage on the eastern road leg for traffic moving northwest through the intersection. Therefore, traffic signals are proposed to preempt the gate arms and keep the intersection clear.

The new grade crossing at Golden Oak Road, shown in Figure 3.4, will require the relocation of an existing gate arm at the northeast corner. Exit gates, pedestrian gates, and swing gates are proposed to meet CPUC and FRA requirements for Quiet Zones. New traffic signals are proposed at the intersection of Golden Oak Road and Golden Triangle Road to preempt the crossing arms and keep the intersection clear of traffic.

Modifications to the existing bike lane that runs parallel to Soledad Canyon Road are also proposed, including chicanes to slow down bicyclists at the crossing. Dual curb ramps are proposed at each corner.

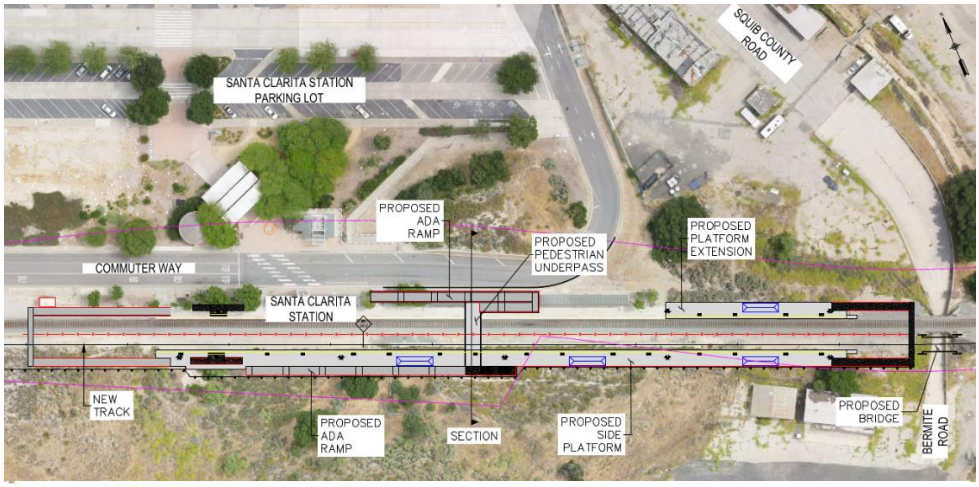
Figure 3.4: Golden Oaks Road Grade Crossing

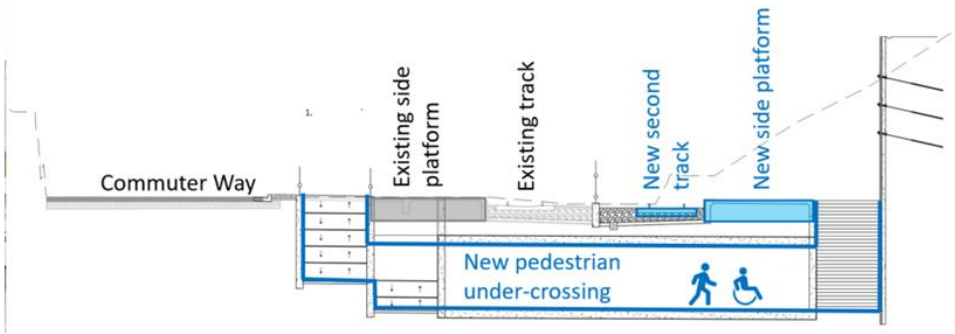


In addition to the base design, as described above, two design options have also been considered.

Design Option #1 - A pedestrian undercrossing has been considered to connect the new side platform to the existing platform and to the existing station plaza, as shown in Figure 3.5.

