# TABLE OF CONTENTS

## VOLUME 1 – STUDY REPORT

### 0 EXECUTIVE SUMMARY

- 0.1 Review of Similar Rail Systems – Goal 1
- 0.2 Intermodal Design Review at Claremont and Montclair - Goal 2
- 0.3 Ridership Modelling – Goal 3
- 0.4 Fare Sensitivity Analysis – Goal 4
- 0.5 Metrolink Farebox Revenue and Subsidy Estimates for 2028 – Goal 4
- 0.6 Intermodal Station Review and Other Complimentary Strategies – Goal 5
- 0.7 Study Conclusions and Recommendations

### 1 INTRODUCTION

- 1.1 Study Purpose
- 1.2 Study Background

### 2 GOALS OF STUDY

### 3 EXISTING CONDITIONS ON SHARED RAIL CORRIDOR OF GOLD LINE AND SAN BERNARDINO LINE

### 4 REVIEW OF RAIL SYSTEMS WITH SIMILAR CHARACTERISTICS

- 4.1 Review Methodology
- 4.2 San Jose Caltrain / VTA Light Rail
- 4.3 Philadelphia SEPTA Heavy Rail / Regional Rail
- 4.4 Chicago Metra Regional Rail / CTA Heavy Rail
- 4.5 Toronto GO Regional Rail / TTC Subway
- 4.6 National Rail / Transport for London
- 4.7 Common Themes for Integrated Stations

### 5 CONCEPTS FOR INTEGRATED PASSENGER TRANSFER FACILITIES

- 5.1 Pomona Station
- 5.2 Claremont Station
- 5.3 Montclair Station
- 5.3.1 Montclair Preferred Design Option

### 6 APPLICATION OF OTHER COMPLEMENTARY STRATEGIES

- 6.1 Scheduling Coordination and Synchronization to Minimize Transfer Wait Times
  - 6.1.1 Gold Line Scheduling
  - 6.1.2 Metrolink SBL Scheduling
  - 6.1.3 Start and End of Service
  - 6.1.4 Service disruption
- 6.2 Maximizing the Use of Cross Platform Transfers
- 6.3 Service Branding and Visual Identity
  - 6.3.1 Branding, Logos, Signage of Station Location Navigation
  - 6.3.2 In Station Audio and Visual Cues
- 6.4 Fare Media and Ticketing
  - 6.4.1 Metro Fare Payment Media
  - 6.4.2 Metrolink Fare Payment Media
  - 6.4.3 Objectives and Recommendations
LIST OF FIGURES

FIGURE 0-1 Metrolink San Bernardino Line and Metro Gold Line .................................................. 9
FIGURE 0-2: Montclair Station ........................................................................................................... 11
FIGURE 0-3: Summary of Ridership Modeling Results ................................................................. 12
FIGURE 0-4: Estimated Metrolink SBL farebox revenue and subsidy ............................................. 15
FIGURE 1-1: Proposed Alignment of Gold Line Extension ............................................................ 19
FIGURE 4-1: Caltrain and VTA LRT at Mountain View Station ..................................................... 23
FIGURE 4-2: Mountain View Station Layout ..................................................................................... 23
FIGURE 4-3: Wayfinding at Mountain View Station .......................................................................... 24
FIGURE 4-4: Fern Rock Station Layout ............................................................................................. 25
FIGURE 4-5: Cross-Platform Configuration for Local and Express Train Service ......................... 26
FIGURE 4-6: Ventra App ...................................................................................................................... 27
FIGURE 4-7: Cross-Platform Configuration for Local and Express Train Service ......................... 27
FIGURE 4-8: Design Concept for Network Identifier ......................................................................... 28
FIGURE 4-9: TfL Public Transportation Service Logos .................................................................... 29
FIGURE 4-10: TfL Interchange Best Practice Guidelines .................................................................. 29
FIGURE 4-11: Cross-Platform between London Underground and TfL Rail ................................. 30
FIGURE 5-1: Proposed Pomona Station Layout ............................................................................... 33
FIGURE 5-2: Proposed Walk Route Between Gold Line and Metrolink Claremont Station ............ 34
FIGURE 5-3: Reference Design for Gold Line Montclair Station and Constraints ......................... 36
FIGURE 5-4: Flush Center Platform .................................................................................................. 37
FIGURE 5-5: Ramps on Center Platform ........................................................................................... 38
FIGURE 6-1: Cross Platform Transfer ................................................................................................ 41
FIGURE 6-2: Metrolink Line Colors ................................................................................................ 42
FIGURE 6-3: Example of Metro Signage and Visual Identity ............................................................ 42
FIGURE 6-4: Trialing Colored Pixelated Tags at Union Station ......................................................... 43
FIGURE 6-5: TAP Enabled Devices .................................................................................................. 44
FIGURE 6-6: Metrolink Ticket with QR code .................................................................................... 44
FIGURE 6-7: Illustrative Distance/Zones ........................................................................................... 46
FIGURE 7-1: Comparison of Modeled Corridor Boardings Compared to Observed Boardings ....... 47
FIGURE 7-2: Gold Line and Metrolink SBL Ridership — Gold Line Extended to Pomona, Base Metrolink Service, Model Years 2019, 2028 and 2042 .................................................... 50
FIGURE 7-3 GOLD LINE AND METROLINK SBL RIDERSHIP – GOLD LINE EXTENDED TO POMONA, ENHANCED METROLINK SERVICE, MODEL YEARS 2019, 2028 AND 2042............................................50

FIGURE 7-4 GOLD LINE AND METROLINK SBL RIDERSHIP – GOLD LINE EXTENDED TO MONTCLAIR, BASE METROLINK SERVICE, MODEL YEARS 2019, 2028 AND 2042.....................51

FIGURE 7-5 GOLD LINE AND METROLINK SBL RIDERSHIP – GOLD LINE EXTENDED TO MONTCLAIR, ENHANCED METROLINK SERVICE, MODEL YEARS 2019, 2028 AND 2042 ..........51

FIGURE 7-6 AGGREGATE CORRIDOR RIDERSHIP FOR GOLD LINE AND METROLINK SBL ................52

FIGURE 8-1: EXAMPLE FARES – SCENARIO 1 AND 2 .................................................................55

FIGURE 8-2 RIDERSHIP CHANGE SCENARIO 1, 2 AND 3 ..........................................................56

FIGURE 8-3 RIDERSHIP CHANGE SCENARIO 4, 5 AND 6 ..........................................................56

FIGURE 8-4 COVINA STATION BOARDINGS ............................................................................58

FIGURE 9-1 PASSENGER TRANSFERS BETWEEN THE TWO RAIL SYSTEMS ......................59

FIGURE 9-2 METROLINK SBL REVENUE ESTIMATES (BASED ON GOLD LINE AT 8/12 MINUTE PEAK/OFF-PEAK HEADWAYS) .................................................................60

FIGURE 9-3 ESTIMATED METROLINK SBL FAREBOX REVENUE AND SUBSIDY .................60
LIST OF TABLES
TABLE 0-1 FARE STRUCTURES TESTED.................................................................13
TABLE 3-1: KEY CHARACTERISTICS OF METRO GOLD LINE AND METROLINK..................21
TABLE 5-1: COST ESTIMATE SUMMARY FOR OPTIONS................................................38
TABLE 6-1 START AND END OF SERVICE COMPARISON .................................................40
TABLE 6-2 METRO AND METROLINK FARE TYPES.........................................................44
TABLE 6-3: ILLUSTRATIVE METRO UPCHARGE ..........................................................45
TABLE 8-1: FARE STRUCTURES TESTED........................................................................54
TABLE 10-1 SUMMARY OF MEETINGS HELD WITH STAKEHOLDERS .........................63
### ABBREVIATIONS/ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
</tr>
<tr>
<td>CAG</td>
<td>Core Agencies Group</td>
</tr>
<tr>
<td>CalSTA</td>
<td>California State Transportation Agency</td>
</tr>
<tr>
<td>CBM18</td>
<td>Corridors Base Model 2018</td>
</tr>
<tr>
<td>CPUC</td>
<td>California Public Utilities Commission</td>
</tr>
<tr>
<td>FTA</td>
<td>Federal Transit Administration</td>
</tr>
<tr>
<td>GL</td>
<td>Gold Line</td>
</tr>
<tr>
<td>LRT</td>
<td>Light-Rail Transit</td>
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<td>VTA</td>
<td>Santa Clara Valley Transportation Authority</td>
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EXECUTIVE SUMMARY

The existing Metro Gold Line is a 29.7-mile rail transit route connecting East Los Angeles to the San Gabriel Valley with a total of 27 existing stations. An eastern extension of the Metro Gold Line is currently planned and will be implemented in two phases. The first phase provides four new stations from Azusa (Citrus Avenue) to Pomona and is scheduled to open for operation in 2024/2025. The second phase (which is subject to funding availability) extends the Gold Line a further 3.3 miles east to the cities of Claremont and Montclair and is scheduled to open for operation in 2028.

Metrolink’s San Bernardino Line (SBL) is a 56.2-mile regional rail line that extends from Los Angeles Union Station to San Bernardino – Downtown. It has 13 stations that include existing stations at Pomona, Claremont and Montclair. The Metro Gold Line extension will also have stations at these locations and therefore, following completion of the Gold Line extension to Montclair, passengers will be able to transfer between the two systems at each of these stations.

This study has considered strategies to enable the two passenger rail services to operate in a complementary and mutually beneficial way. To achieve this, the study goals and objectives are:

Goal 1: Review other rail systems with similar characteristics and identify strategies that will optimize passenger transfers between modes. (Report Chapter 4)

Goal 2: Review the LA Metro Construction Authority Reference Design (including in the 2018 Design and Build construction procurement) for the Gold Line stations to identify opportunities to modify the design to improve passenger transfers and produce integrated station concepts with rough order of magnitude cost estimates. (Report Chapter 5)

Goal 3: Test the effect on future ridership using different service patterns of both Gold Line and Metrolink SBL. (Report Chapter 7)

Goal 4: Undertake a fare sensitivity analysis using different fare structures on the Gold Line, Metrolink SBL and parking fees to assess their impact on ridership. (Report Chapter 8)

Goal 5: Identify and recommend any other innovations that will improve the passenger experience at transfer station based on industrywide best practices. (Report Chapter 6)
0.1 **Review of Similar Rail Systems – Goal 1**

Goal 1 included a review of other regional rail and transit systems that share similar characteristics with the Gold Line and Metrolink SBL to determine how these systems are operated and managed and whether any of these current practices could benefit the future Metrolink SBL and the Gold Line operation. From this review, four key characteristics were evident:

1. Station layouts that have clear sightlines to train services and transfer areas and that have platforms in close proximity to each other make transfers easier to navigate.
2. Fare media technology and integration has been used to make fare payment between systems simpler and quicker. This has been especially useful in regions where there are a multitude of operators each with their own range of fares. The most successful fare media systems are those that allow cash value stored on a contactless media to be used on any service.
3. Concise and consistent wayfinding and passenger information across all transit services in a region, particularly at transit hubs, helps passengers better understand how a transit system works and identify access points to/from the network.
4. Coordination of transit services and planning activities assures that operators schedule their services to arrive within moments of each other for connecting trips and helps bring consistency in the way transfer strategies are planned and implemented.

0.2 **Intermodal Design Review at Claremont and Montclair – Goal 2**

The Gold Line Phase 2B Design and Build contract was procured by Metro during 2019. Engineering design and construction work on infrastructure beyond Pomona is currently a contract option and subject to the availability of funding. To support Goal 2, the study has reviewed the engineering designs included in these bid documents to determine what modifications, if any, could be made to implement the four key characteristics from the review of similar systems in Goal 1. Each station was reviewed specifically to determine whether the platform configuration could be changed to improve the system transfer.

The study found that there were no significant practical improvements that could be made to the layout of the Pomona Gold Line station that would improve the transfer arrangement. The requirement for a grade separated Gold Line crossing at Garey Avenue (just east of the station) severely limits the ability to change the Gold Line vertical profile and reduce the vertical and horizontal separation between the two systems’ platforms.

At Claremont Gold Line station, some improvement is possible, and the study recommends the realignment of the walking route between the Metrolink SBL platforms and the Gold Line platforms to provide a more direct pedestrian connection. This modification would reduce the station to station transfer time by approximately two minutes.
At the Montclair Gold Line station, a reconfigured station layout is recommended for further consideration and design development. This layout would lower the Gold Line station platform elevations by approximately 9 feet to an elevation similar to the existing Metrolink SBL platforms. Also, a change from the current design of a center platform to two side platforms is recommended so that the southern (eastbound) Gold Line platform can be physically joined to the existing westbound Metrolink SBL platform. In doing so, this would provide the opportunity for cross platform transfers (under certain rail operating conditions) and also provide improved station access and egress for Metrolink SBL passengers to and from the Metrolink SBL westbound platform.

**Figure 0-2: Montclair Station**

### 0.3 Ridership Modelling – Goal 3

As part of Goal 3, potential future ridership on the Metrolink SBL and Gold Line has been estimated using LA Metro’s CBM18 transportation planning tool. Ridership estimates have been developed for the predetermined model years of 2028 and 2042. A range of Metrolink SBL and Gold Line service patterns have been tested for each of these model years to give a range of potential future ridership trends.

The service patterns tested were;

1. Metrolink SBL Baseline Service – represents the existing Metrolink SBL service with additional minor service improvements to reflect short term capital investments. These additional services were mostly extra peak service/peak direction express trains.

2. Metrolink SBL Enhanced Service – represents the potential future service following completion of Metrolink’s SCORE Program which is assumed to deliver 20-minute peak service headways (30-minute reverse peak headways) and 30-minute bi-directional off-peak headways.

3. Gold Line extension to Pomona by 2028 with;
   i. existing 8-minute peak service headways and 12-minute off-peak service headways.
   ii. potential future 5-minute peak service headways and 12-minute off-peak service headways

4. Gold Line extension to Montclair by 2028 with;
   i. existing 8-minute peak service headways and 12-minute off-peak service headways.
ii. potential future 5-minute peak service headways and 12-minute off-peak service headways

The service patterns were combined to create model scenarios. Scenarios 1 to 5 used existing Gold Line headways of 8-minute peak and 12-minute off-peak as follows;

**Scenario 1** - 2028 Gold Line Extension to Pomona with Baseline Metrolink services  
**Scenario 2** - 2028 Gold Line Extension to Montclair with Baseline Metrolink services  
**Scenario 3** - 2028 Gold Line Extension to Pomona with Enhanced Metrolink services  
**Scenario 4** - 2028 Gold Line Extension to Montclair with Enhanced Metrolink services  
**Scenario 5** - 2042 Gold Line Extension to Montclair with Enhanced Metrolink services

Additional scenarios numbered as 6 to 10 were modeled with Gold Line headways at 5-minute peak headway/12-minute off-peak headway. Following the modeling exercise, data was output from the model runs that provided overall corridor ridership and also illustrative boardings at each Metrolink SBL and each Gold Line station.

The results of the ridership modelling show an increase in future ridership on both the Gold Line and the Metrolink SBL for all of the tested scenarios in the model year 2028. In summary, the magnitude of the estimated ridership increases at the 2028 model year compared to the 2019 observed corridor ridership are;

1. In 2028, with the Gold Line extended to Pomona, the Gold Line has a 54% increase in ridership, Metrolink SBL has a 56% increase in ridership when using a ‘Baseline’ Metrolink service scenario and has a 100% increase in ridership when using an ‘Enhanced’ Metrolink service scenario.
2. When Gold Line is extended to Montclair, the Gold Line has a 75% increase in ridership, the Metrolink SBL has a 56% increase in ridership when using a ‘Baseline’ Metrolink service scenario and has a 93% increase in ridership when using an ‘Enhanced’ Metrolink service scenario.

Ridership forecasts were also developed for a limited number of scenarios in the model year 2042. This data shows that Metrolink SBL ridership does not appear to grow beyond 2028 and at model year 2042, Metrolink SBL ridership is similar to its 2028 ridership. However, the Gold Line ridership growth continues beyond 2028 and reaches approximately 100% growth compared to the 2019 observed Gold Line ridership.
The main drivers for the 2028 ridership increases are considered to include forecast population and employment growth and improved regional connectivity provided by transit expansion through other Metro projects. These projects include the Purple Line Extension, Crenshaw to LAX, Regional Connector, East San Fernando Light Rail, Vermont Corridor BRT, North San Fernando Valley BRT, North Hollywood and Pasadena BRT and each contribute to overall increases in rail transit ridership. Gold Line ridership continues to increase between 2028 and 2042 due to improved regional connectivity provided by further transit expansion including Sepulveda Pass, West Santa Ana Branch, SR-60 North Side Light Rail, Green Line extension to Torrance. Metrolink ridership growth stabilizes between 2028 to 2042 and the main drivers of these ridership patterns are considered to be; Gold Line extension to Montclair, no further modelled Metrolink SBL service improvements beyond 2028 and growth in I-10 HOV Lane volumes. Additionally, the ridership modeling does not take into account projects that are currently being planned in the corridor (by SBCTA) and therefore may underestimate ridership on Metrolink.

### 0.4 Fare Sensitivity Analysis – Goal 4

As part of Goal 4 to test the sensitivity of the potential future ridership to fare changes, a fare sensitivity analysis has been undertaken. Fare increases for the Gold Line services have been tested together with off-peak fare decreases for the Metrolink SBL service (in addition to the current 25% fare discount). These potential fare structures are shown in Table 0-1 below.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Metrolink SBL Fare Change</th>
<th>Metro Gold Line Fare Change</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>15% Off Peak Discount</td>
<td>$2.50 (+43%)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>$3.00 (+71%)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>$3.50 (+100%)</td>
</tr>
<tr>
<td>4</td>
<td>25% Off Peak Discount</td>
<td>$2.50 (+43%)</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>$3.00 (+71%)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>$3.50 (+100%)</td>
</tr>
<tr>
<td>7</td>
<td>Existing Metrolink Fare</td>
<td>$3.50 Metro Fare</td>
</tr>
<tr>
<td>8</td>
<td>25% Off Peak Metrolink Discount</td>
<td>$1.75 (Existing Metro Fare)</td>
</tr>
</tbody>
</table>

These potential fare changes were tested for the scenarios with the Gold Line extended to Pomona and to Montclair. The results were similar and are summarized as follows.

When the Gold Line is extended to Montclair:

1. Using a 15% off-peak Metrolink SBL fare discount and three incremental increases in Gold Line fare ($2.50, $3.00 and $3.50), there was a very small increase in overall Metrolink SBL ridership (1.1% to 1.5%) and a small decline in Gold Line ridership (-2.6% to -5.9%).

2. Using a 25% off-peak Metrolink SBL fare discount and three incremental increases in Metro fare ($2.50, $3.00 and $3.50), there was a very small increase in overall Metrolink ridership.
SBL ridership (1.7% to 2.1%) and a small decline in Gold Line ridership (-2.6% to -5.9%).

When the Gold Line is extended to Pomona, the fare sensitivity test was limited to two scenarios.

1. The first was only using a Metrolink SBL off-peak fare discount of 25% (with the current $1.75 Gold Line fare). This showed a small potential increase in Metrolink SBL ridership of 1.6% and a no discernable impact to Gold Line ridership.
2. The second test used the Gold Line fare increase of $3.50 and existing Metrolink SBL fares. This showed a 6% decline in Gold Line ridership and no discernable change to Metrolink SBL ridership.

The fare sensitivity analysis is based on the corridor base model (CBM18) which was used to determine the ridership estimates and derive the transfer numbers at the transfer stations. The accuracy of CBM18 model has been verified for estimating overall ridership numbers for a given mode in a given corridor. The model has not been verified for forecasting more localized station-based passenger boardings and passenger transfer numbers. The actual passenger transfer numbers at each of the three transfer stations may therefore exceed those numbers derived from the CBM18 model. For example, there is some historical evidence from previous Metrolink SBL ridership trends at Metrolink Covina Station where Metrolink’s Covina Station experienced a 25% decrease in ridership following the opening of the Gold Line Station at Azusa in 2016 and this ridership decrease has not yet recovered. Therefore, a decline in Metrolink ridership at the Pomona, Claremont and Montclair stations is possible following the opening of the Gold Line stations.

Using the CBM18, the magnitude of the fare changes tested appear to have a negligible effect (approximately 2%) on overall ridership because although Metrolink SBL riders may be attracted to the Gold Line by lower fares, the CBM18 modelling results indicate that the majority of riders do not appear to switch systems as a result of fare changes. Approximately 10% of those riders that transfer to Gold Line system make up a small proportion (10% is approximately equivalent to 1500 daily corridor boardings) of Metrolink SBL’s overall total forecasted 2028 ridership between 15,000 and 20,000 daily corridor boardings. The 10% of the riders that are transferring may well represent new riders accessing new destinations in the San Gabriel Valley.

While recognizing the precedent at Covina for potential mode shift, the two modes are generally serving two separate markets. Riders served by the Metrolink SBL are more likely to be long distance commuters and predominantly commuting to and from to LA Union Station and riders served by the Gold Line are more likely to be traveling/commuting shorter distances including destinations to cities and communities within the San Gabriel Valley. This is also supported by the average trip lengths made by Metrolink SBL and Gold Line riders. Although the future average trip lengths were not derived for the CMB18 ridership model, the existing average trip lengths are 8.8 miles for Gold Line riders and 34.2 miles for Metrolink SBL riders.
0.5 Metrolink Farebox Revenue and Subsidy Estimates for 2028 – Goal 4

Using the potential future ridership of the Metrolink SBL, the potential 2028 Metrolink SBL farebox revenues have been estimated (further analysis as part of Goal 3 and 4). To derive this, Metrolink has provided two average fares; one for short Metrolink trips that would include the completion of a journey using the Gold Line (Metrolink fare is $3.55) and one for longer Metrolink trips that do not include a transfer to the Gold Line (Metrolink fare is $6.57). The potential future revenues for each operating scenario have been calculated and show a range of increases;

1. Approximately 50% increase in revenues using the Baseline Metrolink SBL service scenario.
2. Approximately 90% increase in revenues using the Enhanced Metrolink SBL service scenario.

The estimated future Metrolink SBL farebox revenues have also been used to derive an estimate for the change in operating subsidy required for 2028 services (Figure 0-4). Metrolink has provided variable train service operating costs that have been applied for the assumed 2028 Metrolink SBL services. The estimated 2028 operating costs have been compared with the estimated 2028 farebox revenues and the difference has been assumed to reflect the subsidy. On this basis, the subsidy requirement (defined in 2019-dollar values) would reduce marginally for both scenarios when the Gold Line was extended to Pomona and when the Gold Line is extended to Montclair.

0.6 Intermodal Station Review and Other Complimentary Strategies – Goal 5

In addition to the potential station-specific design modifications at each transfer station discussed as part of Goal 2, the study has also considered more general changes that could be implemented at each interchange station to enhance the transfer between services and improve the overall passenger experience (Goal 5).

Using these four key characteristics identified in the review of other systems with similar characteristics (Goal 1), several complimentary strategies have been identified that could be implemented and add value to the Metrolink SBL and Gold Line transfer stations. These are;

1. Timetable synchronization
2. Branding and visual identity
3. Fare media and ticketing integration

The implementation of the SCORE program will increase Metrolink SBL service frequency to 20-minute peak and 30-minute off-peak. Also, future Gold Line service frequency will be 8
minutes and could be as low as 5 minutes during the peak and 12 minutes off-peak. As these service frequencies are relatively high and considering that both systems will operate at near the capacity in the future, it is not considered practicable to introduce irregular services or extended stopping periods at interchange stations to reduce wait times. However, it is noted that the Gold Line train services will likely operate for 2 or 3 hours longer than Metrolink SBL each evening. This introduces a risk at the transfer station of missed connections, meaning that Gold Line passengers wanting to connect to a Metrolink SBL service will need to ensure that they arrive at a transfer station before the last Metrolink SBL service departs. Metrolink does hold their late-night trains beyond their scheduled departure time at Union Station to mitigate this risk, and this is something that could be considered and allowed for in the future Metrolink SBL schedule. In addition to this, Gold Line on board announcements, Gold Line station announcements and terminal station signage and passenger information could also help manage the end of service coordination at transfer stations.

Branding and visual identity to help passengers clearly differentiate and understand the different service types and choices at transfer stations were also considered. Using color themed architectural details, prominent use of train service operator’s logos and using combined real time passenger information systems are common themes at intermodal and transfer stations and are recommended for consideration at Metrolink SBL and Gold Line transfer stations.

Integrated ticketing that enables transferring passengers to use both Gold Line and Metrolink SBL services with a single ticket has also been considered. Under existing conditions, passengers that purchase a Metrolink ticket have the ability to transfer between the two systems using only their Metrolink ticket. There is currently no reciprocal arrangement for Metro ticket holders to transfer to Metrolink services without purchasing an additional Metrolink ticket. The key challenges to seamless ticketing for Metro passengers include the use of equitable up charging, distance-based upcharges on Metro tickets and the ability for Metrolink’s ticket inspectors to read and validate Metro tickets. There are a number of examples within the five case studies of distance-based integrated ticketing and there are currently no known technological barriers to introducing integrated ticketing for Metro passengers. On that basis the use of integrated ticketing for Metro passengers should be given further consideration.

0.7 STUDY CONCLUSIONS AND RECOMMENDATIONS

In summary the study makes the following conclusions and recommendations;

1. There are potential improvements that could be implemented to the Gold Line station designs at Claremont and Montclair to shorten the walk or time it takes to get from one platform to another. Further study is recommended — Goal 1 and 2.

2. Gold Line ridership is expected to increase as a result of the extension to Pomona and Montclair and the ridership growth will continue beyond 2028 to 2042 — Goal 3.

3. Metrolink SBL ridership is expected to grow as the service improvements are introduced and as the Gold Line is extended. Metrolink SBL ridership growth will stabilize beyond 2028 - Goal 3.

4. There is a very limited response in terms of Gold Line and Metrolink SBL ridership change for the level of fare changes that have been considered. Each system shows small ridership decreases and each system appears to be serving separate ridership markets — Goal 4.
5. The estimated 2028 Metrolink SBL farebox revenues and estimated 2028 Metrolink SBL operating costs will result in no significant change to the current levels of subsidy – **Goal 4**.

6. There are several complimentary strategies that can be used to make it easier for riders to transfer from one system to another. These include: station design to facilitate transfers, consistent wayfinding and passenger information, and integrated fare structure and common fare media. The use of integrated ticketing for Metro passengers should be given further consideration – **Goal 1 and 5**.
1 INTRODUCTION

1.1 STUDY PURPOSE

In January 2018, the Metro Board directed staff to develop a staff-level task force to be set up to develop a toolbox of strategies that would make the Metrolink SBL and future Gold Line services complementary with each other and provide improved transit services to the surrounding communities along the shared rail corridor. (Volume 2 - Appendix 1)

As a result of the Board direction, the Los Angeles County Metropolitan Transportation Authority (Metro) Regional Rail Team is convening a study to look at opportunities to enable the Metro Gold Line and Southern California Regional Rail Authority’s (SCRRA) Metrolink San Bernardino Line (SBL) services to be complementary to each other following the completion of the Metro Gold Line Extension to Pomona (anticipated 2024/2025) and to Montclair (anticipated 2028). When the Gold Line is extended to Montclair, three stations will offer both Gold Line and Metrolink SBL services: Pomona, Claremont and Montclair.

This study examines the three transfer stations and considers strategies including improvements to facilitate passenger transfers between the two modes through a review of best practice used by other transit operators. This study also examines the use of more frequent Metrolink services and examines the impact on ridership following the opening of the Gold Line extension.

1.2 STUDY BACKGROUND

The Metro Gold Line Phase 1 is a 13.7-mile alignment from Los Angeles to Pasadena, connecting Union Station to Sierra Madre, with a total of 14 stations. It was completed in 2003 by the Foothill Gold Line Construction Authority and transferred to Metro for operations. Phase 2A which consists of the section between Sierra Madre and APU/Citrus College, with 6 stations, was completed in 2016, bringing increased connectivity to the cities of Arcadia, Monrovia, Duarte, Irwindale and Azusa. The average weekday trip length on the Gold Line is 8.8 miles.

The development of the next phase as shown in Figure 1-1 (the base contract), is an extension from Glendora to Pomona which is fully funded and anticipated for completion in 2025. Plans to extend the Gold Line to Montclair are currently not funded and is a Design-Build contract option.

The Metrolink SBL extends from Los Angeles Union Station to San Bernardino – Downtown and has existing stations at Pomona North, Claremont and Montclair with a total route length of 56.2 miles and riders have an average weekday trip length of 34.2 miles. The Metro Gold Line extension will also have stations at these locations and thus, passenger transfers between the two rail systems will be possible.
Figure 1-1: Proposed Alignment of Gold Line Extension

Source: Foothill Gold Line Authority
GOALS OF STUDY

The Gold Line and Metrolink SBL share 3.9 miles of right-of-way (ROW) between White Avenue and Montclair Transit Hub and will also have three stations within this section of the railroad corridor. This study aims to identify strategies to enable the two rail services to be complementary and to optimize the passenger experience at each of these three stations. The specific study aims are:

**Goal 1:** Review other rail systems with similar characteristics and identify strategies that will optimize passenger transfers between modes. (Chapter 4)

**Goal 2:** Review the LA Metro Construction Authority Reference Design (including in the 2018 Design and Build construction procurement) for the Gold Line stations to identify opportunities to modify the design to improve passenger transfers and produce integrated station concepts with rough order of magnitude cost estimates. (Chapter 5)

**Goal 3:** Test the effect on future ridership using different service patterns of both Gold Line and Metrolink SBL. (Chapter 7)

**Goal 4:** Undertake a fare sensitivity analysis using different fare structures on the Gold Line, Metrolink SBL and parking fees to assess their impact on ridership. (Chapter 8)

**Goal 5:** Identify and recommend any other innovations that will improve the passenger experience at transfer station based on industrywide best practices. (Chapter 6)
3 EXISTING CONDITIONS ON SHARED RAIL CORRIDOR OF GOLD LINE AND SAN BERNARDINO LINE

The Gold Line currently runs from Atlantic station in East Los Angeles via Union Station and then towards APU/Citrus College in Azusa. The service is operated by Metro Rail at up to an 8-minute frequency during the peak hours, and the fare for a trip between any two stations is the standard Metro fare, currently $1.75.

Metrolink’s San Bernardino Line runs from Union Station to San Bernardino Downtown station, via Pomona, Claremont and Montclair. The service is operated by Metrolink, with up to 3 trains in the peak direction during peak hours and 1 train per hour in the off-peak direction.

When the Gold Line is extended to Pomona in 2024/2025 and to Montclair currently anticipated in 2028, three stations will offer riders the opportunity to transfer between the two rail systems, Pomona, Claremont and Montclair. This study aims to identify strategies that can optimize passenger transfers between the two rail systems.

The key characteristics of the two systems are summarized in Table 3-1 below.

Table 3-1: Key Characteristics of Metro Gold Line and Metrolink

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Metro</th>
<th>Metrolink</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gold Line (to Pomona)</td>
<td>Gold Line (to Montclair)</td>
</tr>
<tr>
<td>Fare</td>
<td>$1.75</td>
<td>$1.75</td>
</tr>
<tr>
<td>Journey Time * (from Union Station)</td>
<td>62 minutes</td>
<td>67 minutes</td>
</tr>
<tr>
<td>Service Frequency</td>
<td>Up to 8-minute frequency during peak in both directions</td>
<td>Up to 30-minute frequency during peak in the peak direction</td>
</tr>
<tr>
<td>Common Fare Media</td>
<td>Metro uses the TAP card for fare payment on all modes operated by Metro. Other transit agencies in Los Angeles County typically also adopt the TAP card to facilitate payment and inter-agency transfers.</td>
<td>Excluding special/private events, all Metrolink fares include free local travel on Metro and all other EZ-Pass operators in LA County except Big Blue Bus. Metrolink tickets use QR-codes which can be scanned by Metro Rail TAP gates</td>
</tr>
</tbody>
</table>

*Gold Line journey times taken from Foothill Gold Line Construction Authority website for the Gold Line extension. Metrolink journey times taken from San Bernardino Line passenger schedule (October 2019)
4 REVIEW OF RAIL SYSTEMS WITH SIMILAR CHARACTERISTICS

The initial study task aims to identify North American regional rail systems and other international examples that have similar characteristics to the Gold Line and Metrolink SBL. The objective is to identify and review best practice strategies implemented by other regional rail operating agencies that integrate different services and optimize transfer between systems. The review identified a long list of cities/agencies and systems, and from the long list, five systems have been considered in greater detail. From these, several strategies have been identified that were considered suitable for application on the Gold Line and Metrolink SBL systems and are described further in the following sections.

4.1 REVIEW METHODOLOGY

In order to identify other similar regional rail systems for review, key characteristics of the Gold Line and Metrolink SBL were identified;

a. Shared rail corridor utilizing both a high frequency urban rail system and lower frequency suburban or regional rail system.

b. Origin/Destination in a suburban area and downtown commercial district.

c. Passenger transfers are possible at interchange stations between the two rail systems.

d. Transit networks and agencies that demonstrate established passenger behaviors at transfer stations and are observable and can be documented.

Using the above criteria, a long list of similar systems has been identified. The long list and the characteristics of each system have been included in Volume 2 - Appendix 2 for reference. After an initial review, the list was reduced to five systems:

1. San Jose Caltrain / VTA light rail
2. Philadelphia SEPTA heavy rail / regional rail
3. Chicago Metra regional rail / CTA heavy rail
4. Toronto GO regional rail / TTC subway
5. London Heathrow Express / London Underground

The following summarizes the key strategies and best practices adopted by the 5 case study systems.

4.2 SAN JOSE CALTRAIN / VTA LIGHT RAIL

The Bay Area has a number of transit operators providing public transportation services that include regional rail, light rail, heavy rail, and bus. Each of these transit agencies operate and plan their systems independently, which means fares, schedules, wayfinding materials, etc. differ between the respective operator. This has catalyzed an effort by Bay Area agencies to create a more integrated transit network throughout the region. The key practices and guiding principles that Bay Area agencies have implemented to make transferring between systems more seamless are:
Station Design. Caltrain’s station and facilities design criteria encourages intermodal connections that are simple, safe, and efficient that are supported by clear and easily understood transit information. Caltrain also emphasizes having platforms in close proximity to connecting transit services so that passengers’ travel distance and time between modes is minimized.

The Santa Clara Valley Transportation Authority (VTA) light rail transit guidelines also emphasize integration with nearby major transit facilities as much as is feasible. The guidelines call for infrastructure such as pedestrian crossings, transfer corridors, and passenger queuing areas to help facilitate intermodal transfers (VTA, 2007).

An example of an integrated station on both networks is Mountain View Station. Caltrain and VTA’s Line 902 share a station and platforms that are close to each other. Figure 4-2 shows the layout of station where the center platform for Line 902 is north and the Caltrain side platform is south. There is a designated pedestrian walkway connecting the two platforms, which are about 25 feet apart. There is a clear sightline between the platforms and station entrances as well as clear pathways to the bus bays. The layout is simple and easy for passengers to navigate and transfer between modes.

Figure 4-2: Mountain View Station Layout
Wayfinding and Passenger Info. Currently, Caltrain’s design criteria, dictates that signage design standards are determined by the Metropolitan Transportation Commission’s (MTC) Hub Signage Program. The program was established in order to provide streamlined and consistent wayfinding signage as well as consolidated passenger information for schedules and fares at major transit hubs with services from multiple transit operators. The MTC partnered with Caltrain, the VTA, and other agencies to implement the program.

Some general wayfinding design principles include:

- Identifying each transit hub with signage so that user groups easily recognize its location by having prominent operator logos.
- Providing clear identification of local transit connections that includes both local and regional scale maps.
- Placing real-time transit info in key decision-making areas for passengers such as at pay stations and platforms. (MTC, 2012).

Fare Media. The Clipper Card, which is a contactless reloadable fare card, has been an important tool for integrating the Bay Area transit agencies. Each agency has been able to maintain their own fares and usage terms, but it has allowed passengers to seamlessly use their Clipper Card to pay for the transit services they use. The Clipper Card can store fare passes from participating agencies or can be loaded with cash value. Cash value can be used on all the systems that accept Clipper, which makes it effortless for passengers to transfer between systems. Clipper can be loaded with value/fares at select retailers, customer service centers, and BART and VTA ticket vending.

Summary of Best Practices:

- Simple station layout with regional rail and urban rail platforms in close proximity to each other.
- Consistent wayfinding signage and passenger information at major transit hubs that is managed by a single entity.
- Fare media that can be used across 22 transit agencies, pass discounts for connecting services, and cash value that can be used as fare payment for all participating agencies.
4.3 PHILADELPHIA SEPTA HEAVY RAIL / REGIONAL RAIL

SEPTA oversee and operates regional public transportation in Philadelphia and surrounding counties and they operate bus, heavy/light rail, regional rail, and bus rapid transit services.

Station Design. The Fern Rock Transportation Center has one island platform for the Broad Street Line and one island (shared with freight) and one side platform for regional rail (Figure 4-4). The station also serves as a yard and maintenance facility for the Broad Street Line and is the only station where a subway line runs at surface level. The platforms for the two systems are perpendicular to each other, with the Broad Street Line on an east-west direction and the regional rail lines north-south. Transfers between the services can easily be made as there are pedestrian walkways channeling passengers to the connecting platforms, which are a 3 to 5-minute walk apart.

Figure 4-4: Fern Rock Station Layout
Cross-Platform Transfers. Another transfer design strategy found in SEPTA’s heavy rail network is a cross-platform transfer between local and express trains. A cross-platform transfer utilizes island platforms (single platform between two tracks). They are located at a few stations along the Broad Street Line. These stations have 4 tracks, and 2 island platforms and two side platforms, where the BSL express trains are located in the inner tracks and the local trains are on the outer tracks (Figure 4-5).

Summary of Best Practices:

- Platforms for the rail systems are within close proximity to each other and are complemented by simple pedestrian paths that guide passengers to the correct platform.
- Cross-platforms that allow passengers to make direct transfers between train services.

4.4 CHICAGO METRA REGIONAL RAIL / CTA HEAVY RAIL

The Regional Transportation Authority (RTA) oversees three transit agencies in the Chicago Metropolitan Area; CTA (bus and heavy rail), Metra (regional rail), and Pace (bus). To facilitate integration of its three transit agencies, some of the key practices and strategies are:

Wayfinding and Passenger Info. The RTA developed the Interagency Signage Program which has helped bring consistency and standardization to signage material used throughout the regional transit system. The Program has three main types of signage material; wayfinding signs, identification signs, and service information panels (includes route maps, schedules, and connection information). Some general design guidelines include:

- Importance in the simplicity and clarity of the message
- Providing information at key decision points
- Avoiding placing information too early and limiting repetitions
- Concentrating information along accessible paths (RTA, 2014)
These new signage design standards have been deployed at 12 major transit hubs since 2013, with installation work being done at six more stations in 2019. Another key passenger information tool is the CTA’s Ventra app, which provides real-time information for all modes allowing passengers to make better decisions when they are on the go about what transportation options best serve their trip.

**Station Design / Cross-Platform Transfers.**
Cross-platforms exist at four stations in the L train network to facilitate transfers between local and express train service. The cross-platform transfers occurred between the Red Line and Purple Line Express traveling in the same direction. These stations have 4 tracks and 2 island platforms, where the Purple Line Express trains run on the outer tracks and the Red Line trains run on the inner tracks (Figure 4-7). This allows passengers to simply walk across the platform between express and local service.

**Summary of Best Practices:**

- Wayfinding program managed by a single entity with standardized design materials.
- Ventra app consolidates trip planning and purchasing information in one easy to use tool.
- Cross-platforms that allow passengers to make direct transfers between local and express train service.

**4.5 Toronto GO Regional Rail / TTC Subway**

Metrolinx is the regional transportation agency that manages and integrates road and public transportation in the Greater Toronto and Hamilton Area (GTHA), coordinating 11 transit operators in GTHA that provide bus, heavy rail, streetcar, and regional rail services. Some key examples of current practices and strategies for integrating transportation systems are:

**Wayfinding and Passenger Info.** Currently, each of the 11 operators use their own unique wayfinding systems. The need for consistent wayfinding across all modes and services has become apparent and has resulted in the development of the Regional Transit Wayfinding Harmonization Project, which has been piloting wayfinding design guidelines at three GO transit stations. The Project has initially established a need for a single symbol to identify and unify the transit network. This initial research has resulted in five guiding principles for the design of the network identifier symbol; it should easily identify transit, inclusive of language and legibility, mode neutral so it represents all modes in the network, brand neutral, and timeless. Figure 4-8 demonstrates the design concept developed based on this initial research.
The provision of high-quality passenger information will enable passengers to choose from the full range of transportation alternatives available to them. To enable this, one of the actions is to create a regional transportation information portal that can be accessed online or via smartphones that provides all users with comprehensive and standardized information. Another action is to coordinate schedules among transit operators by ensuring GO transit and local transit agencies provide each other with a minimum of 90-day notice before implementing any changes in service.

Fare Media. Metrolinx launched PRESTO which is an integrated transit fare system for the 11 operators in the GTHA and is currently available to use on all 11 operators. Transit operators maintain their own fares and card usage terms. PRESTO can store fare passes from individual operators and can also store cash value. Most of the transit operators offer a discount when transferring to/from GO Transit. When passengers transfer between TTC and GO Transit, their fare on either system is discounted by $1.50. Passengers have a 2-hour window to receive the discounted fare if their trip starts with TTC and a 3-hour window if their trip starts with GO Transit. PRESTO cards can be purchased and loaded online, at select retailers, TTC and GO Transit stations. The full integration of fares on the PRESTO card makes it quick and simple for transit users to hop on and off between services.

Summary of Best Practices:

- Future plans to provide more consistent and unified wayfinding.
- Planned implementation strategies to assist passengers in making more informed decisions on available transportation options.
- Integrated fare media for all transit operators in the region. Discounts offered to connecting services to/from regional rail.

4.6 NATIONAL RAIL / TRANSPORT FOR LONDON

The Transport for London (TfL) is a government body that operates public transit in London, United Kingdom. Some of the main transit modes operating under the TfL network include the London Underground (subway), London Buses, and London Overground (commuter rail). Due to the TfL’s extensive transportation network, the agency has focused on making passenger transfers between systems as intuitive and seamless as possible. Most of this work has been centered on fare integration, branding, and wayfinding/passenger information. The following describes current practices and strategies that TfL has implemented in these areas.
**Fare Media.** TfL offers several contactless ways to pay fares on their services which include Oyster Card, contactless debit/credit cards, and TfL app. The Oyster Card is a contactless card that enables passengers to load fare passes or cash value. With cash value, passengers will pay for fares as they go, and fares will then be capped for a daily pass or weekly pass as appropriate. Passengers can also use their bank issued contactless credit/debit cards, mobile devices and smart watches for pay as you go travel, including appropriate fare capping. This method allows passengers to board onto transit more quickly, since they do not need to purchase or load an Oyster Card at ticket vending machines. However, a Travelcard, which is a weekly or monthly fare pass, can only be loaded onto the Oyster Card and is good to use throughout the TfL network and can be managed on the TfL app. A range of fare media options has made it much easier for passengers to transfer between transit services, since they do not need to acquire a specific type of fare media before boarding onto connecting services.

**Figure 4-9: TfL Public Transportation Service Logos**

[TfL Service Logos Image]

Source: Transport for London

**Figure 4-10: TfL Interchange Best Practice Guidelines**

Branding. TfL has developed a logo that unifies the entire transportation network by having a design that is used by all modes on the network. The roundel, a solid blue bar and blue circle, identifies the whole TfL network and each mode is a color variant of the roundel. The transit service is written across the bar. This is a simple and concise method of identifying services in the TfL network without confusing transit users about what services each operator provides. TfL has clearly distinguished service operators within their network by using straightforward logos that are easy to understand and to illustrate in passenger information materials.
Wayfinding and Passenger Information. The *TfL Interchange Best Practice Guidelines* is a guidebook for the spatial management of areas where passengers transfer to connecting services. The guidebook was developed to coordinate the design and planning activities of interchange zones, as they are usually located within the jurisdiction of multiple organizations.

Cross-Platform Transfers. These types of platform transfers are found across the London Underground network and are also at intermodal stations. For example, Stratford Station in east London contains cross-platform transfers between the Underground’s Central Line, TfL Rail, and National Rail service. The station has two levels of rail platforms, and the aforementioned rail lines are located on the top level. The Central Line trains emerge from the tunnels into open air and onto a platform shared by National and TfL Rail. Passengers can easily move between trains across a single platform as seen in Figure 4-11.

**Summary of Best Practices:**

- Station layout that is complemented by clear and consistent wayfinding signage.
- Fare media integration which provides number of ways for passengers to pay their fare; contactless cards, apps, debit/credit cards.
- Branding that clearly demarcates service providers in the TfL network.
- A single entity providing oversight to the planning, design, and implementation of interchange facilities, which ensures consistent use of transfer design guidelines.
- Cross-platform transfers for direct connections between heavy rail and commuter rail.

### 4.7 Common Themes for Integrated Stations

The review of current practices and strategies including Metro’s *Transfer Design Guide* and the five case studies, described above, four main themes were identified that facilitate informed mode choice and seamless transfers between systems and that could be applied to Metrolink SBL and Metro Gold Line.

1. **Station layouts that have clear sightlines** to train services and transfer areas and that have platforms in close proximity to each other make transfers easier to navigate and minimize the distance that passengers have to walk. The systems which were the easiest to navigate to connecting services had station layouts that provided passengers a clear, direct,
and short transfer path. These station layouts also minimize the need for wayfinding, which can be used as more of a complementary tool rather than something that is necessitated.

2. **Fare media technology and integration** make fare payment between systems simpler and quicker. This has been especially useful in regions where there are a multitude of operators each with their own set of fares. The most successful fare media systems have been those that allow cash value stored on a contactless media to be used on any service. Fares automatically deducted from a stored balance has minimizes delay in boarding by not requiring passengers to purchase different fare media between trips and eases decision-making on mode choice.

**Application to study:** Integrated ticketing that enables transferring passengers to use both Gold Line and add Metrolink SBL services with a single ticket has also been considered. Under existing conditions, Metrolink already offers free transfers to any local transit operator including to Metro Rail with mobile tickets purchased through the Metrolink app. However, a passenger traveling from Metro Bus and Rail to Metrolink must still purchase a Metrolink ticket either through the Metrolink app or Metrolink ticket vending machines. This might not be completely intuitive to first time riders, since they might not be aware of different vending systems and fare media between services.

However, based on the ridership analysis undertaken as a part of this study, the anticipated number of passengers that do not have access or ability to purchase a Metrolink ticket at their trip origin is considered to be relatively small. To mitigate the inconvenience to these passengers, it is recommended that Metrolink’s ticket vending machines (TVMs) to be located as conveniently as possible along the walk/transfer routes at each transfer station.

3. **Concise and consistent wayfinding and passenger information** across all transit services in a region, particularly at transit hubs, helps passengers better understand how a transit system works and identify access points to/from the network. The most legible wayfinding signage and passenger information has been at agencies that focus on simplicity, clearly defining different operator spaces, and using technology to distribute consolidated purchase and trip planning information for an entire transit network.

**Application to study:** Metrolink and Metro will be sharing three stations along the Metro Gold Line extension to Montclair, which means it will be pertinent for the agencies to provide distinguishing elements to both services. Passengers that do not use transit regularly may not be able to readily distinguish the service type and operator. It will be important to let passengers know the differences between light and regional rail, and the differing fares and destinations of each service.

- Metro and Metrolink should coordinate the design of wayfinding materials and passenger information such as signage, maps, real time-information, etc. so that there is consistency in symbology, terminology, and how information is displayed. This will ensure that messaging is consistent for passengers.
- There should be a clear distinction between services, particularly at platforms to ensure passengers are boarding the correct services. This can be done by prominently displaying operator logos and/or mode icons in key movement spaces.
- A marketing campaign directed at households within proximity to the stations could be used to further distribute information about local transit services. This can further educate people on the use of the system while also promoting new services to potential new riders.

4. **Coordination of transit services and planning activities** assures that operators schedule their services to arrive within moments of each other for connecting trips and helps bring consistency in the way transfer strategies are planned and implemented.

- Gold Line and Metrolink SBL could coordinate services so that passengers have an efficient transfer and overall, a more efficient end to end journey. However, the intended frequency of the Gold Line service and the implementation of more frequent and clock-face Metrolink SBL services (following the SCORE program) will result in relatively minimal transfer times.
- Limited flexibility on the Gold Line because of its length and the Regional Connector Project introducing potential the scheduling complexity suggest that it is not practical to introduce timed transfers.
5 CONCEPTS FOR INTEGRATED PASSENGER TRANSFER FACILITIES

Following the review of similar regional rail systems and the identification of strategies to improve the integration of different services, the following task focused on examination of the Gold Line Construction Authority reference design for each of the three Gold Line (transfer) stations. The objective of the review was to identify opportunities to incorporate the design related strategies used on the 5 case study systems. This included;

- Examining the station layouts and identifying opportunities to reduce distance between Gold Line and Metrolink SBL platforms.
- Improving sightlines to train services and transfer areas.
- Identifying opportunities to simplify the transfer walking route between station platforms and introduce concise and consistent wayfinding.
- Identify TVM locations along transfer walking routes to assist passengers that do not have a Metrolink ticket.
- Provide a rough order of magnitude capital cost estimate for proposed design changes.

Each station was considered individually and the outcomes from this review are as follows.

5.1 POMONA STATION

The Metrolink SBL and Gold Line station platforms are in close proximity as shown in Figure 5-1. However, there is a significant vertical elevation separation between the Gold Line and Metrolink SBL platforms. The existing Metrolink SBL platforms are at grade whereas the Gold Line platforms are elevated so that the Gold Line track alignment has sufficient vertical clearance for a grade separated crossing of Garey Avenue, which is located approximately 600 feet to the east of the platforms. There is little or no opportunity to lower the Gold Line alignment and reduce this vertical separation without impacting the clearances at Garey Avenue or introducing road re-profiling (lowering). Alterations to the road profile are considered to be impractical as this would also impact the Metrolink SBL rail and station profile and have significant cost implications for the project.

Figure 5-1: Proposed Pomona station layout
5.2 CLAREMONT STATION

The Metrolink and Gold Line stations are located approximately 1,900 feet apart as measured from the center point of the Metrolink SBL platform to the center point of the Gold Line platform. The estimated walk time between these platform center points using the proposed walk route shown on the reference design drawings, is approximately 11 minutes (assuming a walk speed of 3.5’/sec). The walk route is not direct between these two points and utilizes a path through the proposed parking structure on the north side of the railroad right of way before crossing S College Avenue using an existing pedestrian crossing.

A more direct walking route between the stations has been considered that follows the northern boundary of the railroad right of way, between the railroad and the proposed parking structure, shown in Figure 5-2. The walk distance using this alignment, including the access to the Metrolink platform via the undercrossing, is approximately 1,990’ which translates to a walk time of approximately 9.5 minutes. This would reduce the walking time and distance by 400’ and approximately 1.5 minutes. Note that the walking time from the center of the Metrolink platform via the pedestrian undercrossing to the parking lot is approximately 2.6 minutes.

To implement this revised walk route, the following design changes and additions are required;

- Reduce the Gold Line track centers to 14’ locally between the Gold Line and Metrolink SBL platforms.
- Use a minimum walkway width of 6’ locally at the south eastern corner of the proposed parking lot.
- Use a minimum offset of 8’ from the nearest Gold Line track center to the fence line boundary on the south side of the walkway.
- Implement a new pedestrian crossing of College Avenue adjacent to the grade crossing gates on the north side of the railroad right of way.

Figure 5-2: Proposed Walk Route Between Gold Line and Metrolink Claremont Station
5.3 **MONTCLAIR STATION**

The Montclair Gold Line station is a terminal station at the eastern limit of the Phase 2B extension. The Reference Design of the Gold Line platform is an island platform (with Gold Line tracks either side of a central platform) and is located to the north of the existing Metrolink SBL station platforms. To the west of Montclair Station, the Gold Line tracks are grade separated above Monte Vista Avenue and the combined clearance requirement above the roadway and construction depth of the structure mean that the Gold Line track alignment is approximately 7’ to 8’ above the Metrolink SBL tracks. At this station, the resultant Gold Line platform elevations are approximately 9’ above the Metrolink SBL platform elevations. This arrangement is summarized in Figure 5-3 below.

The height difference between the two systems’ platforms means that passengers can only transfer from one system to another using a pedestrian undercrossing located at the east of the Gold Line and Metrolink SBL platforms. There is an existing under crossing at this location which will be extended to serve Gold Line passengers as part of the proposed station construction work. This transfer route results in a walk that is approximately 1260’ between the Gold Line center platform and the Metrolink SBL westbound platform; approximately 6 minutes’ walk-time.

To improve passenger transfer times, a revised station configuration has been considered that includes two significant changes to the Reference Design;

- Lowering the elevation of the proposed Gold Line alignment and the Gold Line platforms to a similar Metrolink SBL platform elevation.
- Introduce Gold Line side platforms and combine the southern Gold Line ide platform with the westbound Metrolink side platform to create shared center platform and allowing for cross platform transfers and optimal passenger access and egress to/from the Metrolink station.
To achieve this, a number of design options have been developed and during the course of the study, these options have been discussed and evaluated with a stakeholder working group that included LA Metro Operations and Safety staff, California Public Utilities Commission (CPUC), Gold Line Construction Authority, Metrolink, City of Montclair, and San Bernardino County Transportation Authority (SBCTA). Through a process of design option selection, the stakeholder group and the study team have agreed on a preferred option for the modified station configuration. The options that were considered and not progressed are summarized in Volume 2- Appendix 3.

### 5.3.1 Montclair Preferred Design Option

The design option that was selected by the stakeholder group aims to provide an optimized interface between the Gold Line eastbound platform and the Metrolink westbound platform using a shared central platform between each track, see Figure 5-4. To achieve this, the Gold Line vertical track alignment has been modified and lowered so that the Gold Line platforms and tracks are at a similar elevation to the Metrolink SBL platforms. The Gold Line station platform configuration has also been modified, from an island platform to two side platforms. This has been achieved using a revised concept for the grade separated crossing of Monte Vista Avenue. The revised concept utilizes a two-span bridge with a central pier located in the median of Monte Vista Avenue and assumes that the structural thickness (from rail level to soffit of the bridge) would be approximately 6’. The current Gold Line reference design utilizes a single span structure and has a comparative structural thickness of 9’. The reduction in height of 3’ has
been used in combination with a revised Gold Line vertical profile to eliminate the elevation difference at the station. The footprint of the proposed station configuration would be the same as that proposed by the Foothill Gold Line Construction Authority and no additional space requirements are anticipated. Integration with other modes should be considered during further design development and should consider the combined demand of Gold Line and Metrolink passengers.

The use of two side platforms at the Gold Line station has also enabled the adaption of standard 14’ track centers from the Reference Design which has 27’ track centers (that are needed for the approach to a center platform). An additional benefit of this design change is the relocation of a pair of #15 crossovers from a location coincident with the Monte Vista Avenue bridge to a location closer to the station and separated from the bridge structure.

This design concept has two variants, described in the stakeholder meetings as Option 1 and Option 2.

**Design Option 1** provides a completely level shared platform surface between the Gold Line eastbound track and the Metrolink SBL westbound track, shown in Figure 5-4. The revised Gold Line track profile required to achieve this impacts the existing Monte Vista Avenue road profile and necessitates a 1’ lowering of the road profile beneath the new Gold Line bridge. In addition to this, the lower Gold Line track profile also necessitates lowering the invert elevation of the existing pedestrian undercrossing on the east side of the station. While technically feasible, these design elements add additional risk and cost to the design concept.
Design Option 2 provides a shared platform between the Gold Line eastbound track and the Metrolink SBL westbound track, shown in Figure 5-5. To avoid any impacts the Monte Vista Avenue road profile and to the existing pedestrian crossing on the east side of the station, there is an elevation difference of up to 3’ between the Gold Line platforms and the Metrolink SBL platforms. This elevation difference within the shared platform is addressed by the use of ramps which have been design as fully ADA compliant.

Conceptual Design Cost Estimate
To assist with the consideration and comparison of Design Option 1 and 2, a rough order of magnitude (ROM) cost estimate has been developed for the incremental cost increase above the Reference Design, to implement these design concepts at Montclair. The incremental ROM cost for Option 1 and 2 are summarized in Table 5-1 below.

Table 5-1: Cost Estimate Summary for Options

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<th>Item</th>
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<th>Option 2</th>
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<tr>
<td>Contingency (50%)</td>
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</tbody>
</table>

Preferred Design Option
The consensus amongst the stakeholder working group is that Option 2 provides the most practicable option for an integrated Montclair Station alternative. Further details on the development of these options and the conceptual engineering drawings are provided in Volume 2 - Appendix 3.
6 APPLICATION OF OTHER COMPLEMENTARY STRATEGIES

The study has also examined a range of other complimentary strategies that could be implemented at each of the three Gold Line and Metrolink SBL transfer stations to enhance the passenger experience and optimize the transfer between systems. The key characteristics that enable integrated intermodal stations and that have been considered are:

1. Train service scheduling and service synchronization to minimize passenger wait times at transfer stations and provide predictable clock face arrivals and departures.
2. Individual brand identification to help reinforce service differentiation and assist wayfinding along the transfer route.
3. Convenience of fare structures and fare media for transfers.

6.1 SCHEDULING COORDINATION AND SYNCHRONIZATION TO MINIMIZE TRANSFER WAIT TIMES

6.1.1 Gold Line Scheduling

Typically, the schedules of high frequency urban light-rail transit (LRT) systems are defined by their start of service time, peak and off-peak services intervals (headways) and last service arrival/departure times. As such, pre-determined scheduled arrival and departure times at intermediate stations are less important to riders than the convenience of a relatively high service frequency.

Gold Line headways (and LRT headways in general) will mean relatively low wait times for Gold Line services when transferring from Metrolink SBL services. The current Gold Line headways are 8 minutes during peak service and 12 minutes during off-peak services. Future peak time headways could also be reduced to 5 minutes (based on the available capacity of the system). Therefore, the maximum wait time for Gold Line services for transferring Metrolink SBL riders would range from 5 minutes to 12 minutes.