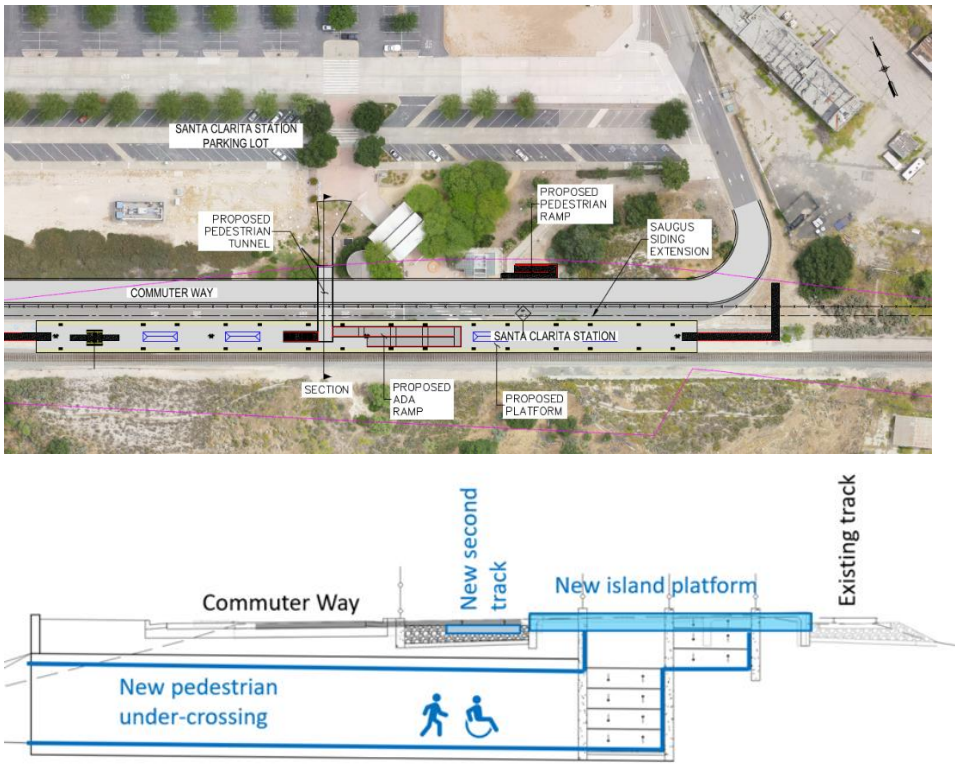
Figure 3.5: Santa Clarita Station Design Option 1





Design Option #2 - An island platform configuration has also been considered that would replace the existing side platform configuration, as shown in Figure 3.6. The island platform would also require and include a pedestrian grade-separated undercrossing connecting the existing lower level station plaza and ticketing area to the new platform. The existing bus stops on Commuter Way would be relocated to the lower parking lot service road.

Figure 3.6: Santa Clarita Station Design Option 2



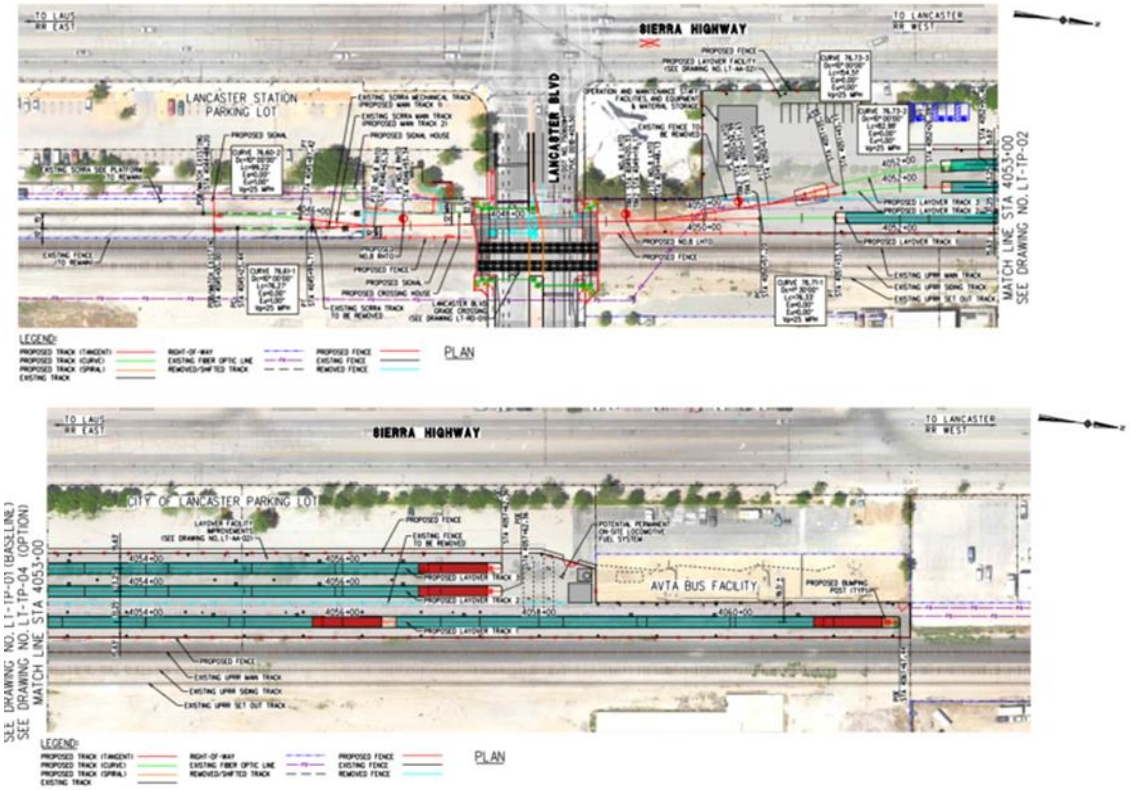
3.4 Lancaster – Specific Design Approach