These headways, when considered along with the operational characteristics of the Gold Line suggest that it would be impractical to synchronize the Gold Line timetable with the Metrolink SBL timetable. However, at terminal stations (Pomona or Montclair), the wait times can be mitigated to some extent by allowing waiting passengers to board Gold Line trains as soon as practicable after the train turnaround. As practiced elsewhere on the Metro LRT and heavy rail network, early boarding allows passengers some additional comfort prior to service departure.

6.1.2 Metrolink SBL Scheduling

Following implementation of the SCORE program and the subsequent Metrolink SBL service improvements, trains would operate at 20 minutes peak time, peak direction headways and 30 minutes off-peak headways. A Gold Line rider transferring to a Metrolink SBL service would therefore have a maximum wait time from 20 minutes to 30 minutes depending on the direction of travel and time of day.

Noting that during the periods between Metrolink service arrivals, a range of between 2 and 5 Gold Line trains in each direction could arrive at a transfer station. Due to the high frequency of
Gold Line service, it would present little or no practical benefit in attempting to synchronize the arrival of a Metrolink SBL services to coincide with the arrival of Gold Line service.

Unlike an LRT service, a regional rail service is expected to operate to a fixed timetable, allowing riders to plan arrival and departure times in advance of their journey. As a significant proportion of the SBL corridor is single track, the capacity of the Metrolink SBL corridor is currently constrained and to enable the introduction of the 20 minute peak and 30 minute off-peak timetable, a number of infrastructure and signaling improvements are required (and are currently being advanced by LA Metro and Metrolink). With the small number of transferring passengers, as identified from the ridership modelling work (described fully in Chapter 7), this suggests that it would not be cost effective to introduce irregular scheduling to facilitate lower wait times.

6.1.3 Start and End of Service

Table 6-1 below compares start and end of service times for Gold Line and Metrolink SBL services. Although a proposed schedule for the ‘Enhanced’ Metrolink SBL service is not available it is assumed that start and end of service times will be similar to existing SBL schedules. Also, no Gold Line schedule is available for the system when it is extended to Pomona or Montclair (and also connected to the current A Line (Blue) following completion of the Regional Connector Project). However, again it is assumed these will be similar to existing schedules.

<table>
<thead>
<tr>
<th>Service</th>
<th>Start of Service</th>
<th>End of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak</td>
<td>Reverse Peak</td>
</tr>
<tr>
<td>Gold Line</td>
<td>3.45am</td>
<td>4.42am</td>
</tr>
<tr>
<td>Metrolink SBL</td>
<td>3.47am</td>
<td>5.46am</td>
</tr>
</tbody>
</table>

Note: Table is based on current weekday schedule for Gold Line and Metrolink and excludes variations to service on Friday’s and Saturdays

The comparison shows that the Gold Line services start and end outside of Metrolink SBL operating times. For Metrolink SBL transfers to Gold Line services this suggests that there will always be a connecting service available at each of the transfer stations. However, the later Metrolink SBL off-peak start of service and the earlier peak and reverse peak end of service suggest that at these times during the day, Gold Line riders will not be able to make a connecting service at the transfer stations. The low number of estimated transfers at these stations would make a significant shift in Metrolink SBL schedules impractical and not necessarily cost effective. However, to minimize the risk of Gold Line riders missing connecting trains at transfer stations, well publicized Metrolink SBL services times at connecting stations could be provide on board Gold Line trains and also be combined and integrated into the Gold Line schedules.
6.1.4 Service disruption

To mitigate service disruptions, Metrolink is currently able to hold the last Metrolink train at Union Station for up to 10 minutes if delays are known with other services and provides a transfer for late passengers. Subject to timetabling constraints, the last Metrolink train at transfer stations could be held on the platforms longer than the typical dwell time to facilitate late Metro Gold Line transfers.

The operation of two separate rail modes within the corridor also provides opportunity for service disruption mitigation. As Metrolink fares and tickets are currently valid on Metro Rail, and the location of the transfer points mid-way along the San Bernardino Line, the ability of passengers to transfer between the two rail systems will provide opportunities and alternatives to assist service recovery.

6.2 Maximizing the Use of Cross Platform Transfers

The study has examined the use of a combined Metrolink SBL and Gold Line platform at Montclair station, shown in Figure 6-1. This platform arrangement provides advantages for stations navigation and ease of access and egress for both Metrolink and Gold Line passengers. However, a further significant advantage is the ability this arrangement has to facilitate cross platform transfers.

The Metrolink morning peak service (westbound trains) will stop adjacent to a shared center platform and enable transferring passengers (from and to both services) a nearly step free transfer with minimal walking distance. However, this arrangement does not easily provide the same benefit for Metrolink SBL and Gold Line evening peak (or morning reverse peak) transfers. The possibility of operating an eastbound Metrolink SBL service and using the westbound track and platform during the evening peak has been discussed with Metrolink and within the stakeholder meetings. Although this was considered feasible (and with certain caveats and conditions), the operation modeling, signal, Positive Train Control, safety and practicality of this has not been fully tested and the practicality of this arrangement has not been fully verified. Further discussion and coordination will be required in the next phase of design development.

6.3 Service Branding and Visual Identity

A strong visual identity has helped other rail systems become more integrated yet retain their separate identities, as examined in other rail systems in North America and international examples in Section 4. Both Metro and Metrolink have separate visual identities, with standards and guidance documents covering aspects such as the display of logos and other signage in station areas and location and type of wayfinding signage and other passenger information.
With a strong service branding and visual identity, the transfer stations become easier for passengers to use through simplified wayfinding.

6.3.1 Branding, Logos, Signage of Station Location Navigation

At the three transfer stations, a coordinated effort would ensure that the platforms clearly identify and differentiate the type of rail service being provided. This can be achieved by prominently displaying the associated logo and color for each respective rail service. The color could be prominently displayed on architecture features and platform furniture such as benches, trash cans, light poles to reinforce the visual identity of the service provided at each platform.

For example, the Gold Line will take a blue color following the transition to the letter names for Metro Rail lines and wider network connectivity following implementation of the Regional Connector project. Metrolink has a color associated with the San Bernardino Line (Figure 6-2), this color is a contrasting color with the Gold Line and could be used to distinguish the platforms at the transfer stations.

![Figure 6-2 Metrolink Line Colors](source: Metrolink website)

![Figure 6-3 Example of Metro Signage and Visual Identity](source: Metro Transfers Design Guide (2018))
6.3.2 In Station Audio and Visual Cues

Wayfinding signage needs to direct passengers, especially transferring passengers to the appropriate platform. At some of the transfer stations, it was not feasible to bring the Metro Gold Line and Metrolink SBL stations closer together for transfer passengers, so clear wayfinding to direct passengers to the appropriate platform is required.

In addition to visual elements, wayfinding elements also need to be ADA compliant. This includes suitable audio and tactile elements. For example, a current trial at Union Station is examining the use of brightly colored QR codes to aid passengers navigate around the station with their phone.

These elements need to be coordinated further between the two agencies to provide suitable and consistent ‘though station’ wayfinding.

6.4 FARE MEDIA AND TICKETING

Clearly defined fare structures and an easily accessible methods of payment can facilitate transfers and also help to remove barriers for riders to access the wider transit network. This aspect was highlighted in the case studies reviewed in Section 4 of this study.

Therefore, the study team has met with Metro TAP card and Metrolink Ticketing teams to understand the types of trips that would be made by passengers following the extension of the Gold Line to Pomona and then to Montclair and to identify any challenges in terms of technology or fare policy that may impact the ability and convenience of system transfers.

6.4.1 Metro Fare Payment Media

Metro uses three methods for fare payment: TAP card or wearable device, cash (bus only), or purchase ticket (rail only) from ticket vending machines (TVMs) which allow debit/credit card and cash payments. The TAP card for fare payment is valid on all modes operated by Metro and includes free transfer to other Metro services or transit agencies within a two-hour period. Other transit agencies in Los Angeles County typically also allow use of the TAP card to facilitate payment and inter-agency transfers. However, the TAP card cannot be used on Metrolink services.

6.4.2 Metrolink Fare Payment Media

Metrolink has three methods for fare payment: mobile app, purchase ticket from TVMs which allow debit/credit card payments and cash and a buy ticket online option. Where the Metrolink
fares are purchased from the mobile app or a TVM, these include transfers to Metro and other municipal services, which is similar to ticket arrangements on a TAP card to allow transfers.

At the three stations where passengers may transfer between the two rail systems, there are four types of trips and associated fare transactions that a rider may make, shown Table 6-2.

### Table 6-2 Metro and Metrolink Fare Types

<table>
<thead>
<tr>
<th>Direction</th>
<th>Trip type</th>
<th>Fare purchase with agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Metrolink to Metro</td>
<td>Single trips / Round trips / 7 day/Monthly Pass</td>
<td>Metrolink fare purchase only</td>
</tr>
<tr>
<td>From Metro to Metrolink</td>
<td>Single trips / Round trips 7 day/Monthly Pass</td>
<td>Single Metro trip using TAP to transfer station and Metrolink fare purchase via mobile app or TVM</td>
</tr>
</tbody>
</table>

The trip types highlight some inconvenience for riders transferring from Metro to Metrolink services, due to the need to purchase a fare prior to boarding a Metrolink service. Strategies were discussed with the Metro/Metrolink team to address these issues including:

1. **Common fare media**: Metro uses the TAP smartcard system, which allows passengers to pay their fare with the card and other TAP-enabled devices (Figure 6-5) and transfer to services with other transit agencies. Metrolink tickets have a QR code (Figure 6-6) which can be scanned by optical readers to allow transfers with transit agencies on the system, including Metro.

2. **Technology**: Technology in terms of fare media, smartcard readers, and other supporting infrastructure, exists to take appropriate payment from a smartcard (although this is not currently used by Metrolink). The technology itself is not expected to be a challenge to the concept of passenger transfers, however, differences in fare policy between Metro and Metrolink need to be reconciled before implementing any changes with technology. Onboard wi-fi on Metrolink and associated...
networking investments could help facilitate ticket purchase for riders who need to purchase a Metrolink ticket. Additional communications equipment or equipment updates may be necessary for some of the TAP integration technologies that could be considered.

3. **Integrated fare policy**: Metro and Metrolink have separate fare policies. Metro has a flat fare policy, that is, a passenger can travel anywhere on the network with a single fare. In contrast with Metrolink, which uses a distance-based fare policy, that is, a passenger pays a fare for a specific journey or distance. This requires passengers to buy tickets/fare for a specific journey. However, distance-based fare policies can be compatible with tap-and-ride systems if passengers validate their fare media upon entry and upon exit using validators or scanners (for example, similar to the system in use on BART or London Underground).

### 6.4.3 Objectives and Recommendations

The Metro upcharge for access to Metrolink services will need to be equitable with an equivalent Metrolink ticket price. Any misalignment between these fares would potentially result in the Metro pass becoming unattractive to Metro riders if the Metrolink equivalent ticket price is less expensive, or it could become more attractive to Metrolink riders if the Metro pass is less expensive than the equivalent Metrolink ticket price. The Metro pass would have some intrinsic added value from the access it would provide to all other eligible LA Metro transit services and this could be reflected in the upcharge. The Table 6-3 shows a comparison of current ticket prices and provides an indication of what a distance-based upcharge could be, however further analysis is required before a recommend fare structure could be defined.

Metrolink does not currently use technology that would enable onboard ticket inspectors to validate Metro TAP cards or pass holders. However, this technology is available in the marketplace and the case studies referenced in Study Report Section 4 provide several examples of integrated ticketing and validation across different agencies and operators. Although this study can conclude that there are no technological barriers to the introduction of integrated Metro ticketing on Metrolink services, the implementation of this does require further consideration and coordination with relevant stakeholders.

<table>
<thead>
<tr>
<th>Metro Pass Type</th>
<th>Metro Pass Base Cost</th>
<th>Indicative Metro Pass Up Charge</th>
<th>Equivalent Metrolink Monthly Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Base</td>
<td>$100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Plus SBL Zone 1</td>
<td>$100</td>
<td>+ $40</td>
<td>$140</td>
</tr>
<tr>
<td>Plus SBL Zone 2</td>
<td>$100</td>
<td>+ $82</td>
<td>$182</td>
</tr>
<tr>
<td>Plus SBL Zone 3</td>
<td>$100</td>
<td>+ $117</td>
<td>$217</td>
</tr>
<tr>
<td>Plus SBL Zone 4</td>
<td>$100</td>
<td>+ $145</td>
<td>$245</td>
</tr>
<tr>
<td>Plus SBL Zone 5</td>
<td>$100</td>
<td>+ $180</td>
<td>$280</td>
</tr>
</tbody>
</table>

A combined Metro and Metrolink Pass will also have to address the different fare pricing policies between Metro (being fixed price) and Metrolink (being distance based). There are several potential approaches to this and using an upcharge based on a pre-determined Metrolink origin and destination, either with specific origin and destination stations or using a predefined geographic zone within/along the Metrolink SBL line. A conceptual illustration of this is provided in Figure 6-7 below and shows how this could be implemented.
An estimate of the value to Metrolink of Metro riders using a Metro(+Metrolink) pass has been derived using the ridership information and specifically those trips that involve a combined Metro and Metrolink trip. Given that the ridership data used for this does not include defined origin and destination, and that the aggregate number of transfers in both direction at the transfer stations is approximately 1,500, a range of between $1.4m to $2.8m per year is estimated.
7 RIDERSHIP MODELING

7.1 MODELING METHODOLOGY

Ridership estimates have been undertaken for both the Gold Line and Metrolink SBL. The objective has been to determine the number of potential future riders and the pattern of future travel demand on each of the systems following the opening of the Gold Line Phase 2B extensions in 2025 (Pomona) and 2028 (Montclair). The demand modeling has been carried out using the Metro’s Corridors Base Model (CBM18). The CBM18 model is the latest available model and Model updates typically occur with each Regional Transportation Plan cycle, the next model update is anticipated during 2021 or 2022.

7.2 MODEL UPDATES AND VALIDATION

Metro validated the CBM18 model for the base year 2017 and the Model has been updated further to reflect changes to the regional rail and transit network, including:

- The Metrolink service schedule was updated to better reflect the 2017 timetables.
- Station penalties were added or removed as part of the calibration to the 2017 ridership reports provided by Metro.
- The Glendale and Pasadena transit systems were updated to better represent the current routes and timetables of these services.

A single baseline model run was carried out to verify the accuracy of the CBM18 for use in this project. The observed 2017 data such as station boardings, and travel times between stations were compared to equivalent model outputs to check that travel behaviors are appropriately replicated along the study corridor. The data from the model outputs and actual observed data were found to be correlate within 10%.

The Figure 7-1 presents a summary of the CBM18 modelled corridor boardings for the base year 2017 compared to the equivalent actual observed ridership across all transit services. Observed ridership is represented by the 2017 ticket-based ridership as reported in the Metro document titled, “WW-TAC-001-P-Station Boarding by Year.” The initial CBM18 model produced reasonable corridor-level ridership, reporting ridership within three percent of observed ridership. After the calibration adjustments mentioned above, the

![Figure 7-1: Comparison of Modeled Corridor Boardings Compared to Observed Boardings](image-url)
systemwide regional rail system ridership was still reasonable (within 9% of observed ridership) and the San Bernardino was verified to be within 10% of observed ridership.

7.3 MODELING PARAMETERS AND SCENARIOS

Following the verification of the CBM18, the required modeling parameters for the Metrolink SBL and Gold Line scenarios were then coded into the model. These parameters include service headways, service run times, fares, parking availability, parking fees etc.

As the future service patterns for both the Metrolink SBL and the Gold Line have not been finalized, a number of different scenarios were modelled to identify variations associated with a range of potential future service patterns. The following scenarios were modeled:

Gold Line Service Scenarios

- Gold Line extended to Pomona
- Gold Line extended to Montclair
- Gold Line headways at 8 minutes during peak time operation and 12 minutes during off-peak operation (to replicate the current Gold Line service)
- Gold Line headways at 5 minutes peak and 12 minutes off-peak as defined by Metro Rail Design Criteria and evaluated in the Project’s EIR

Metrolink SBL Service Scenarios

- Metrolink ‘Base’ headways approximate to 30-minute peak service (with a 60-minute reverse peak service) and a 60-minute bidirectional off-peak service.
- Metrolink Enhanced service which approximately to 20-minute peak headways (with 30-minute reverse peak service) and 30-minute bidirectional off-peak service.

These individual service patterns have been combined to create a set of modeling scenarios described as follows,

Scenario 1 - 2028 Gold Line Extension to Pomona with ‘Base’ Metrolink service levels and 8-minute peak and 12-minute off-peak Gold Line headways

Scenario 2 - 2028 Gold Line Extension to Montclair with ‘Base’ Metrolink service levels and 8-minute peak and 12-minute off-peak Gold Line headways

Scenario 3 - 2028 Gold Line Extension to Pomona with ‘Enhanced’ Metrolink services and 8-minute peak and 12-minute off-peak Gold Line headways

Scenario 4 - 2028 Gold Line Extension to Montclair with ‘Enhanced’ Metrolink services and 8-minute peak and 12-minute off-peak Gold Line headways

Scenario 5 - 2042 Gold Line Extension to Montclair with Enhanced Metrolink services and 8-minute peak and 12-minute off-peak Gold Line headways
Scenario 6 to 10 – are the same as Scenario 1 to 5 except for the change in Gold Line headways to 5-minute peak and 12-minute off-peak headways. These Gold Line headways reflect Metro Rail Design Criteria for new LRT system and were also used as the basis of the Gold Line Extension Phase 2B environmental evaluation.

7.4 MODELING RESULTS

The main outputs for the ridership modeling are station boardings for both Gold Line (LA Union Station to Montclair) and Metrolink SBL (LA Union Station to San Bernardino Downtown). These were also reported as aggregate boardings for each of the modes along the corridor.

Figure 7-2 to Figure 7-5 provide boardings at stations for the current year (observed boardings for 2019), boardings for the ‘model year’ 2028 and boarding for the ‘model year’ 2042.

The results of the ridership modelling show an increase in future ridership on both the Gold Line and the Metrolink SBL for all of the tested scenarios in the model year 2028. In summary, the magnitude of these ridership increases at the 2028 model year as compared to the 2019 observed ridership were;

- When the Gold Line is extended to Pomona;
  - The Gold Line has a 54% increase in ridership
  - Metrolink SBL has a 56% increase in ridership when using a ‘baseline’ Metrolink service scenario and has a 100% increase in ridership when using an ‘enhanced’ Metrolink SBL service scenario.

- When Gold Line is extended to Montclair;
  - The Gold Line has a 75% increase in ridership
  - Metrolink SBL has a 56% increase in ridership when using a ‘baseline’ Metrolink SBL service scenario and has a 93% increase in ridership when using an ‘enhanced’ Metrolink service scenario.

Ridership forecasts were also developed for a limited number of scenarios in the model year 2042. This data shows that Metrolink SBL ridership does not appear to grow beyond 2028 and at model year 2042, Metrolink SBL ridership is similar to its 2028 ridership. This trend in ridership growth between 2028 and 2042 is mainly because no additional service improvements were modeled for Metrolink SBL beyond 2028. However, the Gold Line ridership growth continues beyond 2028 and reaches approximately 100% of total growth compared to the 2019 observed Gold Line ridership.

The forecast average weekday boardings by station were extracted out of the models for each of the model scenarios. While the boardings were extracted by station, the station boardings should be considered as an approximation, as the boardings for individual stations were not calibrated at a station level in the base model. It should be noted that the CBM18 model used to determine the ridership estimates and derive the station boardings is a corridor-based model. The accuracy of CBM18 model has been verified for deriving corridor-based ridership (that means overall ridership numbers for a give mode in a given corridor). Its accuracy has not been verified for forecasting more localized station-based passenger boardings.
Figure 7-2 Gold Line and Metrolink SBL Ridership — Gold Line Extended to Pomona, Base Metrolink Service, Model Years 2019, 2028 and 2042

Figure 7-3 Gold Line and Metrolink SBL Ridership — Gold Line Extended to Pomona, Enhanced Metrolink Service, Model Years 2019, 2028 and 2042
Figure 7-4 Gold Line and Metrolink SBL Ridership – Gold Line Extended to Montclair, Base Metrolink Service, Model Years 2019, 2028 and 2042

Figure 7-5 Gold Line and Metrolink SBL Ridership – Gold Line Extended to Montclair, Enhanced Metrolink Service, Model Years 2019, 2028 and 2042

Figure 7-6 below presents the aggregate corridor ridership for the Gold Line between LA Union Station and Pomona/Montclair and for Metrolink SBL between LA Union Station and San Bernardino Downtown.
The Gold Line and Metrolink SBL ridership modeling indicates ridership increases between 2019 and 2028. By 2028 and with the Gold Line extension completed to Pomona and Montclair, the Metrolink SBL ridership under the ‘Base’ Metrolink SBL services scenario increases by 57% and 53%, respectively. Gold Line ridership increases by 53% and 75% respectively. For the Gold Line extension to Pomona and Montclair, Metrolink SBL ridership under the ‘Enhanced Metrolink SBL services’ scenario increases by 102% and 93%, respectively. Gold Line ridership increases by 54% and 76% respectively.

The main drivers for the 2028 ridership increases are considered to include;

1. Forecast population growth of 16% within the corridor during that timeframe.
2. Forecast employment growth of is up to 18% within the corridor.
3. Improved regional connectivity provided by transit expansion; In addition to the Gold Line extension to Montclair, other transit projects that are currently underway including the Purple Line Extension, Crenshaw to LAX, Regional Connector, East San Fernando...
Light Rail, Vermont Corridor BRT, North San Fernando Valley BRT, North Hollywood and Pasadena BRT will increase ridership overall on rail transit mode.

Gold Line ridership continues to increase between 2028 and 2042. The main driver of 2042 ridership increases is;

1. Improved regional connectivity provided by further transit expansion; Sepulveda Pass, West Santa Ana Branch, SR-60 North Side Light Rail, Green Line extension to Torrance.

Metrolink ridership growth stabilizes between 2028 to 2042. The main drivers of these ridership patterns are considered to be;

2. No further modelled Metrolink SBL service improvements beyond 2028.
3. Growth in I-10 HOV Lane volumes.
8 FARE SENSITIVITY ANALYSIS

8.1 ANALYSIS METHODOLOGY

Using the ridership results developed for the model years, a fares sensitivity analysis was carried out to understand the impacts on potential ridership resulting from changes in Gold Line and Metrolink SBL fare structures. All other parameters in the ridership model remained unchanged so that changes related to fare structures could be isolated and examined. The baseline Metrolink SBL fares that were already in the model included the current 25% discount and the anticipated $3 parking fee for Metro Gold Line riders who choose to park-and-ride. Montclair Station has been treated separately as it is outside of LA County, and the baseline assumes free Gold Line parking. With direction from Metro and Metrolink, the fares structures shown in Table 8-1 were tested to identify potential effects on ridership on both systems.

Fare Sensitivity Scenarios 1 to 6 were used to examine fare changes for the 2028 Gold Line extension to Montclair and an ‘Enhanced’ Metrolink SBL service. Fare changes were paired, meaning that tested Gold Line fares ($2.50, $3.00 and $3.50) were paired with Metrolink SBL tested off-peak discounts of 15% and 25% (which were applied in addition to the current 25% discount).

Scenarios 7 and 8 were used for 2028 Gold Line extension to Pomona, again using ‘Enhanced’ Metrolink SBL services, however these fare changes were not paired. The Gold Line increases ($2.50, $3.00 and $3.50) were tested with existing Metrolink SBL fares (that include the current 25% discount). The Metrolink SBL discounts (15% and 25% off-peak discounts) were tested with the existing Gold Line fare of $1.75.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Metrolink SBL Fare Change*</th>
<th>Metro Gold Line Fare Change**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15% Off-Peak Discount</td>
<td>$2.50 (+43%)</td>
</tr>
<tr>
<td>2</td>
<td>$3.00 (+71%)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$3.50 (+100%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>25% Off-Peak Discount</td>
<td>$2.50 (+43%)</td>
</tr>
<tr>
<td>5</td>
<td>$3.00 (+71%)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>$3.50 (+100%)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Existing Fare</td>
<td>$3.50 Fare</td>
</tr>
<tr>
<td>8</td>
<td>25% Off-Peak Discount</td>
<td>$1.75 (Existing Fare)</td>
</tr>
</tbody>
</table>

*Metrolink SBL fare changes include the existing 25% discount.

**In addition to the $3 Parking at Gold Line stations (excluding Montclair).

An example of the fare structures tested are shown in Figure 8-1.
Following the model runs, the ridership for the two rail lines was extracted from the scenarios to understand the relationship between fares and ridership.

### 8.2 Fare Sensitivity Analysis Results

#### 8.2.1 Scenario 1, 2 and 3 – 15% Metrolink SBL Off-peak Discount and Gold Line Increases

Figure 8-2 shows the changes in ridership associated with the fare changes and pairings applied and as defined in Table 8-1 above. In summary;

- The Metrolink SBL ridership response to the 15% off-peak discount and the increasing Gold Line fares is negligible. Although a range of +1.1% to +1.5% does represent some increased ridership, the accuracy of the model has been verified to be within +/-10%.
- The reduction in the Gold Line ridership is small and, for the increases of the fare (up to 100% for the $3.50), these changes represent a high degree in demand inelasticity.
- However, the amount of change is below the verified level of accuracy of the CBM18 model (as with the Metrolink SBL ridership change).
8.2.2 Scenario 4, 5 and 6 – 25% Metrolink SBL Off-peak Discount and Gold Line Increases

Figure 8-3 shows the changes in ridership associated with the fare changes and pairings applied and as defined in Table 8-1 above. In summary;

- The Metrolink SBL ridership response to the 25% off-peak discount and the increasing Gold Line fares is slightly increase however it is still considered to be negligible. Again (and as with Scenarios 1, 2 and 3) a range of +1.7% to +2.1% does represent some increased ridership, the accuracy of the model has been verified to be within +/-10%.
- The reduction in the Gold Line ridership is very similar to Scenarios 1, 2 and 3, and is small for the relative increases of the fare (up to 100% for the $3.50). Again, these changes represent a high degree of Gold Line demand inelasticity. The amount of change is below the verified level of accuracy of the model (as with the Metrolink SBL ridership change).
8.2.3 Scenario 7 and 8 – 25% Metrolink SBL Off-peak Discount and Gold Line Increases

Scenario 7 tested a single Gold Line fare increase of 100% (relative to the existing base fare of $1.75) to $3.50, while using the existing Metrolink SBL fares (that included the existing 25% discount). The purpose of this was to isolate the net effect on ridership of a Gold Line fare increase. The result was an estimated decrease in ridership of 6%. Again, this was very similar to the results from Scenarios 4, 5 and 6 and well within the model’s verified +/-10% accuracy.

Scenario 8 tested a Metrolink SBL 25% off-peak discount (in addition to the current 25% discount) while using the existing Gold Line fare of $1.75. The purpose of this was to isolate the net effect on ridership of a Metrolink SBL discount. The results were very similar to the Scenarios 4, 5 and 6 showing a Metrolink SBL ridership increase of up to 1.6%, representing a very small change and well below the model’s verified +/-10% accuracy.

The combined results of the unpaired testing assisted in reaching several key conclusions on the potential fare structure changes.

- First, the fare changes that were tested have a negligible effect on overall ridership.
- Second, relatively small number of riders are switching systems as a result of fare changes. Those riders that are transferring (up to 1,500 passengers in each direction per day) is a relatively small proportion of overall ridership.

8.2.4 Station Boarding and Passenger Transfer Numbers Accuracy

The fare sensitivity analysis is based on the corridor base model (CBM18) which was used to determine the ridership estimates and derive the transfer passenger numbers at the transfer stations. The accuracy of CBM18 model has been verified for estimating overall ridership numbers for a given mode in a given corridor. The model has not been verified for forecasting more localized station-based passenger boardings and passenger transfer numbers. The actual passenger transfer numbers at each of the three transfer stations may therefore exceed those numbers derived from the CBM18 model. For example, there is some historical evidence from previous Metrolink SBL ridership trends at Metrolink Covina Station where this station experienced a 25% decrease in daily boardings following the opening of the Gold Line Station at Azusa in March 2016 and this ridership decrease has not yet recovered (as shown in figure 8-4). Therefore, a decline in Metrolink ridership at the Pomona, Claremont and Montclair stations is possible following the opening of the Gold Line stations.

However, using the CBM18 the magnitude of the fare changes tested appear to have a negligible effect (approximately 2%) on overall ridership. Although Metrolink SBL riders may be attracted to the Gold Line by lower fares, the CBM18 modelling results indicate that the majority of riders do not appear to switch systems as a result of fare changes. Approximately 10% of Metrolink riders that do appear to be transferring to the Gold Line system make up a small proportion (approximately 1500 daily corridor boardings) of Metrolink SBL’s overall total forecasted 2028 ridership between of between 15,000 and 20,000 daily corridor boardings. The 10% of the riders that are transferring may well represent new riders accessing new destinations in the San Gabriel Valley.
While recognizing the precedent at Covina for potential mode shift, the two modes are generally serving two separate markets. Riders served by the Metrolink SBL are more likely to be long distance commuters and predominantly commuting to and from to LA Union Station and riders served by the Gold Line are more likely to be traveling/commuting shorter distances including destinations to cities and communities within the San Gabriel Valley. This is also supported by the average trip lengths made by Metrolink SBL and Gold Line riders. Although the future average trip lengths were not derived for the CMB18 ridership model, the existing average trip lengths are 8.8 miles for Gold Line riders and 34.2 miles for Metrolink SBL riders.

**Figure 8-4 Covina Station Boardings**

![Average weekday boardings at Covina Metrolink station](image)
9 FUTURE METROLINK SBL FAREBOX REVENUE AND SUBSIDY ESTIMATES

The increases of ridership estimated by the ridership modelling work also indicate that there will be corresponding changes to farebox revenues. The Metrolink services across Metrolink operating network rely on farebox revenues to meet a proportion of its operating costs. Also, Metrolink relies on subsidies from its contributing funding agencies to meet the difference between its revenues and costs. Therefore, the estimated future ridership has been used to estimate future revenues, and future operating costs have also been estimated to help determine if, and what the changes in future subsidies would be.

9.1 METROLINK REVENUE ESTIMATE

Metrolink currently uses five ticket categories and four passenger/fare discounts. This means that there are up to twenty different combinations of ticket and fare types. To simplify the approach to calculating fare box revenues therefore, a Metrolink SBL average single trip fare has been used in combination with the modelled average daily ridership.

The Metrolink SBL revenue estimates had been calculated for model year 2028. Recognizing that in 2028, the Metrolink SBL riders will have the opportunity to transfer to the Gold Line to complete their journey (or originate from a Gold Line destination and use Metrolink SBL to complete their journey), two average fares have been used. One average fare account for long Metrolink SBL trips (form east of Montclair to west of Pomona or vice versa) and the second average fare accounts for riders that leave or join a Metrolink SBL service at a Gold Line transfer station to complete their journey. To determine the number of long trip and short trip riders, the number of riders that transfer at each of the transfer station has been extracted from the model. The number of transfer passengers for the Gold Line extension to Pomona and to Montclair is shown in Figure 9-1.

Figure 9-1 Passenger Transfers Between the Two Rail Systems

![Passenger Transfers Between the Two Rail Systems](image)

The average weekday ridership estimates for transferring and non-transferring passengers; and the average fares for transferring and non-transferring passengers, have been used to estimate revenue for the 2028 ridership modeling scenarios. Metrolink SBL revenues were also estimated using this method for 2019 observed boardings (without adjustment for transfers) to determine a baseline and establish the accuracy of the calculation. Escalation rates have not
been applied to the revenue estimates and all farebox revenue projections are expressed in 2019 dollars.

Based on this methodology, the Metrolink SBL revenue estimates for each of the 2028 Metrolink SBL service scenarios are presented in Figure 9-2.

**Figure 9-2 Metrolink SBL Revenue Estimates (based on Gold Line at 8/12 minute peak/off-peak headways)**

The methodology and the results of a subsidy estimate to operate the Metrolink SBL in 2028, (following the start of the Foothill Gold Line Extension Phase 2B services to Montclair) is provided in full as Volume 2 - Appendix 5. The results of the future subsidy estimate are as follows.

**Figure 9-3 Estimated Metrolink SBL farebox revenue and subsidy**

The amount of subsidy has been calculated as the difference between future 2028 fare box revenues and future 2028 operating costs. The estimate of future farebox revenues is described in the preceding chapter. The future operating costs have been estimated using a methodology and unit cost rates provided by Metrolink. The future operating costs are also based on an assumed operating timetable (included in Volume 2 - Appendix 5) and because of the uncertainty on what that timetable will
be in 2028, a 15% contingency has also been added to the 2028 operating cost estimate.

The current/actual subsidy for the Metrolink SBL is reported for FY2018/2019 in the Metrolink FY2019/2020 Budget Handbook and is $26.094 million. The estimated 2028 subsidy using the methodology described in Volume 2 - Appendix 5 is $26.465 million. This 2028 subsidy estimate does not take account of other revenues received by Metrolink from Amtrak and the Class 1 Railroads for dispatching and maintenance. In FY2018 these other revenues were $3.666 million. Therefore, the result of the estimate is that there is not likely to be an increase in required subsidy in 2028 and the potential income from other revenues may also contribute to a reduction in 2028 subsidy.
10 STAKEHOLDER COORDINATION AND OUTREACH

The study has been conducted with close coordination and input from several key stakeholders, that have combined as a Task Force;

- Metro as the project sponsor and Gold Line owner/operator
- SBCTA as a contributing agency
- Metrolink as an operator
- Foothill Gold Line Construction Authority as design-build manager
- Cities of Pomona, Claremont, and Montclair as Metrolink station owners
- County of Los Angeles

The project team has held face to face meetings with the Task Force stakeholders at these key milestones and decision points in the project.

A Core Agencies Group (CAG) was also created to effectively engage key stakeholders, which included Metro, SBCTA and Metrolink. The CAG met three times and the Task Force met seven times over the course of the study. The stakeholder coordination process aimed to also gather feedback and other comments on work in progress.

The project team also held meetings with additional stakeholders that included California State Transportation Agency (CalSTA) and CPUC. In addition to stakeholder outreach, there was coordination with other Metro teams including Operations, Modeling and Parking. A summary of the key meetings is provided in Table 10-1 below.
<table>
<thead>
<tr>
<th>Meeting</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAG Study kick off</td>
<td>March 1, 2019</td>
</tr>
<tr>
<td>CAG Meeting #2</td>
<td>March 15, 2019</td>
</tr>
<tr>
<td>CAG Meeting #3</td>
<td>April 4, 2019</td>
</tr>
<tr>
<td>Task Force Study kick off</td>
<td>April 9, 2019</td>
</tr>
<tr>
<td>Task Force Workshop on ridership modeling methodology</td>
<td>May 13, 2019</td>
</tr>
<tr>
<td>Meeting with CPUC to present preliminary concept ideas for Montclair station</td>
<td>July 3, 2019</td>
</tr>
<tr>
<td>Meeting with CalSTA to present preliminary modeling results for grant application</td>
<td>August 20, 2019</td>
</tr>
<tr>
<td>Task Force Presentation of preliminary ridership modeling results</td>
<td>October 22, 2019</td>
</tr>
<tr>
<td>Task Force workshop for Montclair station concept designs for optimized passenger transfer</td>
<td>December 12, 2019</td>
</tr>
<tr>
<td>Task Force workshop for Montclair station concept designs for optimized passenger transfer with CPUC</td>
<td>February 18, 2020</td>
</tr>
<tr>
<td>Task Force Presentation of fare sensitivity results</td>
<td>March 9, 2020</td>
</tr>
<tr>
<td>Task Force Study findings workshop</td>
<td>May 12, 2020</td>
</tr>
</tbody>
</table>
11 CONCLUSIONS AND RECOMMENDATIONS

11.1 STUDY RECOMMENDATIONS

The following are the study’s outcomes and proposed recommendations.

Goal 2 - Consider the introduction of a revised walking route at Claremont Station between the new Metro Gold Line Station and the relocated Metrolink SBL station.

Goal 2 - Consider the proposed design changes at Montclair Station using a modified Gold Line vertical track profile and a revised platform configuration incorporating a shared Metro Gold Line and Metrolink SBL central platform.

Goal 5 - Consider the introduction of strong branding differentiation at transfer stations including the use of themed platform finishes to assist passenger decision making at transfer points.

Goal 5 - Consider the introduction of a Metro pass or fare that includes a distance-based upcharge for travel on Metrolink SBL services.

11.2 NEXT STEPS

At the time of writing the final draft study report, the following are the assumed next steps (and are subject to stakeholder agreement and consensus;)

- Brief Metro and stakeholder Executive Management on the study's objectives, content and findings.
- Finalize the study report.
APPENDIX 1: METRO BOARD REPORT
SUBJECT: CLAREMONT METROLINK STATION STUDY REPORT

ACTION: RECEIVE AND FILE

RECOMMENDATION

RECEIVE AND FILE final report on the Claremont Metrolink Station Study with staff recommendations to keep the Claremont Metrolink Station open and proceed with a staff-level task force to provide recommendations on how Metrolink and Gold Line Phase 2B and other transit services will complement each other to provide greater transit services to the surrounding communities along the shared rail corridor.

ISSUE

On September 28, 2017, Directors Solis, Barger, Fasana, and Najarian directed the Chief Executive Officer to evaluate the benefits and/or impacts related to removing the Claremont Metrolink Station (see Attachment A - Metro Board Motion 21.1). Metro staff worked closely with representatives from the Foothill Gold Line Construction Authority, Southern California Regional Rail Authority (SCRRA), and City of Claremont to complete the Claremont Station study as directed by the Board. The findings of the study are herein presented.

DISCUSSION

Background

The Claremont Metrolink Station is located 1.2 miles west of the Montclair station and 2.1 miles east of the Pomona North station along the Metrolink San Bernardino Line that operates between downtown San Bernardino and Los Angeles Union Station. The Foothill Gold Line Phase 2B extension to Montclair project (Gold Line project) that broke ground on December 6, 2017 will share the railroad right-of-way with Metrolink tracks for approximately 3.78 miles starting from (half a mile west of) the Metrolink Pomona North station to the Claremont station and end in Montclair station. The Gold Line project plans to co-locate the Gold Line stations with Metrolink stations in Pomona, Claremont and Montclair. The Foothill Gold Line Construction Authority final Environmental Impact Report (EIR) included relocating the existing Metrolink Claremont station to 0.9 miles from the Montclair Metrolink station and 2.3 miles from the Pomona North station.

Findings

The findings of the study are a compilation of information gathered from a close collaborative working group comprising of the Foothill Gold Line Construction Authority, SCRRA, City of Claremont and Metro. This study is limited to only the items listed in the Board Motion. In order to specifically
address the items outline in the Metro Board Motion 21.1, these findings are organized into 11 tasks as listed below.

Task 1: Current and projected ridership at the Metrolink Claremont station under existing conditions (without Gold Line Phase 2B)

Ridership at the Metrolink Claremont station is 406 on an average weekday. Ridership at the station has been fairly stable over the past six years (see table 1 below). SCRRA projects 482 average weekday riders by 2025 and the Foothill Gold Line Construction Authority forecasts 1,361 average weekday Metrolink boardings by 2035.

Table 1: Average Weekday Boardings

<table>
<thead>
<tr>
<th>Task 1: Claremont Station</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY25*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>415</td>
<td>402</td>
<td>394</td>
<td>400</td>
<td>397</td>
<td>406</td>
<td>482</td>
</tr>
</tbody>
</table>

* 2025 projection from Metrolink Strategic Plan

Seventy percent (285) of riders drive to or leave the station by car; 25% (103) walk or bike to or from the station; and 5% (19) arrive at or leave the station by bus or other means. It is important to note that the Metrolink Claremont station has a higher percentage of riders walking and biking (25%) to or from the station compared to the Pomona North (15%) and Montclair (4%) stations. This could be due to the Metrolink Claremont station’s proximity to major Claremont destinations such as the Village, Claremont Colleges, and other transit-oriented developments near the station.

Ridership Profile

SCRRA 2015 on-board survey shows that 68% of the 406 average weekday riders (278) mostly leave Claremont to Los Angeles or other destinations for work or school, whereas 32% of riders (128) arrive in Claremont mostly for work or school. Of the 406 average weekday riders, 61% (249) are adults, 12% (48) are senior/disabled, 18% (75) are students, and the remaining 8% (31) are youth.

Task 2: Impacts to Metrolink operations and travel times with the elimination of the Metrolink station

Only early morning Metrolink trains and last two night trains that do not need to wait for passing trains could save approximately 2-3 minutes of travel time with the elimination of the Metrolink Claremont Station. Approximately 70% of the San Bernardino Line is single-track, and therefore trains traveling in opposite directions can only pass each other at the double-track sections which accounts for only 30% of the entire line. Due to the constraints posed by the single-track sections outside of Claremont, Metrolink trains have to wait at double-tracks or sidings for a passing train for at least 10 minutes. The spacing between double-track sections dictates whether a travel time reduction can be incorporated into the schedule. In this case, travel time reduction needs to be greater than 10 minutes to realize travel time savings. The majority of the 38 trains that run on the San Bernardino Line every weekday would not see any travel time savings.

Task 3: Analysis of changes to gate operations at all crossings in Claremont if the Metrolink station is eliminated

There are four at-grade rail crossings in Claremont: Cambridge Avenue, Indian Hill Boulevard, College Avenue, and Claremont Boulevard. The Claremont Metrolink station is currently located between Indian Hill Boulevard and College Avenue whereas the relocated Metrolink station would be
located between College Avenue and Claremont Boulevard. Gate down time was analyzed for the Indian Hill Boulevard, College Avenue, and Claremont Boulevard crossings under existing conditions and two future condition scenarios: Gold Line with and without Metrolink Station (see table 2 below). Cambridge Avenue is over half a mile west from the Claremont station and the current gate down time is not affected by the existing station; therefore, future gate down time would also not be impacted by the station relocation or elimination.

Table 2 shows that gate down time could be reduced by 3-6 minutes in the future if the Metrolink station is eliminated. In addition, table 2 also indicates that gate down time will be significantly higher when the Gold Line is in operation at Claremont and College crossings compared to existing conditions due to the frequency of the Gold Line service during the peak hour. Indian Hill Boulevard, which is proposed to be grade-separated for the light rail tracks, could see a 4 minute reduction in gate down time compared to existing condition.

Table 2: Gate down time in Minutes per Peak Hour*

<table>
<thead>
<tr>
<th>Railroad Grade Crossings</th>
<th>Existing Condition</th>
<th>Future Condition Gold Line with Relocated Metrolink Station</th>
<th>Future Condition Gold Line with Metrolink Station Eliminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indian Hill Boulevard</td>
<td>9 minutes</td>
<td>11 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td>College Avenue</td>
<td>9 minutes</td>
<td>30 minutes</td>
<td>27 minutes</td>
</tr>
<tr>
<td>Claremont Boulevard</td>
<td>11 minutes</td>
<td>35 minutes</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Number of trains during peak hour</td>
<td>4 Metrolink trains</td>
<td>6 Metrolink trains 24 Gold Line trains</td>
<td>6 Metrolink trains 24 Gold Line trains</td>
</tr>
</tbody>
</table>

* Gate down times are estimates and could change with final design and project implementation; peak hour is from 6 AM to 7 AM and from 5 PM to 6 PM
Sources: SCRRRA and Foothill Gold Line Construction Authority

Task 4: Analysis of when Metrolink service would be discontinued in Claremont during Gold Line construction, and length of time during which no rail transit options would be available in Claremont

According to the Foothill Gold Line Construction Authority, if the decision is made to eliminate the Metrolink Claremont Station, Metrolink service to the Claremont station would be discontinued as early as the end of 2021 and there would be no rail service in Claremont for approximately five years until the opening of Gold Line Phase 2B in 2027. However, if the Metrolink Claremont station is relocated as currently planned, construction of the new station could be completed before the existing station is demolished and therefore there would be minimal disruption to the existing Metrolink service.

Task 5: Cost savings associated with the construction of the Gold Line Phase 2B

If the decision is made to remove the Metrolink Claremont station, the Foothill Gold Line Construction Authority estimated a savings of approximately more than $40 million in costs with five months of the construction schedule. The estimated savings do not include potential savings associated with parking facility. If the Metrolink station is relocated, the Authority would have to build parking to
accommodate both Metrolink riders and Gold Line riders.

**Task 6: Impacts and potential mitigations to Metrolink riders that currently board at the Claremont station**

Staff identified potential impacts of the Claremont Metrolink station elimination to riders during and after construction of the Gold Line Phase 2B extension project.

**During Construction**
During construction of the Gold Line, there would be approximately 5 years of no rail service in Claremont as described under Task 4. Riders could board the Metrolink San Bernardino Line at the Montclair station (1.2 miles to the east) or the Pomona North station (2.3 miles to the west). As a potential measure to address this impact, the Foothill Gold Line Construction Authority has committed to provide a free courtesy shuttle during construction to facilitate the transfer from Claremont to the Montclair or Pomona North stations. The free shuttle could cost the Foothill Gold Line Construction Authority approximately $400,000/year for 5 years for a total of $2 million.

The Metrolink passengers at Claremont will have the option of going to the Montclair station and pay $1 additional Metrolink fare for a regular roundtrip to Union Station compared to fares from the Claremont station. In addition, travel time could be increased by an estimated 9 to 11 minutes to board at the Montclair station depending on access mode of shuttle, car, or bicycle. Furthermore, some of the 102 riders who currently access the Claremont station by walking or biking may lose that option due to the additional distance to Montclair and or Pomona North station. Thus, eliminating the Metrolink Claremont station could change the mode of access for riders and increase net vehicle miles, travel time, and cost to Metrolink passengers. In addition, there are intangible impacts to Metrolink passengers at Claremont that are beyond the scope of the study that cannot be quantified and/or addressed.

**After Construction**
After construction of the Gold Line, riders would be able to ride the Gold Line to Union Station or transfer to Metrolink at the Pomona or Montclair Gold Line stations. Table 3 shows a comparison of post-construction conditions under existing conditions and future conditions with the Gold Line. However, riders who utilize the Metrolink Claremont Station to connect to destinations other than Union Station could connect to the Montclair and Pomona North stations by bus, car, or bicycle. The free courtesy shuttle between Claremont and Montclair and/or Pomona would only be provided during the 5 year period of the construction of the Gold Line Phase 2B extension project.

Table 3: Post Construction Conditions
Task 7: Impacts and potential mitigations to the City of Claremont if it becomes the Gold Line terminus with and without a Metrolink Station scenario

In response to the Board motion, Metro staff worked with the City of Claremont staff to identify the following impacts and measures to address impacts should the City of Claremont become a Gold Line terminus with and without a Metrolink station. The City identified impacts to tourism and commerce, traffic, parking, train crossings, and rail transit options should Claremont become the Gold Line terminus. In addition, City staff noted that having the Gold Line and Metrolink stations in Claremont would allow transfers between the two systems which would not be possible if Metrolink is eliminated.

See Attachment B for the list of impacts and measures to the City of Claremont if it becomes a Gold Line Terminus with and without a Metrolink station.

Per the Foothill Gold Line Construction Authority’s statute, the Foothill Gold Line Phase 2B is being planned and engineered to become one complete 12.3-mile, six-station segment from the APU/Citrus College Station in Azusa to the Montclair Transit Center. The project was environmentally cleared as one project, and the procurement documents for the design-build contract being finalized include all elements of the project to Montclair. After San Bernardino County expressed concerns that they may not have the full funding needed to extend the line into San Bernardino County in time to meet the Construction Authority’s schedule, the Construction Authority environmentally cleared the option of having the Claremont Station be a temporary terminus of the line. However, the Construction Authority has found a way to allow San Bernardino County approximately three years from today (two years following the Notice to Proceed for the design-build contract) to make all necessary

### Claremont Rail Service Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Metrolink Existing Conditions</th>
<th>Metro Gold Line Post-Construction Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Frequency</td>
<td>Every 20–30 minutes (peak hours)</td>
<td>Every 6 minutes (peak hours)</td>
</tr>
<tr>
<td></td>
<td>Every 60–90 minutes (off-peak hours)</td>
<td>Every 12 minutes (off-peak hours)</td>
</tr>
<tr>
<td>Fares</td>
<td>$9.25 per trip</td>
<td>$1.75 per trip</td>
</tr>
<tr>
<td>Claremont to Union</td>
<td>$18.50 roundtrip</td>
<td>$3.50 roundtrip</td>
</tr>
<tr>
<td>Parking</td>
<td>Free</td>
<td>$3 per day</td>
</tr>
<tr>
<td>Travel Time</td>
<td>55 minutes</td>
<td>67 minutes</td>
</tr>
<tr>
<td>Claremont to Union</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amenities</td>
<td>Bicycle storage</td>
<td>Bicycle storage</td>
</tr>
<tr>
<td></td>
<td>Restrooms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quiet car option</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food and drinks allowed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seats with tables</td>
<td></td>
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</tbody>
</table>
arrangements, including commitment of the full funding, and still be built as part of the current design-build contract. San Bernardino County has already identified and committed more than half of the funds needed. The Construction Authority is optimistic that the extra time being provided will allow the segment from Glendora to Montclair to be built as one project.

Task 8: Total parking spaces and current parking utilization rate at the co-located Metrolink and proposed Gold Line stations (Pomona North, Claremont and Montclair stations)

Parking utilization rates at the Pomona North, Claremont, and Montclair stations are shown in Table 4. Parking at Claremont is at 68% utilization, Pomona is at 93%, and Montclair is at 63% utilization. This suggests that if the Claremont station is eliminated, riders who drive to the Pomona North station may have difficulty finding parking whereas there is ample parking available at the Montclair station.

Table 4: Average Number of Parking Spaces Occupied

<table>
<thead>
<tr>
<th>Station</th>
<th>Parking Spots Available</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pomona North</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>279</td>
<td>279</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>93%</td>
<td>93%</td>
</tr>
<tr>
<td>Claremont</td>
<td>440</td>
<td>383</td>
<td>374</td>
<td>268</td>
<td>299</td>
<td>299</td>
</tr>
<tr>
<td></td>
<td></td>
<td>87%</td>
<td>85%</td>
<td>61%</td>
<td>68%</td>
<td>68%</td>
</tr>
<tr>
<td>Montclair</td>
<td>1836</td>
<td>1028</td>
<td>1065</td>
<td>1083</td>
<td>1157</td>
<td>1157</td>
</tr>
<tr>
<td></td>
<td></td>
<td>56%</td>
<td>58%</td>
<td>59%</td>
<td>63%</td>
<td>63%</td>
</tr>
</tbody>
</table>

Source: SCRRRA

Metro’s Gold Line Phase 2B Parking Demand Model was used to forecast opening day parking utilization for the Claremont Gold Line station under four scenarios based on a $3/day fee (see table 5). The parking demand model showed that the highest demand for parking would occur if the Claremont Gold Line station is a terminus (i.e. does not go into Montclair) with a Metrolink station.

Table 5: Opening Day Parking Demand

<table>
<thead>
<tr>
<th>Claremont Station Parking Demand Scenarios</th>
<th>Parking Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Scenario: Claremont is a mid-point suburban station with a Metrolink station</td>
<td>539</td>
</tr>
<tr>
<td>Alternative Scenario 1: Claremont is a mid-point suburban station without a Metrolink station</td>
<td>461</td>
</tr>
<tr>
<td>Alternative Scenario 2: Claremont is a terminus station with a Metrolink station</td>
<td>831</td>
</tr>
<tr>
<td>Alternative Scenarios 3: Claremont is a terminus station without a Metrolink station</td>
<td>763</td>
</tr>
</tbody>
</table>

Source: Metro Gold Line Phase 2B Parking Demand Model

Task 9: Determine the formal process by which to eliminate a Metrolink station, should that local station city agree

Currently, there is no formal process to eliminate a Metrolink Station. If the Metro Board decides to
eliminate the Claremont station, an update to the Foothill Gold Line Final EIR would be required. The City of Claremont is not supportive of eliminating the Metrolink station as evidenced by the December 12 City Council Resolution passed in support of the Metrolink Claremont Station (see Attachment C - Claremont City Council Resolution).

**Task 10: Include City of Claremont staff in the project team during all phases of the study**
Metro staff has worked closely and collaboratively with the City of Claremont staff throughout the development of the study. Several coordination meetings were held and the City of Claremont’s input has been incorporated in the study particularly for Task 7 - Impacts to the City of Claremont if it becomes a terminus with and without a Metrolink Station scenario.

**Task 11: City of Claremont Town Hall Summary**
Task 11 directed staff to report back to the Board with a final report, findings and recommendations after presenting the draft to the City of Claremont. Metro staff in coordination with the Foothill Gold Line Construction Authority, SCRRRA, and City of Claremont presented the preliminary results of the study at a City of Claremont hosted Town Hall meeting on December 11, 2017. The meeting was attended by approximately 360 residents and riders who use the Metrolink Claremont Station.

The Mayor of Claremont hosted and facilitated the meeting and staff representatives from Foothill Gold Line Construction Authority, Metrolink, Metro, and the City of Claremont served as panelists and presenters of the preliminary findings from this study. Metro Board Director Solis and Metro Board Director Fasana were also in attendance and provided remarks.

Claremont’s City Council members and representatives of their Traffic and Architectural Commissions, past City Council Members, City staff, leadership from the Claremont Chamber of Commerce, elderly residents, regular commuters, disabled transit riders, environmentalists, students, college professors, longtime residents, business owners, all spoke in favor of keeping their Metrolink Station in Claremont.

As of December 21, 2017, over 400 total comments were received. With the exception of two public comments, all public comments expressed strong support for keeping the Metrolink Station in the City of Claremont and expressed strong opposition to the potential removal of the Claremont Station. Most comments included several reasons for keeping the station and impact of potential station elimination (See Attachment D - Summary of Public Comments). Nearly all public comments expressed strong support for having both Gold Line and Metrolink stations in the City of Claremont. The majority of comments explained the different yet complementary purpose of having both of the station in their town. The majority of the potential impacts and expressed concerns related to station elimination identified in the public comments cannot be measured or fully addressed in this study.

**Recommendation**
Based on the findings of the study and the enormous community support expressed for the Metrolink Claremont Station, staff recommends that the Metrolink Claremont station remains open. Further, staff concurs with relocating the Metrolink Station within the City of Claremont as stipulated in the Foothill Gold Line Extension Final EIR.

**FINANCIAL IMPACT**
There is no financial impact. The Gold Line Phase 2B project includes the cost of the relocation of the Metrolink Claremont station.
ALTERNATIVES CONSIDERED
The alternative would be for the Board not to receive this report. This is not recommended as the study was requested by the Board.

NEXT STEPS
Staff will form a staff-level task force to proactively develop a toolbox of strategies that would make the Metrolink and future Gold Line services complementary with each other to provide greater transit services to the surrounding communities along the shared rail corridor. The task force will include representatives from the San Gabriel Valley Council of Governments (SGVCOG), cities of Pomona and Claremont, Metro, SCRRRA, Foothill Transit, and Foothill Gold Line Construction Authority. Staff will provide updates of the task force efforts to the Board via the Regional Rail quarterly report.