The Lancaster terminal improvements will provide a new layover facility on the north side of the exiting Lancaster Station, at approximately MP 76.8, shown in Figure 3.7 The track layout for the layover facility has been designed to accommodate the overnight storage and servicing of 4 x 5-car Metrolink trains (each assumed to be up to 500’ long) in addition to the use of Lancaster Station tracks that will provide overnight storage for 4 additional trains. This is shown in Figure 3.8. The layout of the layover facility has been designed to accommodate the following servicing requirements.

- Secure overnight storage
- Inspection
- Fueling and sanding
- Cleaning
- Sanitation / toilet dump
- Maintenance staff accommodation

Figure 3.7: Lancaster Project Limits

Figure 3.8: Lancaster Terminal Proposed Layover Facility



The existing Main Track will be extended across Lancaster Boulevard to the proposed layover facility to the north. A new grade crossing will be implemented on Lancaster Blvd and will include enhanced safety features to meet FRA requirements for quiet zone readiness.

On the north side of Lancaster Blvd, the layover track will be configured using 1 x 1000’ and 2 x 500’ long storage tracks. Impacts to the existing City of Lancaster parking lot to the west are required for the additional storage tracks and a potential Metrolink building with provision for staff parking. New water and sewer lines will be extended from Lancaster Boulevard to service the train wash for the layover facility. A gravity connection to the existing storm main within Lancaster Boulevard is not feasible. As a result, a new connection is proposed through Sierra Highway to the nearest manhole north of the layover facility.

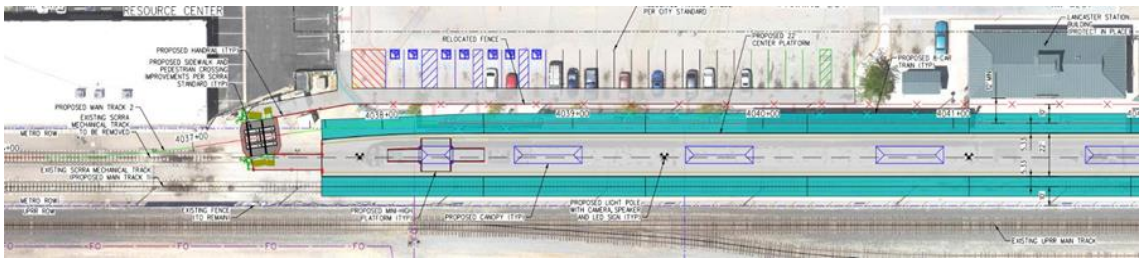
Locomotive fueling is currently performed at Lancaster Metrolink station using direct to locomotive fueling trucks. These trucks access the existing train storage tracks using a gate located in the southern corner of the existing station parking lot. Therefore, provision has also been made in the new layover design for fueling truck access using the City parking lot on the north side of Lancaster Blvd, adjacent to the new layover tracks.

In addition to the base design, as described above, three design options have also been considered.

Design Option #1 – a design option has been considered that uses two platform faces in an island platform configuration at Lancaster Station, shown in Figure 3.9. The objective is to provide greater operational flexibility at the station when service frequencies are increased. The island platform would be 22’ wide and would have tapered ends to minimize impacts to property on the west side of the railroad right-of-way. The island platform would be accessed using two

at-grade pedestrian crossings, one at the south end and one at the north end of the proposed platform.