ATTACHMENTS
Attachment A - Metro Board Motion 21.1
Attachment B - Impacts and Measures to the City of Claremont if it becomes a Gold Line Terminus with and without a Metrolink Station
Attachment C - Claremont City Council Resolution in support of the Claremont Metrolink Station
Attachment D - Summary of Public Comments

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Chief Executive Officer
APPENDIX 2: TECHNICAL NOTE ON BEST PRACTICE AT COMPARABLE SYSTEMS
LOS ANGELES METRO
CONCEPTUAL DESIGN / PLANNING IN SUPPORT OF THE
METROLINK SAN BERNARDINO LINE / GOLD LINE TASK
FORCE

TASK 1 TECHNICAL NOTE

381630-MMD-00-19-NO-PL-0001

PREPARED FOR
Metro Regional Rail
One Gateway Plaza
Los Angeles, CA

June 26, 2019

PREPARED BY
Mott MacDonald

MOTTMACDONALD
Prepared by: Jacqueline Martinez

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Approved by: Eric Banghart

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# TABLE OF CONTENTS

EXECUTIVE SUMMARY ........................................................................................................ 7

1.0 INTRODUCTION ................................................................................................................ 8
  1.1 Project Overview .................................................................................................................. 8
  1.2 Study Background ................................................................................................................. 8

2.0 PURPOSE AND GOALS OF STUDY .............................................................................. 9

3.0 OVERVIEW OF PROJECT TASKS ................................................................................. 10
  3.1 Task 1 Overview .................................................................................................................. 10
  3.2 Review Methodology .......................................................................................................... 10

4.0 OVERVIEW OF GOLD LINE AND SAN BERNARDINO LINE ...................................... 11

5.0 CRITERIA USED TO IDENTIFY SIMILAR SYSTEMS FOR COMPARISON .................. 12

6.0 INITIAL REVIEW OF COMPARABLE SYSTEMS ............................................................... 12
  6.1 San Jose Caltrain / VTA Light Rail ....................................................................................... 13
  6.2 San Diego Amtrak Pacific Surfliner / MTS Trolley ............................................................. 14
  6.3 Seattle Sound Transit Commuter Rail / Light Rail .............................................................. 16
  6.4 Boston MBTA Commuter Rail / Subway ........................................................................... 17
  6.5 Philadelphia SEPTA Heavy Rail / Commuter Rail ............................................................ 19
  6.6 Chicago Metra Commuter Rail / CTA Heavy Rail .............................................................. 20
  6.7 New York MTA subway / commuter rail ......................................................................... 22
  6.8 Toronto GO Transit regional rail / TTC subway ............................................................... 24
  6.9 London Heathrow Express / London Underground ......................................................... 26

7.0 BEST PRACTICES FROM RELEVANT SYSTEMS ....................................................... 28
  7.1 San Jose Caltrain / VTA light rail ....................................................................................... 28
  7.2 Philadelphia SEPTA heavy rail / commuter rail ............................................................... 31
  7.3 Chicago Metra commuter rail / CTA heavy rail ............................................................... 33
  7.4 Toronto GO regional rail / TTC subway ......................................................................... 35
  7.5 London Heathrow Express / London Underground ......................................................... 37

8.0 RECOMMENDATIONS .................................................................................................... 42

9.0 REFERENCES .................................................................................................................... 45

APPENDIX: SUMMARY TABLE OF COMPARABLE SYSTEMS ............................................. 46
LIST OF FIGURES

FIGURE 1: PROPOSED ALIGNMENT OF GOLD LINE EXTENSION ............................................. 9
FIGURE 2: VTA LIGHT RAIL MAP THAT HIGHLIGHTS SHARED STATIONS WITH CALTRAIN ..........13
FIGURE 3: MTS TROLLEY SYSTEM MAP THAT HIGHLIGHTS SHARED STATIONS WITH AMTRAK ....14
FIGURE 4: SOUND TRANSIT MAP THAT HIGHLIGHTS SIMILAR ROUTES ....................................16
FIGURE 5: MBTA SYSTEM MAP THAT HIGHLIGHTS SHARED STATIONS .....................................17
FIGURE 6: SEPTA SYSTEM MAP THAT HIGHLIGHTS SHARED STATIONS ...................................19
FIGURE 7: CTA SYSTEM MAP WITH SHARED STATIONS HIGHLIGHTED ..................................20
FIGURE 8: LIRR SYSTEM MAP WITH SHARED STATIONS HIGHLIGHTED ..................................22
FIGURE 9: TORONTO GO SYSTEM MAP WITH SHARED STATIONS HIGHLIGHTED ..................24
FIGURE 10: LONDON RAIL SYSTEM MAP WITH SHARED STATIONS HIGHLIGHTED ...............26
FIGURE 11: CALTRAIN AND VTA LRT AT MOUNTAIN VIEW STATION ..................................28
FIGURE 12: MOUNTAIN VIEW STATION LAYOUT ..................................................................29
FIGURE 13: WAYFINDING AND INFORMATION AT MOUNTAIN VIEW STATION ....................29
FIGURE 14: FERN ROCK STATION LAYOUT ........................................................................31
FIGURE 15: CROSS-PLATFORM CONFIGURATION FOR LOCAL AND EXPRESS TRAIN SERVICE ....32
FIGURE 16: OAK PARK STATION LAYOUT .............................................................................33
FIGURE 17: CROSS-PLATFORM CONFIGURATION FOR LOCAL AND EXPRESS TRAIN SERVICE ....34
FIGURE 18: VENTRA APP .........................................................................................................34
FIGURE 19: DOWNSVIEW PARK STATION ...............................................................................36
FIGURE 20: DESIGN CONCEPT FOR NETWORK IDENTIFIER ...................................................36
FIGURE 21: HEATHROW EXPRESS AND PICCADILLY LINE ARRIVING AT RESPECTIVE PLATFORMS ....38
FIGURE 22: HEATHROW T5 STATION LAYOUT .......................................................................39
FIGURE 23: TFL PUBLIC TRANSPORTATION SERVICE LOGOS ............................................40
FIGURE 24: TFL INTERCHANGE BEST PRACTICE GUIDELINES ............................................41
FIGURE 25: CROSS-PLATFORM BETWEEN LONDON UNDERGROUND AND TFL RAIL ..........41
LIST OF TABLES

TABLE 1: KEY CHARACTERISTICS OF METRO GOLD LINE AND METROLINK .............................................11
TABLE 2: KEY CHARACTERISTICS CALTRAIN AND VTA LIGHT RAIL ........................................................13
TABLE 3: KEY CHARACTERISTICS AMTRAK AND MTS TROLLEY .............................................................15
TABLE 4: KEY CHARACTERISTICS SOUND COMMUTER RAIL AND LIGHT RAIL TRANSIT ......................16
TABLE 5: KEY CHARACTERISTICS MBTA COMMUTER RAIL AND HEAVY RAIL ......................................18
TABLE 6: KEY CHARACTERISTICS SEPTA COMMUTER RAIL AND SUBWAY .....................................19
TABLE 7: KEY CHARACTERISTICS METRA AND CTA .................................................................21
TABLE 8: KEY CHARACTERISTICS MTA COMMUTER RAIL AND SUBWAY ........................................23
TABLE 9: KEY CHARACTERISTICS GO TRANSIT AND TTC SUBWAY .............................................25
TABLE 10: KEY CHARACTERISTICS HEATHROW EXPRESS AND LONDON UNDERGROUND ............26
EXECUTIVE SUMMARY

Study Background and Purpose
The Metro Gold Line is a 29.7-mile rail transit route connecting East Los Angeles to Azusa, with a total of 27 stations. Extension of the Metro Gold Line is currently planned in two phases, subject to funding availability, with the first phase with four new stations to Pomona anticipated for 2024/2025 and the second phase from Pomona to Montclair in 2028. The Metrolink San Bernardino Line (SBL) extends from Los Angeles Union Station to San Bernardino – Downtown and has existing stations at Pomona North, Claremont and Montclair. The Metro Gold Line extension will also have stations at these locations and thus, passenger transfer between the two rail systems will be possible. As the Metro Gold Line and Metrolink SBL share the right-of-way (ROW) and potentially stations at three locations, this study aims to identify strategies to enable the two rail services to be complementary. The study will consider the shared rail corridor between Pomona and Montclair. The first task (Task 1) of this study aims to consider rail systems that share similar characteristics as the Metro Gold Line and Metrolink SBL to identify relevant best practice strategies for serving passengers at these stations.

Task 1 - Initial Review of Comparable Systems
This task identified rail systems that have similar characteristics to the Metro Gold Line and Metrolink SBL and reviewed best practice transfer enhancement strategies ranging from design concepts and integration strategies for multimodal stations to pricing strategies, and common fare media. The review initially identified a long list of nine rail systems, which included both American and international systems. A further screening identified five systems from the long list for further review and identified potentially relevant strategies for operating intermodal stations. From these five systems, recommendations that are suitable for the Metro Gold Line/Metrolink SBL have been presented below.

Recommendations
There are four primary ways to facilitate informed mode choice and seamless transfers between systems at intermodal stations that could be applied to Metrolink and Metro Gold Line.

1. **Station layouts that have clear sightlines to train services and transfer areas and that have platforms in close proximity to each other** make transfers easier to navigate.

2. **Fare media technology and integration** has been used across all the systems that were reviewed to make fare payment between systems simpler and quicker. This has been especially useful in regions where there are a multitude of operators each with their own set of fares. The most successful fare media systems have been those that allow cash value stored on a contactless media to be used on any service.

3. **Concise and consistent wayfinding and passenger information** across all transit services in a region, particularly at transit hubs, has helped passengers better understand how a transit system works and identify access points to/from the network.

4. **Coordination of transit services and planning activities** assures that operators schedule their services to arrive within moments of each other for connecting trips and helps bring consistency in the way transfer strategies are planned and implemented.
1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

The Los Angeles County Metropolitan Transportation Authority (Metro) Regional Rail Team is studying the opportunities to enable the Metro Gold Line and Southern California Regional Rail Authority’s (SCRRA) Metrolink San Bernardino Line (SBL) services to be complementary to each other following the completion of the Metro Gold Line Extension to Pomona (anticipated 2024/2025) and to Montclair (anticipated 2028). When the Gold Line is extended to Montclair, three stations will offer both Gold Line and SBL services: Pomona, Claremont and Montclair. The study will examine the three stations and consider strategies including improvements to facilitate passenger transfers between the two modes through a review of best practice used by other transit operators. This study will also consider the implications of the operations modeling of Metrolink services carried out as part of other studies to increase frequency and examine the impact on ridership following the opening of the Gold Line extension.

1.2 STUDY BACKGROUND

The Metro Gold Line Phase 1 is a 13.7-mile alignment from Los Angeles to Pasadena, connecting Union Station to Sierra Madre, with a total of 13 stations. It was completed in 2003 by the Foothill Gold Line Construction Authority and transferred to Metro for operations. Phase 2A which consists of the section between Sierra Madre and APU/Citrus College, with 6 stations, was completed in 2016, bringing increased connectivity to the cities of Arcadia, Monrovia, Duarte, Irwindale and Azusa.

The development of the next phase, ultimately extending the Gold Line to Montclair, Phase 2B, will be developed with a phased approach due to the increasing cost of construction and funding availability. Phase 2B(i), which includes Phase 1 and Phase 2 shown in Figure 1, will extend the Gold Line to Pomona and is estimated for completion in 2024/2025. Phase 2B(ii), which includes Phase 3 and Phase 4 in Figure 1, will extend the line to Montclair and is currently estimated to be completed in 2028. This will provide a one-side between East Los Angeles and Montclair, with a total route length of 42 miles.

The Metrolink SBL extends from Los Angeles Union Station to San Bernardino – Downtown and has existing stations at Pomona North, Claremont and Montclair with a total route length of 56.2 miles. The Metro Gold Line extension will also have stations at these locations and thus, passenger transfer between the two rail systems will be possible.
2.0 PURPOSE AND GOALS OF STUDY

As the Metro Gold Line and Metrolink SBL share 3.9 miles of right-of-way (ROW) between White Avenue and Monte Vista Avenue and potentially stations at three locations, this study aims to identify strategies to enable the two rail services to be complementary. The study will consider the shared rail corridor between Pomona and Montclair. This study aims to:

- Use comparative systems to determine optimized passenger transfers between modes
- Evaluate Metrolink service scenarios
- Undertake sensitivity analysis on ridership and fares
- Identify other innovations based on industrywide best practices
- Recommended approach and cost estimate

The anticipated outputs from this study are:
1. Forecast Metrolink & Metro ridership for service scenarios to be defined
2. Recommendations to optimize mode transfer
3. Metrolink ridership sensitivity to fares parking and access
3.0 OVERVIEW OF PROJECT TASKS

This study consists of the following tasks:

- Task 1 – Study of Similar Commuter Rail and Light Rail Systems (This Technical Note)
- Task 2 – Identify Potential Design Enhancements to Transfers
- Task 3 and 4 – Define and Evaluate Ridership for Metrolink Service Scenarios
- Task 5 – Undertake Sensitivity Analysis Using Fare Structures and Parking
- Task 6 – Identify Complementary Service Strategies
- Task 7 – Stakeholder Coordination
- Task 8 – Public Outreach – by Metro
- Task 9 – Final Report and Presentation

3.1 TASK 1 OVERVIEW

Task 1 identified rail systems that have similar characteristics to the Metro Gold Line and Metrolink SBL so that passenger transfers on similar systems could be reviewed for best practice transfer enhancement strategies ranging from design concepts and integration strategies for multimodal stations to pricing strategies, and common fare media. The review initially identified a long list of rail systems, which included both American and international systems. A further screening has identified five systems from the long list for further review and identified potentially relevant strategies for passenger transfers. From these five systems, recommendations that are suitable for the Metro Gold Line/Metrolink SBL have been presented.

3.2 REVIEW METHODOLOGY

In order to identify potential strategies to optimize passenger transfers between the Metro Gold Line and the Metrolink San Bernardino Line, systems were considered against the following criteria to identify an initial long list of similar systems for further review:

a. Shared rail corridor utilizing a high frequency urban rail system and lower frequency suburban or regional rail systems
b. Origin/Destination in a suburban area and downtown
c. Passenger transfer is possible between the two rail systems
d. Mature transit networks and agencies so that passenger behaviors at transfer stations are observable and can be documented

With the above screening criteria, a long list of similar systems was identified and included:

1. San Jose Caltrain / Santa Clara Valley Transportation Authority (VTA) light rail
2. San Diego Amtrak Pacific Surfliner / San Diego Metropolitan Transit System (MTS) trolley
3. Seattle Sound Transit commuter rail / light rail
4. Boston Massachusetts Bay Transportation Authority (MBTA) commuter rail / light rail
5. Philadelphia Southeastern Pennsylvania Transportation Authority (SEPTA) heavy rail / commuter rail
6. Chicago Transit Authority (CTA) heavy rail / Metra commuter rail
7. New York Metropolitan Transportation Authority (MTA) subway / commuter rail
8. Toronto Go Transit / Toronto Transit Commission (TTC) subway

The next sections of this technical note have examined the characteristics of Metro Gold Line and Metrolink SBL, to identify case study systems and review the best practice strategies adopted by other transit agencies that could be applied to the stations on the shared rail corridor.

4.0 OVERVIEW OF GOLD LINE AND SAN BERNARDINO LINE

The Metro Gold Line currently runs from Atlantic station in East Los Angeles via Union Station and then towards APU/Citrus College in Azusa. The service is operated by Metro Rail at up to a 6-minute frequency during the peak hours and the fare for a trip between any two stations is the standard Metro fare, currently at $1.75.

The San Bernardino Line runs from Union Station to San Bernardino Downtown station, via Pomona North, Claremont and Montclair. The service is operated by SCRRRA (Metrolink), with up to 3 trains in the peak direction during peak hours and 1 train in the off-peak direction.

When the Gold Line is extended to Pomona in 2024/2025 and to Montclair in 2028, three stations will offer riders the opportunity to transfer between the two rail systems. This task aims to identify strategies that have been adopted in similar systems for optimizing passenger transfers at multi-modal rail and transit stations.

The key characteristics of the two systems are summarized in Table 1 below.

Table 1: Key Characteristics of Metro Gold Line and Metrolink

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Metro</th>
<th>Metrolink</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gold Line (to Pomona)</td>
<td>Gold Line (to Montclair)</td>
</tr>
<tr>
<td>Fare</td>
<td>$1.75</td>
<td>$1.75</td>
</tr>
<tr>
<td>Journey Time (from Union Station)</td>
<td>62 minutes</td>
<td>67 minutes</td>
</tr>
<tr>
<td>Service Frequency</td>
<td>Up to 6 minutes headway during peak</td>
<td>Up to 30-minute frequency during peak in the peak direction</td>
</tr>
<tr>
<td>Common Fare Media</td>
<td>Metro uses the TAP card for fare payment on all modes operated by Metro. Other transit agencies in Los Angeles County typically also adopt the TAP card to facilitate payment and inter-agency transfers.</td>
<td>Some Metrolink fares include travel on Metro and these are on special TAP enabled tickets. It is also possible to purchase these tickets on the Metrolink app.</td>
</tr>
</tbody>
</table>
5.0 CRITERIA USED TO IDENTIFY SIMILAR SYSTEMS FOR COMPARISON

Considering the KEY characteristics of the Metro Gold Line and SBL defined above, a number of similar systems have been identified that exhibit similar features and have potential to offer strategies for passenger transfers. These criteria are as follows:

   a) Two separate rail systems operating in the same corridor – one system should be a suburban / regional rail system and one system should be a high frequency urban rail system.

   b) Frequency – urban rail system should have higher service frequency than suburban / regional rail.

   c) Fare structure – different fares charged for each rail service which reflects the type of service provided, that is, a relatively lower fare for mass transit service and a relatively higher fare for a regional rail service.

   d) Journey time – using a high frequency service with a large density of stations and a longer journey time. The Metro Gold Line is operated with light rail vehicles and with a greater number of stops between Pomona/Montclair, the journey time is higher than a similar service on the SBL.

   e) Ridership – the rail systems should serve similar densities of population and/or areas of population.

   f) Intermodal stations – sharing stations and/or corridor could present opportunities for passengers to be able to transfer between systems.

6.0 INITIAL REVIEW OF COMPARABLE SYSTEMS

Using the criteria defined in Section 5, a total of nine initial systems similar to the study systems have been identified and reviewed. Evaluating these systems provides an understanding of how various systems facilitate transfers between rail transit services. The systems that possessed the most relevant characteristics to the Study systems were carried forward for further analysis so that industry best practices could be identified. The following is a description of each of the initial nine systems.
6.1 **SAN JOSE CALTRAIN / VTA LIGHT RAIL**

Caltrain is a commuter rail line owned and operated by the Peninsula Corridor Joint Powers Board and provides service between San Francisco and the Santa Clara Valley. The VTA operates light rail service throughout Santa Clara County. Caltrain and the VTA's 902 Line share stations and a section of rail corridor between Mountain View Station and San Jose Diridon Transportation Center. Caltrain runs north-south from Oracle Park Station in San Francisco towards San Jose Diridon Transportation Center in the City of San Jose and has only commute-hour service south towards the City of Gilroy. Caltrain offers local, limited stop, and baby bullet train service. The VTA's 902 Line runs between the suburban City of Mountain View in the north and the City of Campbell in the south. Table 2 below summarizes the key characteristics for both systems.

![Figure 2: VTA Light Rail Map That Highlights Shared Stations with Caltrain](image)

**Table 2: Key Characteristics Caltrain and VTA Light Rail**

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System Caltrain</th>
<th>High Frequency Urban System VTA Light Rail</th>
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<tbody>
<tr>
<td>Frequency</td>
<td>Up to 5 trains per hour during peak in peak direction</td>
<td>15-minute headway</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>27 (local service)</td>
<td>1.5 (limited and baby bullet service)</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$5.45 Distance-based</td>
<td>$2.50 Flat rate</td>
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<tr>
<td>Ridership (Average weekday boarding)</td>
<td>4,585 (2017 data) Source: Caltrain Annual Passenger Counts</td>
<td>1,128 (2017 data) Source: VTA Light Rail System Performance</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – two shared stations along corridor</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>Yes</td>
<td></td>
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</table>
The Santa Clara Valley systems have been carried forward for further study based on the following key common characteristics:

- The terminus points are in suburban and downtown areas.
- The systems share two stations, which allows for intermodal opportunities for passengers to transfer between systems.
- Modes are similar to the Study systems, with a regional commuter rail and light rail system.
- Fare structure and price.

Unlike other comparable systems, this is rarity that regional rail ridership outperforms urban rail. The biggest factor for this is it is one of the few systems where commuter rail has train service that will get passengers between the shared stations about four times faster than urban rail. The differences in price are also not drastically different, so passengers are possibly very much willing to pay for a significantly faster service.

6.2 San Diego Amtrak Pacific Surfliner / MTS Trolley

Amtrak is a national passenger rail service operator and provides regional rail service along Southern California’s coast through its Pacific Surfliner Line. The San Diego MTS operates trolley light rail service, which serves San Diego’s urban core and surrounding suburban cities. Amtrak’s Pacific Surfliner and MTS’ Sycuan Green Line share stations and corridor between the Santa Fe Depot Station in the heart of Downtown San Diego and the Old Town Station, which is four miles north of Downtown. Amtrak’s Pacific Surfliner runs north-south from San Luis Obispo to San Diego, with most stations located in their respective city’s downtown areas. The Sycuan Green Line has a terminus point at 12th and Imperial Station in Downtown San Diego and continues northeast with a terminus point at Santee Station in the City of Santee. Table 3 below summarizes the key characteristics for both systems.

Figure 3: MTS Trolley System Map That Highlights Shared Stations with Amtrak
Table 3: Key Characteristics Amtrak and MTS Trolley

<table>
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<th>High Frequency Urban System</th>
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<tbody>
<tr>
<td>Frequency</td>
<td>1 train per hour</td>
<td>15-minute headway</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>10-15</td>
<td>9</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$2.85 Distance-based</td>
<td>$2.50 Flat rate</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>11,696 (online) (2017 data)</td>
<td>38,761 (online) (2017 data)</td>
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<tr>
<td>Source: Amtrak FY18 Ridership</td>
<td>Source: MTS Community Impact and Performance Report</td>
<td></td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – two shared stations along corridor</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>No</td>
<td></td>
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The San Diego systems have several key differences that are not relevant to the study systems and have not been carried forward for further study. These are:

- The frequency is extremely low on the Pacific Surfliner due to it functioning as long-distance passenger rail, rather than commuter rail.

- Travel time in between the shared stations is short and is about the same for the regional rail and urban rail system, which does not highlight the premium service that regional rail is supposed to offer.

- The fare to travel between the shared stations is almost equal for both systems, due to Amtrak’s distance-based fare and the short distance travel.
6.3 Seattle Sound Transit Commuter Rail / Light Rail

Seattle’s Sound Transit operates both commuter and light rail services throughout the Seattle metropolitan area. Sound Transit’s commuter rail service is known as Sounder, while the light rail service is known as Link. The systems do not share stations nor a rail corridor, but the Sounder South Line and the Central Link Line do have a similar route between Seattle’s Chinatown area in the city center and the City of Tukwila located south of Seattle. Sounder’s South Line operates between King Street Station in Seattle and Lakewood Station in the City of Lakewood. The Central Link Line runs from the University of Washington Station south towards Angle Lake Station in the City of SeaTac, which is 2.5 miles south of the Seattle-Tacoma International Airport. Table 4 below summarizes the key characteristics for both systems.

Table 4: Key Characteristics Sound Commuter Rail and Light Rail Transit

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System Sound Commuter Rail</th>
<th>High Frequency Urban System Sound Light Rail Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Up to 2 trains per hour in peak direction</td>
<td>6-minute headway in peak</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>20</td>
<td>28</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$3.75 Distance-based</td>
<td>$3.00 Distance based</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>1,000 (2018 data) Source: Seattle Service Implementation Plan</td>
<td>3,104 (2018 data) Source: Seattle Service Implementation Plan</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>No – the stations along the shared corridor are 2 miles apart</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
Although the Seattle’s systems had some similarities to the study systems, the following is a major key difference that has not carried them forward for further study:

- The two systems run along a similar route between two station points, but do not share an actual rail corridor or stations. The systems are about 2 miles apart, which would make it difficult to assess intermodal opportunities for passenger transfers between the systems.

### 6.4 Boston MBTA Commuter Rail / Subway

Boston’s MBTA operates an extensive transit network that includes commuter rail and light/heavy rail that serves the Greater Boston area. The heavy rail Red Line and the commuter rail Middleborough/Lakeville Line share a corridor and stations in between Braintree Station in the City of Braintree and South Station in Downtown Boston. The Middleborough/Lakeville Line is a north-south line that runs from South Station in Downtown Boston towards Middleborough/Lakeville Station in the suburban town of Middleborough. The Red Line is also a north-south line that runs from Alewife Station in Cambridge towards JFK/UMass Station near the University of Massachusetts Boston. It has two branches where one heads southwest towards Ashmont Station and the other heads southeast towards Braintree Station. Table 5 below summarizes the key characteristics for both systems.

![Figure 5: MBTA System Map That Highlights Shared Stations](image)
Table 5: Key Characteristics MBTA Commuter Rail and Heavy Rail

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System MBTA Commuter Rail</th>
<th>High Frequency Urban System MBTA Subway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1-hour headway in peak direction</td>
<td>9-minute headway</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>21</td>
<td>30</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$6.75 Distance-based</td>
<td>$2.25 Flat rate</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>72 (Brain tree Station 2014 data) Source: MBTA Ridership and Service Statistics</td>
<td>5,122 (2014) Source: MBTA Ridership and Service Statistics</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – two shared stations along corridor</td>
<td>No</td>
</tr>
<tr>
<td>Relevance for Study</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

Although the Boston systems have several characteristics that are in common with the study systems, the following are key differences that have not carried it forward for further study:

- The commuter rail line has a very low frequency of one train per hour in the peak direction and not all trains serve the Braintree Station throughout peak hours, which makes it incomparable to the study systems.

- The Braintree Station on the commuter rail line had very low ridership with an average weekday boarding of 72 passengers, which is likely due to most trains not servicing this stop.
6.5 PHILADELPHIA SEPTA HEAVY RAIL / COMMUTER RAIL

SEPTA is a regional public transportation authority that operates an extensive transit network that includes heavy/light rail and commuter rail throughout Philadelphia and neighboring counties. There are three commuter rail lines (Doylestown, Warminster, West Trenton) and one heavy rail line (Broad Street Line) that share the same corridor and stations at Fern Rock Transportation Center in upper North Philadelphia and Suburban Station in the City Center District of the City. The Doylestown, Warminster, and West Trenton line share a rail corridor in the City Center District of Philadelphia, which is where the southern terminus is located for all three lines. The lines branch off to their respective northeastern neighborhoods. The Broad Street Line is a north-south route that runs from Fern Rock Transportation Center towards NRG Station in South Philadelphia. Table 6 below summarizes the key characteristics for both systems.

Table 6: Key Characteristics SEPTA Commuter Rail and Subway

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System</th>
<th>High Frequency Urban System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Up to 5 trains per hour in peak</td>
<td>8-minute headway</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$6.00 Distance-based</td>
<td>$2.50 Flat rate</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>813 (2017 data)</td>
<td>4,580 (2017 data)</td>
</tr>
<tr>
<td>Source: Fiscal Year 2019 Annual Service Plan</td>
<td>Source: Fiscal Year 2019 Annual Service Plan</td>
<td></td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – two shared stations along corridor</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
The Philadelphia systems have the following characteristics in common with the study systems, which have carried them forward for further study:

- The commuter rail system serves similar suburban and urban neighborhoods along the section of shared corridor.
- The systems share stations along the corridor, which allows for intermodal opportunities between systems.
- The service frequency for both commuter and urban rail resembles the study system.
- Fare structure and price.

6.6 **CHICAGO METRA COMMUTER RAIL / CTA HEAVY RAIL**

Metra is owned and operated by the Regional Transportation Authority, which provides commuter rail service throughout the Chicago metropolitan area. The CTA operates a mass rapid transit system known as the “L” system, which provides service to Chicago’s urban core and surrounding suburbs. Metra’s Union Pacific West (UP-W) Line and the CTA Green Line share a station in Chicago’s suburban Oak Park neighborhood and run on a shared corridor towards downtown. The two systems have separate stations in downtown that are three blocks apart. Metra’s UP-W line heads east from the Elburn suburb of Kane County, Illinois towards Ogilvie Transportation Center in downtown Chicago. The Green Line heads east from Harlem/Lake Station in Oak Park towards Garfield Station south of downtown. The Line has two branches; one ending southwest at Ashland/63rd Station and the other ending southeast at Cottage Grove Station.

Table 7 below summarizes the key characteristics for both systems.
Table 7: Key Characteristics Metra and CTA

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System Metra</th>
<th>High Frequency Urban System CTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Up to 20-minute headway in peak direction</td>
<td>7-10 minute headway</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$4.25 Distance-based</td>
<td>$2.50 Flat rate</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>991 (2018 data) Source: Metra Commuter Rail System Station Boarding/Alighting Count</td>
<td>1,603 (2018 data) Source: CTA Ridership L Station Entry Daily Totals</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – one shared station along corridor</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The Chicago systems share notably similar traits to the study systems, which have carried them forward for further study that include:

- The shared section of corridor serves both suburban and downtown neighborhoods.
- The systems share a station at one end of the shared corridor and have stations in close proximity to each other at the other end, which allows for an understanding of transfers at a shared station as well as transfers for when stations are within walking distance of each other.
- The service frequencies for both the commuter and urban rail systems mirror the study systems.
- Fare prices and structure.
6.7 **New York MTA Subway / Commuter Rail**

The New York MTA and its subsidiaries operate transit throughout Downstate New York, which includes commuter rail and subway service. The Long Island Rail Road (LIRR), which oversees commuter rail in Long Island, has its Main Line sharing a station at Woodside in Queens with the 7 Line subway. Both rail systems head west towards Manhattan; the Main Line trains have a terminus at Penn Station and the 7 Line has a terminus at 34th Street-Hudson Yards Station, which is 3 blocks west of Penn Station. The LIRR has three major terminus points in western New York City: Penn Station in Manhattan, Long Island City Station in Queens, and Atlantic Terminal in Brooklyn. The 7 Line runs east-west from Main Street Station in Queens towards 34th Street-Hudson Yards Station in Manhattan.

*Figure 8: LIRR System Map with Shared Stations Highlighted*
Table 8: Key Characteristics MTA Commuter Rail and Subway

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System MTA Commuter Rail</th>
<th>High Frequency Urban System MTA Subway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Up to 30 trains per hour in peak (all LIRR Main Line trains serving Woodside station)</td>
<td>20 trains per hour in peak</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>20</td>
<td>39</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$9.00 Distance-based</td>
<td>$2.75 Flat rate</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>117,180 (data for all LIRR Main Line trains at Penn Station)</td>
<td>10,082 (2017 data)</td>
</tr>
<tr>
<td></td>
<td>Source: 2017 LIRR Ridership Book</td>
<td>Source: NY MTA Average Weekday Subway Ridership</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – one shared station along corridor</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

The New York systems have many differences in key characteristics that have not carried them forward for further study, which are:

- The terminus points where the two rail systems share a rail corridor and stations are located in extremely dense neighborhoods. There is not a comparable suburban neighborhood within this corridor.

- The service frequency is much higher for both rail systems than what is seen on the study systems.

- Ridership is much higher for both rail systems due to a large urban population and multiple rail lines converging at the shared stations and corridor.
6.8 **TORONTO GO TRANSIT REGIONAL RAIL / TTC SUBWAY**

Toronto’s GO Transit operates regional commuter rail transit in what is known as the Golden Horseshoe in Southern Ontario, Canada. The TTC operates the Toronto Subway, which services the cities of Toronto and Vaughan. GO Transit’s Barrie Line and Toronto Subway’s Line 1 share a corridor and stations at Union Station in Downtown Toronto and Downsview Park Station in the Downsview neighborhood north of Downtown. GO Transit’s Barrie Line runs north-south between the Allendale Waterfront Station and Union Station. Toronto’s Subway Line 1 is a u-shaped north-south line that has a middle point at Union Station. The western branch has a terminus at the Vaughan Metropolitan Centre in the City of Vaughn and the eastern branch has a terminus at Finch Station in the Newtonbrook neighborhood of Toronto.
Table 9: Key Characteristics Go Transit and TTC Subway

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System GO Transit</th>
<th>High Frequency Urban System TTC Subway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Up to 4 trains per hour in peak direction</td>
<td>2-3 minute headway</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>$5.65 Distance-based</td>
<td>$3.25 Flat rate</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>280 (2018 data)</td>
<td>2,520 (2018 data)</td>
</tr>
<tr>
<td></td>
<td>Source: GO Transit Ridership Performance Year to Date</td>
<td>Source: Toronto Transit Commission Subway Ridership</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – one shared station along corridor</td>
<td></td>
</tr>
<tr>
<td>Relevance for Study</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

The Toronto systems have the following characteristics in common with the study systems that have carried them forward for further study:

- The rail systems serve both suburban and urban neighborhoods.
- There are two shared stations along the corridor that allow for intermodal opportunities between systems.
- Service frequency and travel time differences between commuter and urban rail are similar to the study systems.
- Fare structure and price.
6.9 **London Heathrow Express / London Underground**

The Heathrow Express is an airport rail link service operated by a subsidiary of Heathrow Airport Holdings. The London Underground, which is overseen by the Transport for London, is an extensive subway network in London, England. The Heathrow Express and the London Underground’s Piccadilly Line share a station and Heathrow Terminal 5 and follow the same rail corridor towards Paddington Station. However, on the Piccadilly Line passengers need to transfer at Hammersmith Station to any of the three lines that continue towards Paddington Station. The Heathrow Express offers premium direct rail service between Heathrow Airport and Paddington Station in Central London. The Piccadilly Line is the second-longest line in the London Underground system and has two branches; one services Heathrow Airport and the other has a terminus in the town of Uxbridge in west London.

**Table 10: Key Characteristics Heathrow Express and London Underground**

<table>
<thead>
<tr>
<th>Key Characteristic</th>
<th>Suburban / Regional Rail System Heathrow Express</th>
<th>High Frequency Urban System London Underground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4 trains per hour</td>
<td>Up to 12 trains per hour</td>
</tr>
<tr>
<td>Journey Time Between Shared Stations (minutes)</td>
<td>15</td>
<td>58</td>
</tr>
<tr>
<td>Fare Structure</td>
<td>Peak hour £22 Distance-based</td>
<td>£3.10 Distance-based</td>
</tr>
<tr>
<td>Ridership (Average weekday boarding)</td>
<td>17,000 (online) Source: Heathrow Express Facts &amp; Figures</td>
<td>12,350 (Heathrow T5 Station) Source: TfL London Underground Performance Reports</td>
</tr>
<tr>
<td>Intermodal Opportunity</td>
<td>Yes – shared station at airport and transfer to lines heading to Paddington Station</td>
<td>Yes</td>
</tr>
<tr>
<td>Relevance for Study</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The London systems have the following characteristics that have carried them forward for further analysis:

- Travel time differences and fare prices demonstrate a clear distinction between a premium express rail service versus an all stops urban rail system.
- The shared station at the airport and the transfer station allow for an understanding of the intermodal opportunities that exist for passengers using the two systems.

**Relevant Systems for Further Study**

Based on the review of the nine initial systems and key characteristics relevant to the study systems, the following five systems were carried forward for further analysis:

- San Jose Caltrain / VTA light rail
- Philadelphia SEPTA heavy rail / commuter rail
- Chicago Metra commuter rail / CTA heavy rail
- Toronto GO regional rail / TTC subway
- London Heathrow Express / London Underground
7.0 BEST PRACTICES FROM RELEVANT SYSTEMS

The following summarizes those key strategies and best practices adopted by the 5 case study systems that facilitate informed passenger choices and optimized passenger transfer.

7.1 SAN JOSE CALTRAIN / VTA LIGHT RAIL

The Bay Area has a number of transit operators providing a variety of public transportation services that include commuter rail, light rail, heavy rail, and bus. Each of the two dozen transit agencies operate and plan their systems independently, which means fares, schedules, wayfinding materials, etc. are all unique to their respective operator. This has catalyzed an effort by Bay Area agencies to create a more integrated transit network throughout the region. Below are some key practices and guiding principles that Bay Area agencies have implemented to make transferring between systems more seamless.

Station Design. Caltrain’s station and facilities design criteria encourages intermodal connections that are simple, safe, and efficient that are supported by clear and easily understood transit information. Caltrain also emphasizes having platforms in close proximity to connecting transit services so that passengers’ travel distance between modes is minimized. Caltrain considers center platform configurations to be the most efficient use of platform space, where feasible (Caltrain, 2011). The VTA light rail transit guidelines also emphasize physically integrating with nearby major transit facilities as much as is feasible. The guidelines call for infrastructure such as pedestrian crossings, transfer corridors, and passenger queuing areas to help facilitate intermodal transfers (VTA, 2007). In terms of track layout and configuration the guidelines recommend double-tracking unless the corridor operates on a one-way street.

Caltrain and VTA’s Line 902 share a station at Mountain View Station and are adjacent to each other per Caltrain’s design criteria. Figure 12 shows the layout of station where the center platform for Line 902 is north and the Caltrain side platform is south. There is a designated pedestrian walkway connecting the two the platforms, which are about 25 feet apart. There is a clear sightline between the platforms and station entrances as well as clear pathways to the horseshoe-shaped bus bays. The layout is simple and easy for passengers to navigate and transfer between modes.
Wayfinding and Passenger Info. Currently, Caltrain’s design criteria, dictates that signage design standards are determined by the Metropolitan Transportation Commission’s (MTC) Hub Signage Program (HSP). The program was established in order to provide streamlined and consistent wayfinding signage as well as consolidated passenger information for schedules and fares at major transit hubs with services from multiple transit operators. The MTC partnered with Caltrain, the VTA, and other agencies to implement the program.

Some general wayfinding design principles include:

- Identifying each transit hub with signage so that user groups easily recognize its location by having prominent operator logos.
- Providing clear identification of local transit connections that includes both local and regional scale maps.
- Placing real-time transit info in key decision-making areas for passengers such as at pay stations and platforms.
- Avoiding over-signing by prioritizing signage from vantage point (MTC, 2012).
The San Francisco Bay Area Planning and Urban Research Association (SPUR) developed the 2017 Caltrain Corridor Vision Plan, which included recommendations on making transfers more seamless between public transit operators. Some of their recommendations focused on improving wayfinding and passenger information. This included consistent presentation of transit information across agencies, not just at transit hubs, creating a mobile platform where passengers can compare travel times and prices between modes as well as purchase services (SPUR, 2017). Moovel is an app that is currently being piloted in Palo Alto. SPUR also recommended continually providing updated transit information and conditions through mobile apps and electronic signage.

**Fare Media.** The Clipper Card, which is a contactless reloadable fare card, has been an important tool for integrating 22 Bay Area transit agencies. Each agency has been able to maintain their own fares and usage terms, but it has allowed passengers to seamlessly use their Clipper Card to pay for the transit services they use. The Clipper Card can store multitude fare passes from participating agencies or can be loaded with cash value. Cash value can be used on all the systems that accept Clipper, which makes it effortless for passengers to transfer between systems. When a passenger taps their card on a validator, the fare is automatically deducted from the card’s cash value balance. This allows passengers to more easily decide which system to use, especially in situations when they are pressed for time. Additionally, some agencies allow certain fare passes to be used on others. For example, a Caltrain zone-2 or greater monthly pass that is loaded on Clipper can be used for free transfers to and from VTA bus and rail services, including free transfers to SamTrans. Clipper can be loaded with value/fares at select retailers, customer service centers, and BART and VTA ticket vending. Fares cannot be loaded via Caltrain ticket vending machines.

**Parking.** Paid parking is available at all Caltrain stations, whereas VTA has some free parking lots at its light rail stations. Caltrain owns the parking lot at Mountain View Station. VTA users may use the lot if they purchase a daily parking ticket. Caltrain requires that parking users have a daily parking ticket ($5.50) or monthly parking permit ($82.50) to use their lots. However, monthly parking permits are only sold together with a Caltrain monthly pass. Parking is enforced 24/7 and users are required to display their parking passes in their vehicles. A parking pass does increase the overall cost of using Caltrain, however a monthly parking permit coupled with a monthly zone-2 fare pass (that includes free transfers to local bus service) may be cost-effective as it can allow customers greater ease/options for accessing the station.

**Summary of Best Practices:**

- Simple station layout with regional rail and urban rail platforms in close proximity to each other.
- Consistent wayfinding signage and passenger information at major transit hubs that is overseen by one entity.
- Fare media that can be used across 22 transit agencies, pass discounts for connecting services, and cash value that can be used as fare payment for all participating agencies.
7.2 PHILADELPHIA SEPTA HEAVY RAIL / COMMUTER RAIL

SEPTA oversees and operates regional public transportation, which includes bus, heavy/light rail, commuter rail, and bus rapid transit, in Philadelphia and surrounding counties. Below are some current practices that SEPTA undertakes to improve transfers between services.

Station Design. The Fern Rock Transportation Center has one island platform for the Broad Street Line and one island (shared with freight) and one side platform for regional rail (see Figure 14). The station also serves as a yard and maintenance facility for the Broad Street Line and is the only station where a subway line runs at surface level. The platforms for the two systems are perpendicular to each other, with the Broad Street Line on an east-west direction and the regional rail lines north-south. Transfers between the services can easily be made as there are pedestrian walkways channeling passengers to the correct platforms, which are a 3-5 minute walk apart. However, transit and regional rail use different fare media for their services, which disrupts the connection between the two systems.

Figure 14: Fern Rock Station Layout
Fare Media. The Key Card is SEPTA's contactless card fare payment system that is accepted on bus, trolley, subway, and at select regional rail lines. The Key Card can be loaded with fare passes or cash value and due to its MasterCard technology can be used as a pre-paid debit card. Users can manage their account online, where they can choose to load transit fare into their travel wallet or cash into their debit wallet. These wallets cannot be used interchangeably, so a transit validator will only deduct fares from a user's travel wallet. Currently, SEPTA TransPass holders (weekly and monthly pass) can use their Key Card for travel on the Airport Line only during weekdays and any rail line on weekends and holidays. If passengers wish to have the option of using both transit and regional rail lines, passengers do have the option of purchasing a TrailPass, which is a monthly or weekly zone-based paper ticket, that can be used on all transit and regional rail lines.

Parking. SEPTA provides parking facilities at most regional rail stations and some transit stations. Parking fees are $1 during weekdays at most stations except at Fern Rock where it costs $2. Parking is free during weekends on regional rail daily use lots only. There are monthly parking passes that can only be bought in conjunction with a monthly TrailPass, which guarantees that users have a reserved parking space. A monthly parking pass is typically $25 except at Fern Rock where the cost is $32.

Cross-Platform Transfers. Another transfer design strategy found in SEPTA's heavy rail network is a cross-platform used for transfers between local and express trains. A cross-platform is configured at stations with either island platforms where a single platform is in between tracks used for two travel directions or two side platforms in between the tracks connected by a passageway. Cross-platforms are not found at the two stations analyzed in this memo, but they are located at a few stations along the Broad Street Line. These stations have 4 tracks and 2 island platforms, where the BSL express trains are located in the inner tracks and the local trains are on the outer tracks (see Figure 15).

Summary of Best Practices:

- Platforms for the rail systems are within close proximity to each other and are complemented by simple pedestrian paths that guide passengers to the correct platform.
- Regional rail fare is not fully integrated into the Key Card system, posing barriers for transfers to connecting transit services.
- Cross-platforms that allow passengers to make direct transfers between train services.
7.3 **CHICAGO METRA COMMUTER RAIL / CTA HEAVY RAIL**

The Regional Transportation Authority (RTA) finances and oversees three transit agencies in the Chicago Metropolitan Area; CTA (bus and heavy rail), Metra (commuter rail), and Pace (bus). Below are some current practices and strategies the RTA has used to improve the integration of its three transit agencies.

**Station Design.** In Oak Park, Metra UP-W Line and the CTA Green Line share a station. Each system has a different name for the system, the Green Line has named it Harlem/Lake Station and Metra has named it Oak Park Station. The two systems are on the same elevated rail corridor, but the platforms are separated from each other (see Figure 17). Metra has one side platform and a center platform that it shares with freight trains. The Metra platforms are located on the northern side of the station. The Green Line has one center platform and is located on the southern side of the station. Passengers can access the systems through the main ticket concourse on the southern side of the station. The platforms are not connected by a level pedestrian walkway. If passengers want to move between system platforms, they have to use the stairs to get to the ticket concourse, which leads them to the system of their choice. The elevated station layout is a bit complicated to navigate especially for non-regular transit users as there are no clear sight lines for transfers or entrances from street level. However, there are information attendants in the concourse that can assist passengers with transit information.

**Figure 16: Oak Park Station Layout**

**Wayfinding and Passenger Info.** The RTA developed the Interagency Signage Program which has helped bring consistency and standardization to signage material used throughout the regional transit system. The RTA undertook this effort to help passengers easily navigate the system by making it easy to understand where to make transit connections. The Program has three main types of signage material; wayfinding signs, identification signs, and service information panels (includes route maps, schedules, and connection information). Some general design guidelines include:

- Importance in the simplicity and clarity of the message
- Providing information at key decision points
• Avoiding placing information too early and limiting repetitions
• Concentrating information along accessible paths (RTA, 2014)

These new signage design standards have been deployed at 12 major transit hubs since 2013, with installation work being done at six more stations in 2019. Oak Park station is one of the six stations planned for new signage in 2019, which will make it easier for transit users to navigate the station. Another key passenger information tool is the CTA’s Ventra app, which provides real-time information for all modes allowing passengers to make better decisions when they are on the go about what transportation options best serve their trip.

**Fare Media.** Ventra is the contactless card and mobile app fare system that is currently being used by CTA and Pace. Passengers can load fare passes from the respective transit agencies and store cash value. Ventra used to have a pre-paid debit card feature, which allowed the card to be used wherever Mastercard was accepted. This feature was underutilized by passengers, so it has recently been discontinued and cards are now transit-only. Currently, only mobile tickets for Metra can be purchased and stored on the Ventra app. However, the app gives passengers the option to pay for their mobile Metra tickets with the cash value that is available on their account. Metra users also have the option of purchasing a Link-Up pass in conjunction to their monthly Metra pass, which gives them access to connecting travel on CTA (during peak hours) and Pace (anytime). Ventra will be launching virtual version of the card via Apple Pay later in 2019. Cards can be purchased and loaded online, select retailers, and ticket vending machines. Even though Ventra is not fully integrated with Metra fares, the app helps consolidate all the information and purchasing abilities in one place. This makes it much more convenient for passengers to manage their account.

**Cross-Platform Transfers.** Similar to SEPTA, cross-platforms exist at four stations in the L train network to facilitate transfers between local and express train service. These stations were not located along the lines studied in this memo. The cross-platform transfers occurred between the Red Line and Purple Line Express traveling in the same direction. These stations have 4 tracks and 2 island platforms, where the Purple Line Express trains run on the outer tracks and the Red Line trains run on the inner tracks (see Figure 18). This allows passengers...
to simply walk across the platform between express and local service.

Parking: CTA provides limited park and ride options for its riders and available lots are managed by either a private operator or municipality. This means daily rates vary between stations. However, L Train users can participate in the Monthly Reserved Parking Program, where riders are given a discounted monthly rate. Monthly passes also vary in price depending on the station operator. Metra has a similar parking policy and monthly permit options.

Summary of Best Practices:

- Elevated platforms are within in close proximity and new wayfinding signage planned for installation in 2019 will better orient passengers at the street level.
- Wayfinding program managed by a single entity that has standardized design materials, so that it is easier for passengers to recognize and navigate.
- Ventra app consolidates all necessary trip planning and purchasing information in one easy to use tool.
- Integrated fare media through contactless cards and mobile apps.
- Cross-platforms that allow passengers to make direct transfers between local and express train service.

7.4 Toronto GO regional rail / TTC subway

Metrolinx is the regional transportation agency that manages and integrates road and public transportation in the Greater Toronto and Hamilton Area (GTHA). As such, Metrolinx coordinates the planning and financing of the 11 transit operators in GTHA that provide bus, heavy rail, streetcar, and commuter rail services. The regional transportation plan known as The Big Move is a guiding document on how the region is planning to build a comprehensive and integrated transportation network. The following are some key examples of current practices and strategies for integrating transportation systems.

Station Design. Downsview Park is a station that opened in 2017. It is served by two transit operators, GO Transit’s Barrie Line and TTC’s Line 1 subway. The platforms for the two services are grade separated with the Barrie Line running at surface level perpendicular to the Line 1 subway. Line 1 has a center platform with two tracks. The Barrie Line currently has only one platform at this station as a second platform is being built as part of the ongoing construction to double-track the Line. The layout of the station is fairly simple to navigate, since passengers follow signage that informs where the TTC and GO Transit platforms are located.
Wayfinding and Passenger Info. Currently, each of the 11 operators use their own unique wayfinding systems. One of The Big Move’s priority actions is to implement consistent wayfinding across all modes and services. This has resulted in the development of the Regional Transit Wayfinding Harmonization Project, which has been piloting wayfinding design guidelines at three GO transit stations. Based on the results of the pilot phase, the guidelines will be updated and an implementation plan will be developed. The Project has initially established a need for a single symbol to identify and unify the transit network. Their research has so far shown that when services are described by the identity of local operators it can lead to confusion for transit users that are not very familiar with the transit network. This initial research has resulted in five guiding principles for the design of the network identifier symbol; it should easily identify transit, inclusive of language and legibility, mode neutral so it represents all modes in the network, brand neutral, and timeless. Figure 21 demonstrates the design concept developed based on this initial research. The bus blade shows a common network identifier with the symbol atop of the pole, a bus icon illustrating what service is provided, and an operator logo letting passengers know who provides the service.
The Big Move identified a couple of priority actions regarding the provision of high-quality passenger information. One of the actions is to create a regional transportation information portal that can be accessed online or via smartphones that provides all users comprehensive and standardized information of the full range of transportation alternatives available to them. Users would be able to choose the most optimal route for their need by comparing arrival times, prices, service alerts, etc. Another action is to coordinate schedules among transit operators by ensuring GO transit and local transit agencies provide each other with a minimum of 90-day notice before implementing any changes in service. The Big Move has also identified undertaking social marketing campaigns that are directed at households near rapid transit stations that provide information about transportation options available to those households.

**Fare Media.** One of the strategies of The Big Move is to implement an integrated transit fare system for the 11 operators in the GTHA. Metrolinx launched PRESTO and is currently available to use on all 11 operators. Transit operators maintain their own fares and card usage terms. PRESTO can store fare passes from individual operators and can also store cash value. When a passenger taps their card on a validator, the fare will automatically be discounted from their account balance. If passengers have a monthly fare pass on their card, the system will recognize the pass and will not deduct from the cash value balance. Most of the transit operators offer a discount when transferring to/from GO Transit. When passengers transfer between TTC and GO Transit, their fare on either system is discounted by $1.50. Passengers have a 2-hour window to receive the discounted fare if their trip starts with TTC and a 3-hour window if their trip starts with GO Transit. PRESTO cards can be purchased and loaded online, at select retailers, TTC and GO Transit stations. The full integration of fares on the PRESTO card makes it quick and simple for transit users to hop on and off between services.

**Summary of Best Practices:**

- Simple station layout with platforms near each other and easy to navigate pedestrian paths to platforms.
- Future plans to provide more consistent and unified wayfinding.
- Planned implementation strategies to assist passengers in making more informed decisions on available transportation options.
- Integrated fare media for all transit operators in the region. Discounts offered to connecting services to/from regional rail.

### 7.5 London Heathrow Express / London Underground

The Transport for London (TfL) is a government body that operates public transit in London as well as providing oversight to the public transportation network in London. Some of the main transit modes operating under the TfL network include the London Underground (subway), London Buses, and London Overground (commuter rail). Due to the TfL’s extensive transportation network, the agency has focused on making transfers between systems as intuitive and seamless as possible for its passengers. Most of this work has been centered on fare integration, branding, and wayfinding/passenger information. The following describes current practices and strategies that TfL has implemented in these areas.
Station Design. At Heathrow Terminal 5 Station, the Piccadilly Line and Heathrow Express are on separate platforms. At the station the services are enclosed by a glass wall and are clearly demarcated with the name of the service, both of which help passengers visibly distinguish the services. Additionally, wayfinding and pedestrian walkways help guide passengers to the service of their choice. Figure 23 shows the general layout of the station and how passengers would transfer between services. Since the platforms are separated from each other, passengers need to use stairs/escalators to reach a mezzanine level where they can walk across and back down to the platform of their choice. There are also transit information booths within close proximity to the platforms that can provide more information regarding schedules, fares, and payment options.

Figure 21: Heathrow Express and Piccadilly Line Arriving at Respective Platforms

Source: Heathrow Airport
Figure 22: Heathrow T5 Station Layout

Level -1
Escalators to Transfer between platforms

Level -2
Train Platforms

Source: Heathrow Airport
Fare Media. TfL offers several contactless ways to pay fares on their services which include Oyster Card, debit/credit cards, and TfL app. The Oyster Card functions similarly to most contactless cards where passengers can either load fare passes or cash value. With cash value, passengers will pay for fares as they go, and fares will then be capped at a certain amount so that they are not overcharged. Passengers can also use their bank issued contactless credit/debit cards, mobile devices and smart watches for pay as you go travel, where fares will be automatically deducted from their bank account. This method allows passengers to board onto transit more quickly, since they do not need to purchase or load an Oyster Card at ticket vending machines. However, a Travelcard, which is a weekly or monthly fare pass, can only be loaded onto the Oyster Card and is good to use throughout the TfL network. Passengers can manage all their fare payment options on the TfL app and use it to tap on/off of transit. A singular consolidated fare media has made it much easier for passengers to transfer between transit services, since they do not need to acquire a different type of fare media before boarding onto connecting services.

Branding. TfL has developed a logo that unifies the entire transportation network by having a design that is used by all modes on the network. London’s National Rail (long-distance rail service) is not branded in this way as it is not within the TfL network. The roundel, a solid blue bar and blue circle, identifies the whole TfL network and each mode is a color variant of the roundel. The transit service is written across the bar. This is a simple and concise method of identifying services in the TfL network without confusing transit users about what services each operator provides. TfL has clearly distinguished service operators within their network by using straightforward logos that are easy to understand and to illustrate in passenger information materials.

Wayfinding and Passenger Information. The TfL Interchange Best Practice Guidelines is a guidebook for the spatial management of areas where passengers transfer to connecting services. The guidebook was developed to coordinate the design and planning activities of interchange zones, as they are usually located within the jurisdiction of multiple organizations. There are 4 main design themes and principles steering the management of interchange zones; efficiency, usability, understanding, and quality (TfL, 2009). Efficiency and understanding are the most relevant principles for wayfinding and passenger information. Efficiency discusses the operations and movement to and within an interchange zone. It calls for the coordination of services and clearly defining when passengers are moving from one operator to another. Understanding discusses the design of movement spaces and passenger information. It calls for clear sightlines to destinations and having enough information to guide users through and within the interchange zone. The layout of interchange zones and facilities should be simple enough to
a point where wayfinding is complementary and not completely necessary to guide users where to go. Typically, Underground stations have corridors/passageways that easily channel passengers to the correct platforms and connections, which are complemented by directional signage on where to go. This makes navigating the Tube intuitive even for those unfamiliar with the system.

In addition to these design principles, the guidebook emphasizes strong collaboration between different responsible agencies to establish agreements and clear responsibilities for the operation and maintenance of interchange zones. The TfL Interchange Program Board was formed to provide a more streamlined approach to these coordination activities between agencies. This has helped implement interchange strategies across the transit network in a consistent manner.

**Cross-Platform Transfers.** These types of platform transfers are found all across the London Underground network and are also at intermodal stations. While this platform configuration was not in the stations looked at in this memo, Stratford Station in east London contains cross-platform transfers between the Underground’s Central Line, TfL Rail, and National Rail service. The station has two levels of rail platforms, and the aforementioned rail lines are located on the top level. The Central Line trains emerge from the tunnels into open air and onto a platform shared by National and TfL Rail. Passengers can easily move between trains across a single platform as seen in Figure 26.
Summary of Best Practices:

- Simple station layout that is complemented by clear pedestrian paths, wayfinding signage, and proximity of platforms.
- Fare media integration across a large transportation network. Multitude of ways for passengers to carry their fare media; contactless cards, apps, debit/credit cards.
- Branding that clearly demarcates service providers in the TfL network.
- A single entity providing oversight to the planning, design, and implementation of interchange facilities, which ensures consistent use of transfer design guidelines.
- Cross-platform transfers for direct connections between heavy rail and commuter rail.

8.0 RECOMMENDATIONS

The purpose of this technical memo was to evaluate best practices for enabling passengers to make informed choices on the mode of travel and optimizing transfers between commuter rail and light rail along shared rail corridors. This research included a review of Metro’s Transfer Design Guide, which was released in March 2018. This guidebook established guidelines for the planning, design, and implementation of transfers throughout the LA County transportation network. The design guidelines focused on improving the transfer experience from a customer perspective, which covered the following areas:

- Making decisions – providing relevant transit information at key decision-making areas, such as maps or real-time service information
- Moving – the area in which passengers move through to make transfers should be shortest and most comfortable path feasible
- Waiting to board – the waiting area should possess design elements that make passengers feel safe and comfortable.

After careful review of current practices and strategies from Metro and the five additional case studies there are four primary ways to facilitate informed mode choice and seamless transfers between systems that could be applied to Metrolink and Metro Gold Line.

1. **Station layouts that have clear sightlines to train services and transfer areas and that have platforms in close proximity to each other** make transfers easier to navigate. The systems which were the easiest to navigate to connecting services had station layouts that provided passengers a clear, direct, and short transfer path. These station layouts also minimize the need for wayfinding, which can be used as more of a complementary tool rather than something that is necessitated.

2. **Fare media technology and integration** has been used across all the systems that were reviewed to make fare payment between systems simpler and quicker. This has been especially useful in regions where there are a multitude of operators each with their own set of fares. The most successful fare media systems have been those that allow cash value stored on a contactless media to be used on any service. Fares automatically deducted from a stored balance has minimized delays in boarding by not requiring passengers to purchase different fare media between trips and has eased decision-making on what transportation
services to use. Metrolink already offers free transfers to any local transit operator and just recently to Metro Rail with mobile tickets purchased through the Metrolink app. However, a passenger traveling from Metro Bus and Rail to Metrolink must still purchase a Metrolink ticket either through the Metrolink app or Metrolink ticket vending machines. This might not be completely intuitive to first time riders, since they might not be aware of different vending systems and fare media between services.

- A consolidated fare media and ticket purchasing system can ease confusion and pave the way for using stored value as fare payment on either system. Typically, this can be done either through a contactless card, such as TAP or through an app where a virtual card can be stored.
- Metrolink and Metro should continue to collaborate on offering discounts for connecting services through their fare passes, which could be simpler to implement with integrated fare media. As seen in some of the case studies, some agencies offered free transfers to local transit with monthly commuter rail passes or discounted fares when transferring from local transit to commuter rail.

3. **Concise and consistent wayfinding and passenger information** across all transit services in a region, particularly at transit hubs, has helped passengers better understand how a transit system works and identify access points to/from the network. The most legible wayfinding signage and passenger information has been at agencies that focus on simplicity, clearly defining different operator spaces, and using technology to distribute consolidated purchase and trip planning information for an entire transit network. Metrolink and Metro Gold Line will be sharing three stations along the Metro Gold Line extension to Montclair, which means it will be pertinent for the agencies to provide distinguishing elements to both services. People who do not use transit often might think the services are of the same type and operated by the same agency. It will be important to let passengers know the differences between light and commuter rail, and despite the similarities in name, that the agencies are not the same.

- Metro and Metrolink should coordinate the design of wayfinding materials and passenger information such as signage, maps, real time-information, etc. so that there is consistency in symbology, terminology, and how information is displayed. This will make sure that messaging is consistent for passengers.
- There should be a clear distinction between services, particularly at platforms to ensure passengers are boarding the correct services. This can be done by prominently displaying operator logos and/or mode icons in key movement spaces.
- Service attendants could be placed at stations to provide information and assist passengers with questions about fare payment or navigating the transit system. They could be the most valuable during the first few months of Gold Line service.
- A marketing campaign directed at households within proximity to the stations could be used to further distribute information about local transit services. This can further educate people on how to use the system while also creating opportunities to capture new riders.
• An application could be developed that helps consolidate passengers’ trip planning needs. The app could ideally offer real-time information, route planning, travel time estimates, and fare purchasing options, all in a one stop shop.

4. **Coordination of transit services and planning activities** assures that operators schedule their services to arrive within moments of each other for connecting trips and helps bring consistency in the way transfer strategies are planned and implemented.