Figure 3.9: Lancaster Station Design Option 1



Design Option #2 and Design Option #3 – design options have also been considered that would replace the proposed at-grade pedestrian crossings to the island platform with a grade separated pedestrian crossing, shown in Figure 3.10 and Figure 3.11 Two alternative designs have been included for this; Option #2 (Figure 3.10) is an undercrossing at the proposed island platform mid-point and Option #3 (Figure 3.11) is an over-crossing (bridge) at the north end of the proposed island platform.

Figure 3.10: Lancaster Station Design Option 2

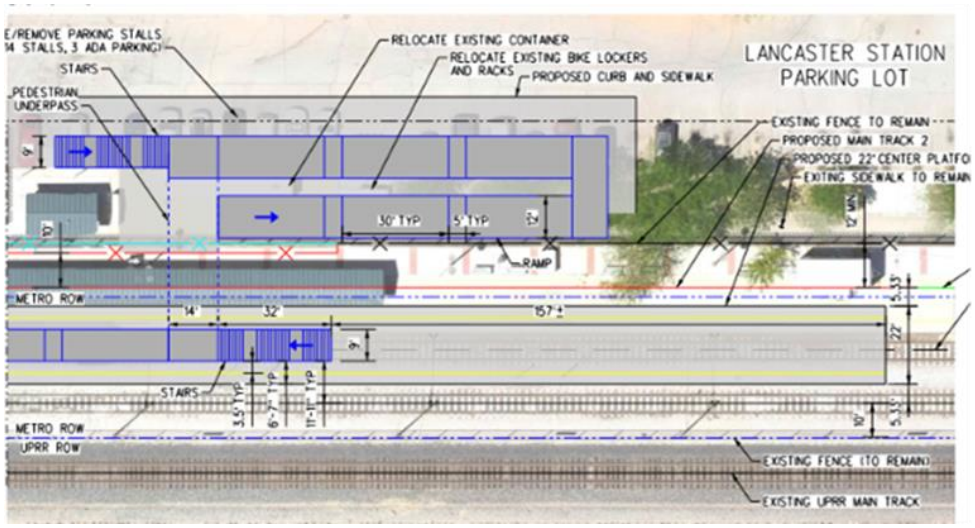
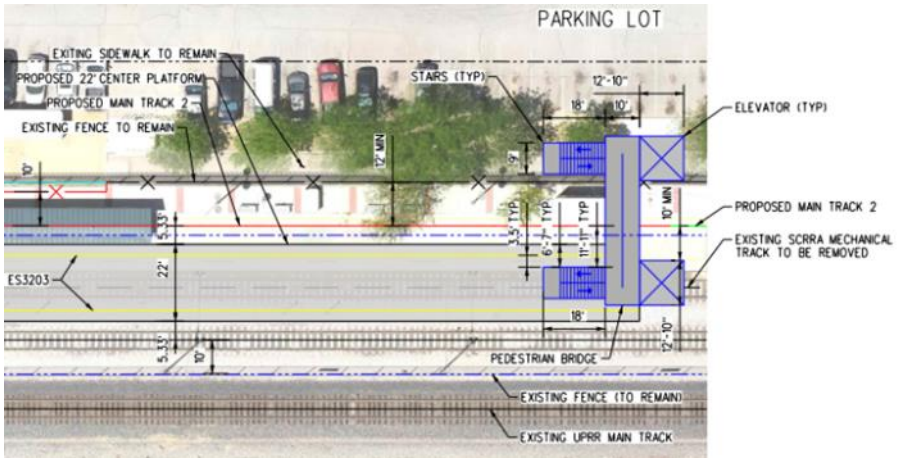


Figure 3.11: Design Option 3



4 Right-of-way and Property

Publicly available GIS data has been used to assemble right-of-way base maps showing existing parcels within ¼ mile of the Project area. The preliminary design of the Balboa segment requires permanent acquisition of a portion of APN 2601-003-017 just north of the I-5 crossing near San Fernando Road, shown in Figure 4.1. An encroachment into Caltrans right-of-way at the north end of the improvements near Sierra Highway is also required.

The assembled right-of-way base map for the Canyon Siding Extension indicates that a portion of the existing Santa Clarita Station was built outside the existing right-of-way. The impacted parcel is shown in the figure below as APN 2836-010-910. Preliminary research into the tax map confirms the impact to this parcel. The proposed improvements at Santa Clarita Station include the extension of the Saugus siding and a side platform, which will further impact this property. A title report will be required to confirm ownership of the parcel in question.

Figure 4.1: Santa Clarita Station Right-of-Way Impact

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