• This means that Metro and Metrolink should give each other enough time notice whenever there are service changes, so that passengers can make their connecting trips without much delay.
• To help manage the planning and implementation of various transfer elements, many agencies developed programs that were overseen by one entity. Metro and Metrolink could decide to develop a program that is overseen by one agency to coordinate these types of activities.
• This recommendation can also be implemented through more frequent Metrolink service, which could result in schedules that are more compatible to allow easier connecting trips.
9.0 REFERENCES


National Association of City Transportation Officials and Santa Clara Valley Transportation Authority. 2007. Light Rail Transit Service Guidelines.

Metropolitan Transportation Commission. February 2012. Regional Transit Wayfinding Guidelines & Standards.


### APPENDIX: SUMMARY TABLE OF COMPARABLE SYSTEMS

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
<th>Suburban / Regional Rail System</th>
<th>High Frequency Urban System</th>
<th>Intermodal Opportunities</th>
<th>Relevance for Study</th>
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<tr>
<td>Metrolink San Bernardino Line / Metro Gold Line</td>
<td>Systems in this Study</td>
<td><strong>METROLINK SAN BERNARDINO LINE</strong>&lt;br&gt;</td>
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<td><strong>METRO GOLD LINE</strong>&lt;br&gt;</td>
<td><strong>Key Characteristics</strong>&lt;br&gt;</td>
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<td>Frequency</td>
<td>Journey Time (minutes)</td>
<td>Fare Structure</td>
<td>Ridership (Average weekday boarding)</td>
<td>Frequency</td>
<td>Journey Time (minutes)</td>
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<td>Up to 30-minute headway in peak direction</td>
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<td>67 (Montclair to Union Station)</td>
<td>Flat rate $1.75</td>
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<td>San Jose Caltrain / VTA light rail</td>
<td>Section of rail system between Mountain View and Downtown San Jose running to the east and west of San Jose Airport</td>
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<td><strong>Key Characteristics</strong>&lt;br&gt;</td>
<td><strong>VTA LIGHT RAIL</strong>&lt;br&gt;</td>
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<td>Fare Structure</td>
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<td>Short section of rail between Santa Fe Depot and Old Town Station</td>
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<td><strong>Key Characteristics</strong>&lt;br&gt;</td>
<td><strong>MTS TROLLEY</strong>&lt;br&gt;</td>
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<td>1 train per hour</td>
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<td><strong>Key Characteristics</strong>&lt;br&gt;</td>
<td><strong>SOUND TRANSIT LIGHT RAIL</strong>&lt;br&gt;</td>
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<td>Frequency</td>
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<td>Fare Structure</td>
<td>Ridership (Average weekday boarding)</td>
<td>Frequency</td>
<td>Journey Time (minutes)</td>
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<td>Up to 2 trains per hour in peak direction</td>
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<td>1,000 (2018 data)</td>
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<td>Distance-based $3.00</td>
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<td>System</td>
<td>Description</td>
<td>Suburban / Regional Rail System</td>
<td>High Frequency Urban System</td>
<td>Intermodal Opportunities</td>
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<td><strong>MBTA COMMUTER RAIL</strong>&lt;br&gt;Key Characteristics&lt;br&gt;&lt;br&gt;Frequency&lt;br&gt;Journey Time (minutes)&lt;br&gt;Fare Structure&lt;br&gt;Ridership (Average weekday boarding)&lt;br&gt;1-hour headway in peak direction&lt;br&gt;21&lt;br&gt;Distance-based $6.75&lt;br&gt;72 (2014 data)&lt;br&gt;<strong>MBTA SUBWAY</strong>&lt;br&gt;Key Characteristics&lt;br&gt;&lt;br&gt;Frequency&lt;br&gt;Journey Time (minutes)&lt;br&gt;Fare Structure&lt;br&gt;Ridership (Average weekday boarding)&lt;br&gt;9-minute headway&lt;br&gt;30&lt;br&gt;Flat rate $2.25&lt;br&gt;5.122 (2014)</td>
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<td>Yes – two shared stations along corridor</td>
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<td>Section of rail system between Fern Rock Transit Center and Suburban Station</td>
<td><strong>SEPTA COMMUTER RAIL</strong>&lt;br&gt;Key Characteristics&lt;br&gt;&lt;br&gt;Frequency&lt;br&gt;Journey Time (minutes)&lt;br&gt;Fare Structure&lt;br&gt;Ridership (Average weekday boarding)&lt;br&gt;Up to 5 trains per hour in peak&lt;br&gt;24&lt;br&gt;Distance-based $6.00&lt;br&gt;813 (2017 data)&lt;br&gt;<strong>SEPTA SUBWAY</strong>&lt;br&gt;Key Characteristics&lt;br&gt;&lt;br&gt;Frequency&lt;br&gt;Journey Time (minutes)&lt;br&gt;Fare Structure&lt;br&gt;Ridership (Average weekday boarding)&lt;br&gt;8-minute headway&lt;br&gt;25&lt;br&gt;Flat rate $2.50&lt;br&gt;4,580 (2017 data)</td>
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<td>Yes – frequencies and fares similar to Study systems</td>
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<td>Section of rail system between Oak Park Station and Ogilvie Transportation Center</td>
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<td><strong>MTA COMMUTER RAIL</strong>&lt;br&gt;Key Characteristics&lt;br&gt;&lt;br&gt;Frequency&lt;br&gt;Journey Time (minutes)&lt;br&gt;Fare Structure&lt;br&gt;Ridership (Average weekday boarding)&lt;br&gt;Up to 30 trains per hour in peak&lt;br&gt;20&lt;br&gt;Distance-based $9.00&lt;br&gt;117,180 (data for all LIRR Main Line trains at Penn Station)&lt;br&gt;<strong>MTA SUBWAY</strong>&lt;br&gt;Key Characteristics&lt;br&gt;&lt;br&gt;Frequency&lt;br&gt;Journey Time (minutes)&lt;br&gt;Fare Structure&lt;br&gt;Ridership (Average weekday boarding)&lt;br&gt;20 trains per hour in peak&lt;br&gt;39&lt;br&gt;Flat rate $2.75&lt;br&gt;10,082 (2017 data)</td>
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<td>Description</td>
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<td>Toronto GO Transit regional rail / TTC subway (Toronto, Canada)</td>
<td>Section of rail system between Downsview Park and Union Station</td>
<td>GO Transit commuter rail (Toronto, Canada)</td>
<td>TTC subway (Toronto, Canada)</td>
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<td>Fare Structure</td>
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<td>Up to 4 trains in peak direction</td>
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APPENDIX 3: TECHNICAL NOTE ON MONTCLAIR STATION CONCEPT
Introduction and Background

In support of the Metrolink San Bernardino Line/Gold Line Task Force, Mott MacDonald has studied a number of design concepts at Montclair Transit Center that aim to optimize the interface for passenger transfers between the proposed new Gold Line station (forming the potential terminal of the Gold Line Phase 2B extension) and the existing Metrolink station.

The focus of this study has been to determine the feasibility of two concepts:

- Lowering the elevation of the proposed Gold Line alignment to facilitate a more effective mode transfer.
- Introduce a shared center platform between the eastbound Gold Line platform and westbound Metrolink platform allowing for optimal passenger transfers.

This technical memo together with three corresponding engineering drawings were first issued to Metro on May 21, 2019. The engineering drawings were subsequently presented to the California Public Utilities Commission (CPUC) on July 3, 2019 with the aim of soliciting feedback from the CPUC and reaching concurrence on an acceptable approach on improving pedestrian access and mode transfer mechanisms.

The three engineering concepts presented to the CPUC were as follows;

- Option 1 – Utilizing two Gold Line side platforms where the eastbound Gold Line platform is adjacent to and also forms an island platform with the existing Metrolink westbound platform.
- Option 2 – Similar to Option 1, except for a level difference across the combined platforms. These platforms are connected using a ramp at each end to provide direct pedestrian access across the eastbound Gold Line tracks and onto the Metrolink westbound platform.
- Option 3 – Utilizing the current Gold Line center platform reference design and the Gold Line alignment (and its platform) were re-profiled such that it facilitates pedestrian access across the Gold Line tracks using two ADA compliant ramps onto the Metrolink westbound platform.

The key points raised by the CPUC at this meeting were as follows;

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CPUC noted that the current pedestrian undercrossing is an approved design for the Gold Line Reference Design which grade separates pedestrians and trains and provides the greatest level of safety.

CPUC would not support pedestrian grade crossings at both ends of the Gold Line platform. This may be reconsidered if new innovative safety treatments could be introduced.

Although similar layouts exist on other systems, San Diego as an example such as Old Town station where trolley, Coastliner, and freight share a station, there is a large amount of pedestrian/train interaction and accidents do occur.

CPUC may consider in further detail an option where a pedestrian crossing is located on the eastern end of the platform only (at the tail track end) if Montclair Gold Line Station is intended to be the terminus station for a long period of time and if appropriate safety mitigations can be provided.

CPUC suggested that safety mitigations may include swing gates, audiovisual warning devices, gate arms, but the design also needs to consider fire life safety requirements if implemented.

A possible undercrossing on the west side could also be considered, however, SBCTA/Metro will need to find funding for this and consider ridership demands.

Other stations on the Gold Line could be examined for potential safety mitigation measures and there is a lot of Metro experience in this area as well to provide support.

Following the CPUC meeting, Mott MacDonald updated the three engineering concepts to address this feedback. A description of these designs following these updates is as follows;

Option 1 – Combined Metro/Metrolink platform with no elevation difference (Drawing Number 381630-MMD-02-19-DCRV-0007)

For a flush, step free interface between the combined Gold Line eastbound platform and the Metrolink westbound platform, the Gold Line track alignment has been reprofiled and lowered so that the Gold Line platforms and tracks are a similar elevation to the Metrolink platforms. This option requires approximately 1’ of lowering of the road profile on Monte Vista Avenue combined with a shallower bridge deck/structure (assumed to be 6’ between top of rail and bridge soffit) in order to maintain a 15’-6” bridge clearance. Drawings for Option 1 are included in Appendix A.

The existing pedestrian undercrossing located at the east end of the existing Metrolink Station would also have to be lowered by approximately 2’ in order to accommodate the lowered Gold Line tracks and the required undercrossing extension northward, with a minimum internal 9’ vertical clearance. The Gold Line tracks and platform would need to use an approximate +0.8% grade to match flush with the existing Metrolink Station, which is within the maximum +/-1.0% grade of the Metro Rail Design Criteria (MRDC).

Passengers alighting on the combined center platform would be able to egress the station via the at-grade crossing of the Gold Line track at the east end of the Gold Line Station platforms as well as utilizing the undercrossing.

The design changes that have been introduced since the CPUC meeting are as follows;

- The proposed at-grade pedestrian crossing located at the west end of the Gold Line platforms has been removed.
- A comprehensive suite of safety features which have been used at other Gold Line stations has been proposed and added to the concept engineering layouts. These include widened pedestrian crossing, automated barriers, gates, audio and visual warning systems.
An additional set of stairs has been added to the north east of the station that improves passenger access from the Metrolink and combined Gold Line platforms to the parking lot.

The advantages and disadvantages of this layout are summarized as follows:

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides an optimized step free platform layout for passenger transfer and access / egress</td>
<td>Requires lowering of Monte Vista Avenue and road rep智ling</td>
</tr>
<tr>
<td>Includes space provision for Metro and Southern California Regional Rail Authority/Metrolink ticket vending machines on combined platforms</td>
<td>Requires lowering of the existing pedestrian undercrossing invert and reconstruction of existing Metrolink platform ramps</td>
</tr>
<tr>
<td>Introduces a small reduction in proposed retaining wall</td>
<td>Increases pedestrian traffic on at-grade crossing</td>
</tr>
<tr>
<td>Reduced Gold Line track centers reduces the right of way footprint</td>
<td>Presents a significant change from the environmentally cleared design</td>
</tr>
<tr>
<td>Reduced Gold Line track centers reduces the crossover lengths</td>
<td>Increases station construction costs and represent the highest additional cost of all three design options</td>
</tr>
</tbody>
</table>

**Option 2 – Combined Metro/Metrolink platform with up to 3’ elevation difference (Drawing Number 381630-MMD-02-19-DCRV-0008)**

This option provides a flush grade crossing connecting the combined station access/ticketing area, across the Gold Line tracks, to the Gold Line and Metrolink platforms. However it also introduces an elevation difference between the combined Gold Line eastbound platform and the Metrolink westbound platform of approximately 3’. The design concept utilizes a shallower bridge deck/structure and a re-profile of the Gold Line tracks but does not require modifying the existing road profile of Monte Vista Avenue. Similar to Option 1, the Gold Line profile would need to enter the station at the same estimated grade of the Metrolink platform of +0.8%. Drawings for Option 2 are included in Appendix B.

The design changes that have been introduced since the CPUC meeting are as follows;

- The proposed at-grade pedestrian crossing located at the west end of the Gold Line platforms has been removed.
• A comprehensive suite of safety features which have been used at other Gold Line stations has been proposed and added to the concept engineering layouts. These include widened pedestrian crossing, automated barriers, gates, audio and visual warning systems.
• An additional set of stairs has been added to the northeast end of the station that improves passenger access from the Metrolink and combined Gold Line platforms to the parking lot.
• There is potential for the crossover to be relocated to a position off the structure at Monte Vista Avenue. This potential crossover location has been added to the concept drawings.

The advantages and disadvantages of this layout are summarized as follows:

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not require reprofiling of Monte Vista Avenue</td>
<td>Elevation difference between the share eastbound Gold Line platform and the west bound Metrolink platform will impede passenger flow</td>
</tr>
<tr>
<td>Does not require lowering of the existing pedestrian undercrossing invert</td>
<td>Increases pedestrian traffic on at-grade crossing</td>
</tr>
<tr>
<td>Provides an optimized step free grade crossing from the access/ticketing area to Metrolink westbound platform</td>
<td>Presents a significant change from the environmentally cleared design</td>
</tr>
<tr>
<td>Reduced Gold Line track centers reduce right of way footprint</td>
<td>Increases station construction costs</td>
</tr>
<tr>
<td>Reduced Gold Line track centers reduce crossover lengths</td>
<td>Side platforms on Gold Line terminal station not preferred by Metro</td>
</tr>
<tr>
<td>Provides potential to remove crossovers form bridge (subject to acceptance of design deviation)</td>
<td></td>
</tr>
</tbody>
</table>

Option 3 – Gold Line Island Platform with lowered elevation (Drawing Number 381630-MMD-02-19-DCRV-0009)

The Gold Line platform arrangement (center platform) is similar to the current Gold Line Construction Authority design. It differs in that it utilizes a shallower bridge structure (as with Options 1 and 2) to minimize the platform height difference between the Gold Line and Metrolink Stations (3’-4”). In order to create a transfer path between stations, this option would require adding another set of ramps below the already proposed pedestrian ramp at the eastern end of the center platform. This is to satisfy the
remaining elevation difference of approximately 1’-2’ between the Metrolink platform and the gold line grade crossing. Drawings for Option 3 are included in Appendix C.

The design changes that have been introduced since the CPUC meeting are as follows:

- The proposed at-grade pedestrian crossing located at the west end of the Gold Line platforms has been removed.
- A comprehensive suite of safety features which have been used at other Gold Line stations has been proposed and added to the concept engineering layouts. These include widened pedestrian crossing, automated barriers, gates, audio and visual warning systems.
- An additional set of stairs has been added to the north east of the station that improves passenger access from the Metrolink and combined Gold Line platforms to the parking lot.

The advantages and disadvantages of this layout are summarized as follows:

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not require reprofiling of Monte Vista Avenue</td>
<td>Increases pedestrian traffic on at-grade crossing</td>
</tr>
<tr>
<td>Does not require lowering of the existing pedestrian undercrossing invert</td>
<td>Presents a significant change from the environmentally cleared design</td>
</tr>
<tr>
<td>Provides a step free grade crossing from the access/ticketing area to Metrolink westbound platform</td>
<td>Increases station construction costs</td>
</tr>
<tr>
<td>Retains Center platform design at a terminal station</td>
<td>Gold Line crossovers remain located on the bridge structure</td>
</tr>
<tr>
<td></td>
<td>Elevation difference between the share eastbound Gold Line platform and the west bound Metrolink platform will impede passenger flow</td>
</tr>
</tbody>
</table>

A rough order of magnitude cost estimate has been prepared for each option has been prepared and attached in the Appendix D.

**Next Steps**

For Option 1 and Option 2, passenger movement to and from the integrated Gold Line/Metrolink center platform is improved by allowing passengers to egress from the station by crossing the Gold Line tracks at-grade to the north and passenger egress through the existing pedestrian undercrossing. These options also allow for passenger transfers from the Metrolink westbound platform to the Gold Line eastbound platform or Gold Line westbound platform on the other side of the tracks. Passenger connectivity throughout the station is improved and wayfinding to station facilities such as ticketing and transfers to local transit can be
considered for the station as a whole. For Option 3, the center platform for Gold Line has been retained but the re-profiling of the track/platform has allowed an additional connection to be made between the Gold Line and Metrolink platforms which will improve the line of sight and connectivity for passengers using the station.

The study has identified a number of technical issues that require further design and evaluation:

**Safety**

- A station egress calculation should be undertaken to determine the maximum number of passengers that will utilize the revised station access/egress points (including the new pedestrian grade crossing). This should be developed with pedestrian modeling to establish the behavior and risk of crowding at the station during the maximum passenger flow event like an emergency.

**Design**

- Further development of the Gold Line bridge structure design over Monte Vista Avenue is recommended to verify the design structural depth and track section type and depth.
- Verification of the extent of work needed to lower the invert of the pedestrian undercrossing is recommended, aiming to determine whether a complete replacement of the undercrossing or a modification of the undercrossing would be the most cost-effective solution.

**Constructability**

- Determination of the staging and likely number and duration of track outages necessary to modify or replace the pedestrian undercrossing is recommended. The aim would be to determine whether the Metrolink platform closures would also be necessary during construction work.

**Environmental Impact (Change)**

- Review and comparison of the right of way and engineering footprints to characterize the nature of change and the potential scope of additional environmental impact assessment is recommended.

**Survey and Utilities**

- Examine the existing utilities (public and private) in Monte Vista Avenue and at the existing Transit Center to determine the degree to which they will be impacted by the modified Gold Line structure, the lowering of the road profile and the impact of extending and modifying the pedestrian access under crossing and ramps.

**Operability**

- Determine the feasibility of operating eastbound Metrolink services using the westbound Metrolink track and platform during the evening peak and verify that a combined platform (Gold Line and Metrolink) does provide additional passenger transfer benefits that will help with a cost/benefit analysis.
Appendix A – Option 1 Design Drawing
Appendix B – Option 2 Design Drawing
Appendix C – Option 3 Design Drawing
Appendix D – Cost Estimate (incremental increase over the reference design)

<table>
<thead>
<tr>
<th></th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>+$1,300,000</td>
<td>+$1,200,000</td>
<td>+$700,000</td>
</tr>
<tr>
<td>Track work</td>
<td>+$700,000</td>
<td>+$800,000</td>
<td>+$700,000</td>
</tr>
<tr>
<td>Bridge structure</td>
<td>-</td>
<td>-</td>
<td>+$500,000</td>
</tr>
<tr>
<td>Pedestrian undercrossing</td>
<td>+$1,600,000</td>
<td>-</td>
<td>+$100,000</td>
</tr>
<tr>
<td>Highways work</td>
<td>+$4,900,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Incremental Total</td>
<td>+$8,500,000</td>
<td>+$900,000</td>
<td>+$1,000,000</td>
</tr>
<tr>
<td><strong>Total Incremental Cost with Unallocated Contingency (50%)</strong></td>
<td><strong>+$12,800,000</strong></td>
<td><strong>+$1,400,000</strong></td>
<td><strong>+$1,500,000</strong></td>
</tr>
</tbody>
</table>

The format used for the estimate is the FTA Standard Cost Categories (SCC) for Major Capital Projects. The FTA SCC format presents the capital cost estimates in an industry-recognized format that considers all project components known to drive cost. In order to estimate the incremental capital cost quantities, a breakdown of the conceptual engineering design elements was necessary. The cost for each option was developed using the conceptual drawings, typical sections, and written descriptions providing the definition for each of the major cost components. These form the basis for the identification of various composite cost elements that have been used to prepare the capital cost estimates.

Cost take offs were developed using similar projects and studies including Crenshaw/LAX Transit Corridor, Metrolink Stations Assessment, and others, and are presented in 2019 USD. In addition, a 30 to 50 percent contingency for allocated contingencies were added to each improvement item’s base construction cost for unknown or undeveloped costs for each item. To account for unanticipated costs, refinements in the design as it progresses through the design phases of the project, and to account for the potential for future changes, 50 percent contingency has been applied for unallocated contingencies and soft costs.
APPENDIX 4: TECHNICAL NOTE ON RIDERSHIP MODELING AND FARE SENSITIVITY ANALYSIS
Los Angeles Metro Regional Rail

RIDERSHIP FORECAST AND FARE SENSITIVITY

Technical Memorandum | April 15, 2020

PREPARED FOR
LOS ANGELES METRO REGIONAL RAIL

SUBMITTED BY
RSG

IN COOPERATION WITH
MOTT MACDONALD
CONTENTS

1.0 INTRODUCTION ................................................................................ 1
2.0 MODEL VALIDATION ........................................................................ 2
3.0 SCENARIOS ....................................................................................... 5
  3.1 NO-BUILD SCENARIOS ..........................................................................5
  3.2 BUILD SCENARIOS ................................................................................6
  3.3 TRAVEL TIMES .......................................................................................7
  3.4 FARES AND PARKING COSTS ..............................................................8
4.0 RIDERSHIP FORECASTS ............................................................... 11
  4.1 TRANSIT TRIPS AND BOARDINGS ..................................................... 11
  4.2 MODE SHIFTS ....................................................................................... 12
  4.3 BOARDINGS BY STATION ................................................................. 14
    GOLD LINE ........................................................................................... 14
    SAN BERNADINO LINE .................................................................... 15
  4.4 MARKET ANALYSIS .............................................................................. 17
    GEOGRAPHIC MARKET ANALYSIS .................................................. 17
5.0 FARE SENSITIVITY ......................................................................... 19
  5.1 APPROACH ........................................................................................... 19
  5.2 RESULTS ................................................................................................ 21
    TRANSIT TRIPS AND BOARDINGS .................................................... 21
    MODE SHIFTS ..................................................................................... 22
6.0 SUMMARY ........................................................................................ 23
LIST OF FIGURES

FIGURE 1. MODELED V. OBSERVED BOARDINGS FOR SBL/GOLD LINE CORRIDOR SERVICES .......................................................................................................................... 3
FIGURE 2. PROPOSED EXTENSION OF GOLD LINE .......................................................................................................................... 6
FIGURE 3. SBL/GOLD LINE SUPER-DISTRICTS ....................................................................................................................... 17
FIGURE 4. EXAMPLE FARES SCENARIOS .......................................................................................................................... 20

LIST OF TABLES

TABLE 1. PERFORMANCE MEASURES FOR THE SBL/GOLD LINE STUDY .......... 1
TABLE 2. 2017 MODELED V. OBSERVED BOARDINGS FOR SBL/GOLD LINE CORRIDOR ............................................................................................................. 3
TABLE 3. 2017 MODELED V. OBSERVED BOARDINGS FOR METROLINK SERVICES ......................................................................................................................... 4
TABLE 4: COMPETING TRAVEL TIMES ON SBL/GOLD LINE ......................................................................................................................... 8
TABLE 5. METROLINK FARE ASSUMPTIONS .......................................................................................................................... 9
TABLE 6. TRANSIT TRIPS AND BOARDINGS SUMMARY – SCENARIOS 1 – 5 .......................................................................................................................... 11
TABLE 7. TRANSIT TRIPS AND BOARDINGS SUMMARY – SCENARIOS 6 – 10 .......................................................................................................................... 11
TABLE 8. SHIFTS BY TRANSIT MODE AND OPERATOR – SCENARIOS 1 – 5 .......................................................................................................................... 13
TABLE 9. SHIFTS BY TRANSIT MODE AND OPERATOR – SCENARIOS 6 – 10 .......................................................................................................................... 13
TABLE 10. BOARDINGS FOR GL – SCENARIOS 1 – 5 ......................................................................................................................... 14
TABLE 11. BOARDINGS FOR GL – SCENARIOS 6 – 10 ......................................................................................................................... 15
TABLE 12. BOARDINGS BY STATION FOR SBL – SCENARIOS 1 – 5 ......................................................................................................................... 16
TABLE 13. BOARDINGS BY STATION FOR SBL – SCENARIOS 6 – 10 ......................................................................................................................... 16
TABLE 14. NEW TRANSIT TRIP MARKET SUMMARY – SCENARIOS 1 – 5 ......................................................................................................................... 18
TABLE 15. NEW TRANSIT TRIP MARKET SUMMARY - SCENARIOS 6 - 10 ......................................................................................................................... 18
TABLE 16. FARE SENSITIVITY SCENARIOS .......................................................................................................................... 19
TABLE 17: FARE SENSITIVITY ANALYSIS: TRANSIT TRIPS AND BOARDINGS - SCENARIOS 1 - 6 .............................................................................................................. 21
TABLE 18: FARE SENSITIVITY ANALYSIS: TRANSIT TRIPS AND BOARDINGS - SCENARIOS 7 - 8 .............................................................................................................. 21
TABLE 19: FARE SENSITIVITY ANALYSIS: SHIFTS BY TRANSIT MODE AND OPERATOR - SCENARIOS 1 - 6 .............................................................................................................. 22
TABLE 20: FARE SENSITIVITY ANALYSIS: SHIFTS BY TRANSIT MODE AND OPERATOR - SCENARIOS 7 - 8 .............................................................................................................. 22
1.0 INTRODUCTION

This ridership forecast summary describes the model validation and ridership estimates for 10 ridership scenarios and seven fare sensitivity scenarios for the Metrolink San Bernardino Line (SBL)/Metro Gold Line (GL) corridor. The ridership forecasts are based on the LA Metro Corridors Based Model 18 (CBM18), adapted for use in this study.

The 10 scenarios are evaluated through a series of performance measures that inform decision-making around rail alternatives in the corridor. These performance measures are reported for the CBM18 model region, which includes six counties in Southern California (Los Angeles County, Imperial County, Orange County, Riverside County, San Bernardino County, and Ventura County) as well as the study area. The performance measures are presented in Table 1.

This report summarizes the validation of the model, provides an overview of the scenarios, and describes the performance measures for each scenario.

<table>
<thead>
<tr>
<th>TABLE 1. PERFORMANCE MEASURES FOR THE SBL/GOLD LINE STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERFORMANCE MEASURE DEFINITION</td>
</tr>
<tr>
<td>Ridership Forecasts</td>
</tr>
<tr>
<td>Transit Trips</td>
</tr>
<tr>
<td>Mode Share</td>
</tr>
<tr>
<td>Boardings</td>
</tr>
<tr>
<td>Transfer Rate</td>
</tr>
<tr>
<td>Market Analysis</td>
</tr>
<tr>
<td>Transit Trips by Market segment</td>
</tr>
</tbody>
</table>
2.0 MODEL VALIDATION

Metro validated the CBM18 model for the base year 2017. RSG had previously reviewed CBM18 routes and then updated the Metrolink system to 2017 timetables as part of the Los Angeles – Glendale – Burbank Feasibility Study. In addition, RSG revised walk access times for the Santa Ana and Glendale stations to 1 minute and for Burbank and Orange stations to 30 seconds. These provided a more precise walk access times to these stations in the 2017 model.

RSG updated the CBM18 model as part of the Vermont Transit Corridor Technical Study Phase 2 and North Hollywood to Pasadena Bus Rapid Transit (BRT) Environmental Impact Statement studies in consultation with Metro staff. The technical team made changes to the CBM18 mode choice program during the calibration for these two studies to improve the model’s ability to replicate observed transit ridership for these corridors. These changes focused primarily on improving the transit network input data. A summary of these changes to update the 2017 No-Build scenario for the SBL/GL ridership analysis is provided here for reference:

- The Metrolink service schedule was updated to better reflect the 2017 timetables.
- Station penalties were added or removed as part of the calibration to the 2017 ridership reports provided by Metro.
- The Glendale and Pasadena transit systems were updated to better represent the current routes and timetables of these services.

These changes provide a more focused calibration of the CBM18 model to support the SBL/GL corridor study.

Figure 1 and Table 2 present a summary of the corridor boardings compared to observed ridership across all transit services. Observed ridership is represented by the 2017 ticket-based ridership as reported in the Metro document titled, “WW-TAC-001-P-Station Boarding by Year.” The initial CBM18 model produced reasonable corridor-level ridership, reporting ridership within three percent of observed ridership. After the calibration adjustments mentioned above, the systemwide commuter rail system ridership was still reasonable (within 9% of observed ridership) and the San Bernardino line came to be within 10% of observed ridership (Table 3).
These comparisons between observed and modeled ridership demonstrate that the CBM18 model is validated and is reasonable to support ridership forecasting for the SBL/GL corridor. Boardings on local bus are within 7% of observed, boarding for local and rapid buses are within 10% of observed, and boardings on the San Bernardino and Gold Line together are within 7% of observed. Table 2 details these findings. Local bus lines studied in this corridor include Metro local 260, 81, 181(180), 78(79), 70, 268, 266, 267(264), and 256. The rapid lines studied were the Metro 762, 780 and 770.

### TABLE 2. 2017 MODELED V. OBSERVED BOARDINGS FOR SBL/GOLD LINE CORRIDOR

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>MODEL BOARDINGS</th>
<th>OBSERVED BOARDINGS</th>
<th>DIFFERENCE</th>
<th>PERCENT DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Bus</td>
<td>67,748</td>
<td>63,359</td>
<td>4,389</td>
<td>7%</td>
</tr>
<tr>
<td>Rapid Bus</td>
<td>22,349</td>
<td>18,659</td>
<td>3,690</td>
<td>20%</td>
</tr>
<tr>
<td>Gold Line</td>
<td>49,369</td>
<td>52,581</td>
<td>(3,212)</td>
<td>-6%</td>
</tr>
<tr>
<td>San Bernardino Line</td>
<td>8,753</td>
<td>9,721</td>
<td>(968)</td>
<td>-10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>148,219</strong></td>
<td><strong>144,320</strong></td>
<td><strong>3,899</strong></td>
<td><strong>3%</strong></td>
</tr>
</tbody>
</table>
TABLE 3. 2017 MODELED V. OBSERVED BOARDINGS FOR METROLINK SERVICES

<table>
<thead>
<tr>
<th>LINE</th>
<th>2017 TICKET-BASED RIDERSHIP</th>
<th>CBM18 ESTIMATE</th>
<th>CBM18 VARIANCE</th>
<th>CALIBRATED ESTIMATE</th>
<th>CALIBRATED VARIANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perris Valley</td>
<td>3,258</td>
<td>1,816</td>
<td>-44%</td>
<td>4,701</td>
<td>44%</td>
</tr>
<tr>
<td>Antelope Valley</td>
<td>6,044</td>
<td>8,688</td>
<td>44%</td>
<td>5,888</td>
<td>-3%</td>
</tr>
<tr>
<td>Inland Empire</td>
<td>5,111</td>
<td>4,249</td>
<td>-17%</td>
<td>5,238</td>
<td>2%</td>
</tr>
<tr>
<td>Orange Line</td>
<td>10,639</td>
<td>6,678</td>
<td>-37%</td>
<td>6,285</td>
<td>-41%</td>
</tr>
<tr>
<td>Riverside</td>
<td>4,050</td>
<td>2,831</td>
<td>-30%</td>
<td>3,572</td>
<td>-12%</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>9,721</td>
<td>8,357</td>
<td>-14%</td>
<td>8,753</td>
<td>-10%</td>
</tr>
<tr>
<td>Ventura</td>
<td>4,377</td>
<td>7,047</td>
<td>61%</td>
<td>4,700</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>43,200</td>
<td>39,666</td>
<td>-8%</td>
<td>39,137</td>
<td>-9%</td>
</tr>
</tbody>
</table>

The 2017 model produces Metro system almost 1.3 million boardings and just over 1.2 million transit trips. Metro rail boardings are 26% of the total system boardings.

TABLE 4. 2017 TRANSIT TRIPS AND BOARDINGS BY MODE

<table>
<thead>
<tr>
<th>2017 MODEL BOARDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro System Boardings</td>
</tr>
<tr>
<td>Metro Bus Boardings</td>
</tr>
<tr>
<td>Metro Rail Boardings</td>
</tr>
<tr>
<td>Total Transit Trips</td>
</tr>
</tbody>
</table>
3.0 SCENARIOS

3.1 NO-BUILD SCENARIOS

The project team conducted the scenario analysis for both 2028 and 2042. Metro technical staff provided 2028 and 2042 No-Build trip tables and networks. The project team’s analysis is consistent with the following projects currently in the planning and environmental phase:

- West Santa Ana Branch
- Sepulveda Transit Corridor
- Vermont Transit Corridor
- North Hollywood to Pasadena BRT

The project team updated the No-Build scenarios for 2028 and 2042 to reflect the other network changes expected, such as the Vermont Corridor BRT and the North Hollywood to Pasadena BRT. The project team added the Vermont Corridor BRT to the network as a new fixed guideway. The North San Fernando Valley BRT connects with the existing Orange Line BRT and the proposed North Hollywood to Pasadena BRT at the North Hollywood station.

The project team made several additional changes to the CBM18 2042 scenario to provide consistency across corridors:

- Changed the proposed East San Fernando Light Rail run times to reflect the speed of at-grade running times for a total time of 30 minutes, as per the operations plan provided by Metro.
- Removed the Sepulveda Transit Corridor segment between Exposition Boulevard and Los Angeles International Airport (LAX).
- Redistributed university trips to destinations in traffic analysis zones (TAZ) which contain the California State University Northridge (CSUN) campus. University trips assigned to TAZ 347 were shifted to TAZ 349 and TAZ 348 where CSUN is located.\(^1\)

The 2042 No-Build scenario is used as a basis for evaluating alignments in the SBL/GL corridor, so all services included in the No-Build are present in the build scenarios. The No-Build scenario contains significant rail improvements in 2042 for a more comprehensive rail system.

\(^1\) Similar evaluations of university trips around Pierce College and California Institute of Technology (Cal Tech) indicated a need to shift university trips to their respective campuses.
3.2 BUILD SCENARIOS

Error! Reference source not found. shows the proposed extension of the Gold Line to Pomona and Montclair stations. The extension includes five additional stations at Citrus College Park-and-Ride, Foothill 2B Glendora, Gold-Euclid Ave, Foothill 2B La Verne and Claremont. Pomona, Claremont and Montclair are the three transfer stations between the Metro Gold Line and the Metrolink San Bernardino line.

FIGURE 2. PROPOSED EXTENSION OF GOLD LINE

There are five scenarios SBL/GL corridor:

1. **2028 Gold Line Extension to Pomona with ‘Base’ Metrolink service levels**
   - SBL 30/60 min Peak/Off-Peak Period Headways
   - One Express Train* in the peak period with a stop at Pomona
   - Gold Line Extends to Pomona with 8/12-minute peak/off-peak headways

2. **2028 Gold Line Extension to Montclair with ‘Base’ Metrolink service levels**
   - SBL 30/60 min Peak/Off-Peak Period Headways
   - One Express Train* in the peak period with a stop at Montclair
   - Gold Line Extends to Montclair with 8/12-minute peak/off-peak headways

3. **2028 Gold Line Extension to Pomona with Enhanced Metrolink services**
   - SBL 20/30 min Peak/Off-Peak Period Headways
   - Express Train* stops at Pomona
   - Gold Line Extends to Pomona with 8/12-minute peak/off-peak headways
4. 2028 Gold Line Extension to Montclair with Enhanced Metrolink services
   - SBL 20/30 min Peak/Off-Peak Period Headways
   - Express Train* stops at Montclair
   - Gold Line Extends to Montclair with 8/12-minute peak/off-peak headways

5. 2042 Gold Line Extension to Montclair with Enhanced Metrolink services
   - SBL 20/30 min Peak/Off-Peak Period Headways
   - Express Train* stops at Montclair
   - Gold Line Extends to Montclair with 8/12-minute peak/off-peak headways

The current San Bernardino 25% discount applies in all future years for all scenarios. Metro charges $3 for parking at all stations with parking facilities, except Los Angeles Union Station where the price is as it is today, and Montclair station where there is no charge. Fares are described in more detail in Section 3.4.

Additional scenarios 6-10 were run with the same assumptions as scenarios 1-5 but with 5/12 minutes for peak and off-peak headways, respectively, on the Gold Line.

### 3.3 TRAVEL TIMES

Station to station travel times for the San Bernardino line were extracted from the Metrolink General Transit Feed Specification (GTFS) data for the base year (2017). Travel times are similar for outbound and inbound trips. The total travel time between San Bernardino Depot and Los Angeles Union Station is 95 minutes. The station to station travel time for the Gold Line extension to Montclair was extracted from operations plans listed on the Foothill Gold Line project website[^2]. With the extension to Pomona the travel time on the Gold Line from Los Angeles Union Station to Pomona is 62 mins. The extension to Montclair gives a 67-minute travel time to Los Angeles Union Station.

Table 5 shows the relative travel times on the two services between shared stations. Walk time transfer penalties between Metrolink and Gold Line services was set to four mins at the Pomona stations, seven minutes at the Claremont stations and five minutes at the Montclair stations. These transfer times were estimated from the walking distance between the two services at each station.

[^2]: [https://foothillgoldline.org/default/faq/](https://foothillgoldline.org/default/faq/)
### TABLE 5. COMPETING TRAVEL TIMES ON SBL/GOLD LINE

<table>
<thead>
<tr>
<th>STATION TO STATION</th>
<th>METROLINK SBL</th>
<th>METRO GOLD LINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Union to Pomona</td>
<td>52 mins</td>
<td>62 mins</td>
</tr>
<tr>
<td>Los Angeles Union to Claremont</td>
<td>59 mins</td>
<td>67 mins</td>
</tr>
</tbody>
</table>

### 3.4 FARES AND PARKING COSTS

Metro Gold Line fares are a fixed price per ride at $1.75. Metrolink has distance-based fares which have been calibrated in the model to account for discounts and monthly or weekly passes. To reflect the current 25% discount on the SBL tickets, a fixed 25% was taken off the already calibrated ticket prices. The Metrolink fare assumptions for ticket prices from San Bernardino Station are shown in Parking costs at Union Station reflect the current pricing structure of $8 parking cost, converted to $9.96 in 2011 dollars. Other Metro rail stations with parking facilities were given a parking cost of $3. This was converted to 2011 dollars as $2.56. One exception is the Montclair station, which will not be owned by Metro, so no parking cost was applied at this station. The Metrolink parking facilities were priced the same as they are today.
Table 6. These fares are represented in 2011 dollars and are inclusive of the 25% discount.

Parking costs at Union Station reflect the current pricing structure of $8 parking cost, converted to $9.96 in 2011 dollars. Other Metro rail stations with parking facilities were given a parking cost of $3. This was converted to 2011 dollars as $2.56. One exception is the Montclair station, which will not be owned by Metro, so no parking cost was applied at this station. The Metrolink parking facilities were priced the same as they are today.
# TABLE 6. METROLINK FARE ASSUMPTIONS

<table>
<thead>
<tr>
<th>STATION NAME</th>
<th>FARE</th>
<th>STATION NAME</th>
<th>FARE</th>
<th>STATION NAME</th>
<th>FARE</th>
<th>STATION NAME</th>
<th>FARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-Metrolink San Bernardino Downtown (DT)</td>
<td>2.39</td>
<td>C-Metrolink Laguna Niguel</td>
<td>4.71</td>
<td>C-Metrolink Anaheim</td>
<td>7.89</td>
<td>C-Metrolink Santa Clarita</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Rialto</td>
<td>2.39</td>
<td>C-Irvine Transportation Center</td>
<td>4.71</td>
<td>C-Metrolink San Juan Capistrano</td>
<td>7.89</td>
<td>C-Metrolink Northridge v2</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Fontana</td>
<td>2.39</td>
<td>C-Metrolink Tustin</td>
<td>4.71</td>
<td>C-Metrolink Buena Park</td>
<td>7.89</td>
<td>C-Metrolink Vista Canyon</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Rancho Cucamonga</td>
<td>3.54</td>
<td>C-Metrolink Santa Ana</td>
<td>4.71</td>
<td>C-Norwalk/Santa Fe Springs</td>
<td>7.89</td>
<td>C-Metrolink Newhall</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Claremont</td>
<td>4.69</td>
<td>C-Metrolink Orange</td>
<td>4.71</td>
<td>C-Metrolink San Clemente</td>
<td>9.42</td>
<td>C-Burbank-Bob Hope Airport</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Upland</td>
<td>4.69</td>
<td>C-Metrolink El Monte</td>
<td>5.84</td>
<td>C-Metrolink East Ontario</td>
<td>9.42</td>
<td>C-Metrolink Northridge</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Montclair</td>
<td>4.69</td>
<td>C-Metrolink Baldwin Park</td>
<td>5.84</td>
<td>C-Metrolink Pedley</td>
<td>9.42</td>
<td>C-Chatsworth</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Pomona</td>
<td>4.69</td>
<td>C-Metrolink Covina</td>
<td>5.84</td>
<td>C-Burbank Airport Hollywood Way</td>
<td>10.17</td>
<td>C-Metrolink Simi Valley</td>
<td>11.7</td>
</tr>
<tr>
<td>C-Metrolink Riverside-La Sierra</td>
<td>4.71</td>
<td>C-Cal State LA</td>
<td>6.99</td>
<td>C-Glendale Transit Center</td>
<td>10.17</td>
<td>C-Metrolink Industry</td>
<td>12.48</td>
</tr>
<tr>
<td>C-Metrolink North Main Corona</td>
<td>4.71</td>
<td>C-Union Station</td>
<td>6.99</td>
<td>C-Metrolink Burbank</td>
<td>10.17</td>
<td>C-Metrolink Camarillo</td>
<td>13.23</td>
</tr>
<tr>
<td>C-Metrolink West Corona</td>
<td>4.71</td>
<td>C-Moreno Valley/March Field</td>
<td>7.89</td>
<td>C-Metrolink Sun Valley</td>
<td>10.17</td>
<td>C-Metrolink Moorpark</td>
<td>13.23</td>
</tr>
<tr>
<td>C-Metrolink Anaheim Canyon</td>
<td>4.71</td>
<td>C-Downtown Perris</td>
<td>7.89</td>
<td>C-Metrolink Van Nuys</td>
<td>10.17</td>
<td>C-Metrolink Montebello</td>
<td>14.01</td>
</tr>
<tr>
<td>C-Metrolink Riverside-Downtown</td>
<td>4.71</td>
<td>C-South Perris</td>
<td>7.89</td>
<td>C-Metrolink Sylmar/San Fernando</td>
<td>10.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-Riverside Hunter Park</td>
<td>7.89</td>
<td>C-Metrolink Commerce</td>
<td>10.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-Fullerton Transportation Center</td>
<td>7.89</td>
<td>C-Downtown Pomona</td>
<td>10.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.0 RIDERSHIP FORECASTS

RSG conducted four types of analysis to evaluate ridership for the SBL/GL study: transit trips and boardings, mode shifts, boardings by station, and market analysis. There are performance indicators for each type of analysis to produce a comprehensive view of the ridership benefits and impacts by scenario.

4.1 TRANSIT TRIPS AND BOARDINGS

Table 7 and Table 8 present ridership statistics, transit trips, and boardings for each scenario in the SBL/GL study. Scenarios 1 – 5 include 8-minute peak headways on the GL, while scenarios 6 – 10 include 5-minute peak headways. As expected, there is an increase in transit trips and total boardings for all scenarios, particularly when the GL is extended to Montclair. Scenarios in which the GL is extended to Montclair increase ridership by approximately 8,000 transit trips compared to parallel scenarios going to Pomona.

**TABLE 7. TRANSIT TRIPS AND BOARDINGS SUMMARY FOR SCENARIOS 1 – 5**

<table>
<thead>
<tr>
<th>Scenarios with 8-minute peak headways on Gold Line</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 Gold Line to Pomona</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>77,652,996</td>
</tr>
<tr>
<td>2028 Gold Line to Montclair</td>
<td>1,547,228</td>
<td>1,555,452</td>
<td>1,550,080</td>
<td>1,557,774</td>
<td>1,728,779</td>
</tr>
<tr>
<td>Change in Transit Trips</td>
<td>N/A</td>
<td>8,223</td>
<td>2,851</td>
<td>10,545</td>
<td>181,551</td>
</tr>
</tbody>
</table>

**TABLE 8. TRANSIT TRIPS AND BOARDINGS SUMMARY FOR SCENARIOS 6 – 10**

<table>
<thead>
<tr>
<th>Scenarios with 5-minute peak headways on Gold Line</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
<th>Scenario 9</th>
<th>Scenario 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 Gold Line to Pomona</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>77,652,996</td>
</tr>
<tr>
<td>2028 Gold Line to Montclair</td>
<td>1,554,329</td>
<td>1,562,895</td>
<td>1,557,191</td>
<td>1,565,222</td>
<td>1,736,903</td>
</tr>
<tr>
<td>Change in Transit Trips</td>
<td>7,101</td>
<td>15,667</td>
<td>9,963</td>
<td>17,994</td>
<td>189,674</td>
</tr>
</tbody>
</table>
Extending the GL to Montclair provides an increase in ridership of about 8,200 riders, with enhancements to Metrolink adding another 2,300 additional riders for a total increase of 10,500 for Scenario 4. Increasing headway to 5-minutes provides a ridership increase of approximately 7,100 riders. Riders on the GL extension benefit from a more comprehensive rail system in the 2042 No-Build network.

Transfer rates are defined as the percent of riders who transfer (i.e. a transfer rate of 1.6 means that 60% of riders are transferring, and 40% of riders are not transferring). In 2017 (steps one through four), transfers are 1.5 boardings per trip. This compares to data from the 2017 National Household Travel Survey on transfer rates that indicate 55% of transit riders transfer. In 2028, transfers increase to 1.6 boardings per trip for all scenarios. In 2042, transfers increase again to 1.7 boardings per trip. Transfer rates tend to increase with higher frequency service, confirming the increase in transfer rates for 2028 and 2042 where there are higher levels of service. The forecasted increase in transfer rates gleaned from this evaluation is reasonable compared to the average indicated in the literature.

4.2 MODE SHIFTS

Mode shifts identify where new services offer a better alternative than existing services. Table 9 and Table 10 provide mode shifts in boardings for each scenario. At 8-minute GL headways, ridership increases on both lines, as expected, with the exception of Scenario 2 (unenhanced GL to Montclair), which shows an increase on the GL but a slight decline in ridership on the SBL. A similar pattern is seen at the 8-minute headways as well.

The GL sees the greatest ridership benefits in all scenarios, with increase between 12-18%, though with enhanced Metrolink, the SBL also sees ridership increases of between 19-23%. There is a consistent 7% increase in boardings for parallel scenarios 1-4 and 6-9 in 2028, with an 8% increase in boardings between scenarios 5 and 10 in 2042.
### TABLE 9. SHIFTS BY TRANSIT MODE AND OPERATOR FOR SCENARIOS 1 – 5

<table>
<thead>
<tr>
<th>Scenarios with 8-minute peak headways on Gold Line</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 Gold Line to Pomona</td>
<td>57,182</td>
<td>65,327</td>
<td>57,496</td>
<td>65,540</td>
<td>75,087</td>
</tr>
<tr>
<td>2028 Gold Line to Montclair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2028 to Pomona with Enhanced Metrolink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2028 to Montclair with Enhanced Metrolink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2042 to Montclair with Enhanced Metrolink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Boardings by Line

<table>
<thead>
<tr>
<th></th>
<th>Gold Line Boardings</th>
<th>Change in GL Boardings</th>
<th>San Bernardino Boardings</th>
<th>Change in SBL Boardings</th>
<th>Total Boardings</th>
<th>Change in Total Boardings</th>
<th>Total Metro Boardings</th>
<th>Change in Metro Boardings</th>
<th>Total Metrolink Boardings</th>
<th>Change in Metrolink Boardings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>57,182</td>
<td>3,921</td>
<td>15,795</td>
<td>-410</td>
<td>2,507,171</td>
<td>18,009</td>
<td>1,837,327</td>
<td>13,525</td>
<td>70,522</td>
<td>N/A</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>65,327</td>
<td>12,506</td>
<td>15,385</td>
<td>4,575</td>
<td>2,523,098</td>
<td>34,763</td>
<td>1,850,852</td>
<td>2,202,782</td>
<td>70,012</td>
<td>-212</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>57,496</td>
<td>4,231</td>
<td>20,371</td>
<td>3,681</td>
<td>2,513,173</td>
<td>24,146</td>
<td>1,839,027</td>
<td>365,455</td>
<td>74,829</td>
<td>4,307</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>65,540</td>
<td>12,712</td>
<td>19,476</td>
<td>4,377</td>
<td>2,527,923</td>
<td>39,612</td>
<td>1,852,068</td>
<td>436,955</td>
<td>73,811</td>
<td>3,290</td>
</tr>
<tr>
<td>Scenario 5</td>
<td>75,087</td>
<td>23,992</td>
<td>20,172</td>
<td>40,748</td>
<td>2,954,130</td>
<td>474,658</td>
<td>2,227,407</td>
<td>390,080</td>
<td>110,845</td>
<td>40,748</td>
</tr>
</tbody>
</table>

### TABLE 10. SHIFTS BY TRANSIT MODE AND OPERATOR FOR SCENARIOS 6 – 10

<table>
<thead>
<tr>
<th>Scenarios with 5-minute peak headways on Gold Line</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
<th>Scenario 9</th>
<th>Scenario 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 Gold Line to Pomona</td>
<td>61,104</td>
<td>69,688</td>
<td>61,413</td>
<td>69,894</td>
<td>81,174</td>
</tr>
<tr>
<td>2028 Gold Line to Montclair</td>
<td>3,921</td>
<td>12,506</td>
<td>4,231</td>
<td>12,712</td>
<td>23,992</td>
</tr>
<tr>
<td>2028 to Pomona with Enhanced Metrolink</td>
<td>15,815</td>
<td>15,377</td>
<td>20,415</td>
<td>19,470</td>
<td>20,191</td>
</tr>
<tr>
<td>2028 to Montclair with Enhanced Metrolink</td>
<td>20</td>
<td>-418</td>
<td>4,620</td>
<td>3,675</td>
<td>4,396</td>
</tr>
<tr>
<td>2042 to Montclair with Enhanced Metrolink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Boardings by Line

<table>
<thead>
<tr>
<th></th>
<th>Gold Line Boardings</th>
<th>Change in GL Boardings</th>
<th>San Bernardino Boardings</th>
<th>Change in SBL Boardings</th>
<th>Total Boardings</th>
<th>Change in Total Boardings</th>
<th>Total Metro Boardings</th>
<th>Change in Metro Boardings</th>
<th>Total Metrolink Boardings</th>
<th>Change in Metrolink Boardings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 6</td>
<td>61,104</td>
<td>3,921</td>
<td>15,815</td>
<td>-418</td>
<td>2,525,180</td>
<td>18,009</td>
<td>1,853,197</td>
<td>13,525</td>
<td>70,734</td>
<td>N/A</td>
</tr>
<tr>
<td>Scenario 7</td>
<td>69,688</td>
<td>12,506</td>
<td>15,377</td>
<td>4,307</td>
<td>2,541,934</td>
<td>34,763</td>
<td>1,867,461</td>
<td>2,202,782</td>
<td>70,174</td>
<td>-348</td>
</tr>
<tr>
<td>Scenario 8</td>
<td>61,413</td>
<td>4,231</td>
<td>20,415</td>
<td>3,290</td>
<td>2,531,317</td>
<td>24,146</td>
<td>1,855,043</td>
<td>365,455</td>
<td>74,829</td>
<td>4,544</td>
</tr>
<tr>
<td>Scenario 9</td>
<td>69,894</td>
<td>12,712</td>
<td>19,470</td>
<td>40,748</td>
<td>2,546,783</td>
<td>39,612</td>
<td>1,868,684</td>
<td>436,955</td>
<td>73,811</td>
<td>3,459</td>
</tr>
<tr>
<td>Scenario 10</td>
<td>81,174</td>
<td>23,992</td>
<td>20,191</td>
<td>40,748</td>
<td>2,981,829</td>
<td>474,658</td>
<td>2,227,407</td>
<td>390,080</td>
<td>111,270</td>
<td>40,748</td>
</tr>
</tbody>
</table>
4.3 BOARDINGS BY STATION

RSG analyzed boardings by station for the six scenarios to better understand the local impacts of the improvements.

Gold Line

Table 11 and Table 12 presents the station boardings for the GL. The highest volume station in all scenarios is Memorial Park followed by the last station on the line in each scenario (either Pomona or Montclair). There is a 14% increase in boardings when the GL is extended from Pomona to Montclair. Most of the increase comes from new riders boarding at Montclair or Claremont stations, and the remaining stations increase boardings just a few percentage points.

### TABLE 11. BOARDINGS FOR GL FOR SCENARIOS 1 – 5

<table>
<thead>
<tr>
<th>Station</th>
<th>2028 Gold Line to Pomona</th>
<th>2028 Gold Line to Montclair</th>
<th>2028 to Pomona with Enhanced Metrolink</th>
<th>2028 to Montclair with Enhanced Metrolink</th>
<th>2042 to Montclair with Enhanced Metrolink</th>
<th>Percent Difference from 1 to 2</th>
<th>Percent Difference from 3 to 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ul-Union Station</td>
<td>2,610</td>
<td>2,699</td>
<td>2,680</td>
<td>2,753</td>
<td>5,347</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Ul-Chinatown</td>
<td>892</td>
<td>897</td>
<td>896</td>
<td>900</td>
<td>1,168</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>Ul-Lincoln/Cypress</td>
<td>1,551</td>
<td>1,566</td>
<td>1,557</td>
<td>1,566</td>
<td>1,980</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Heritage Square</td>
<td>1,970</td>
<td>1,968</td>
<td>1,967</td>
<td>1,977</td>
<td>1,884</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Southwest Museum</td>
<td>1,338</td>
<td>1,353</td>
<td>1,338</td>
<td>1,349</td>
<td>1,862</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Highland Park</td>
<td>2,583</td>
<td>2,594</td>
<td>2,582</td>
<td>2,590</td>
<td>2,965</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Ul-South Pasadena</td>
<td>1,536</td>
<td>1,555</td>
<td>1,540</td>
<td>1,561</td>
<td>1,722</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Fillmore</td>
<td>1,797</td>
<td>1,820</td>
<td>1,803</td>
<td>1,818</td>
<td>2,111</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Metro Gold Del Mar</td>
<td>4,180</td>
<td>4,234</td>
<td>4,195</td>
<td>4,249</td>
<td>3,979</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Memorial Park</td>
<td>6,983</td>
<td>7,318</td>
<td>7,029</td>
<td>7,357</td>
<td>8,706</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Ul-Metro Gold Lake</td>
<td>2,681</td>
<td>2,728</td>
<td>2,696</td>
<td>2,743</td>
<td>3,195</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-Metro Gold Allen</td>
<td>1,819</td>
<td>1,841</td>
<td>1,819</td>
<td>1,840</td>
<td>2,571</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Sierra Madre Villa</td>
<td>1,850</td>
<td>1,875</td>
<td>1,853</td>
<td>1,876</td>
<td>2,468</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Gold Arcadia</td>
<td>2,824</td>
<td>2,862</td>
<td>2,826</td>
<td>2,858</td>
<td>3,043</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Monrovia Station</td>
<td>1,841</td>
<td>1,884</td>
<td>1,835</td>
<td>1,877</td>
<td>1,877</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-Gold Duarte</td>
<td>1,041</td>
<td>1,060</td>
<td>1,041</td>
<td>1,058</td>
<td>1,085</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-Gold Irwindale</td>
<td>2,936</td>
<td>2,962</td>
<td>2,905</td>
<td>2,933</td>
<td>2,681</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Azusa Railroad</td>
<td>2,115</td>
<td>2,131</td>
<td>2,097</td>
<td>2,114</td>
<td>2,070</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Citrus College Park &amp; Ride</td>
<td>3,807</td>
<td>3,993</td>
<td>3,809</td>
<td>4,001</td>
<td>4,120</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Ul-Foothill 2B Glendora Station</td>
<td>1,655</td>
<td>1,651</td>
<td>1,651</td>
<td>1,640</td>
<td>1,552</td>
<td>0%</td>
<td>-1%</td>
</tr>
<tr>
<td>Ul-Gold-Euclid Ave</td>
<td>1,402</td>
<td>1,381</td>
<td>1,403</td>
<td>1,383</td>
<td>2,517</td>
<td>-1%</td>
<td>-1%</td>
</tr>
<tr>
<td>Ul-Foothill 2B La Verne Station</td>
<td>1,315</td>
<td>1,975</td>
<td>1,373</td>
<td>1,996</td>
<td>2,879</td>
<td>50%</td>
<td>45%</td>
</tr>
<tr>
<td>Ul-Metrolink Pomona</td>
<td>6,456</td>
<td>3,272</td>
<td>6,602</td>
<td>3,325</td>
<td>3,150</td>
<td>-50%</td>
<td>-50%</td>
</tr>
<tr>
<td>Ul-Metrolink Claremont</td>
<td>-</td>
<td>2,635</td>
<td>-</td>
<td>2,624</td>
<td>2,897</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ul-Metrolink Montclair</td>
<td>-</td>
<td>7,117</td>
<td>-</td>
<td>7,152</td>
<td>7,259</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>57,182</td>
<td>65,327</td>
<td>57,496</td>
<td>65,540</td>
<td>75,087</td>
<td>14%</td>
<td>14%</td>
</tr>
</tbody>
</table>
TABLE 12. BOARDINGS FOR GL FOR SCENARIOS 6 – 10

<table>
<thead>
<tr>
<th>Station</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
<th>Scenario 9</th>
<th>Scenario 10</th>
<th>Percent Difference from 6 to 7</th>
<th>Percent Difference from 8 to 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 Gold Line to Pomona</td>
<td>3,023</td>
<td>3,138</td>
<td>3,095</td>
<td>3,187</td>
<td>7,033</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>2028 Gold Line to Montclair</td>
<td>972</td>
<td>974</td>
<td>972</td>
<td>976</td>
<td>1,263</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2028 to Pomona with Enhanced Metrolink</td>
<td>1,675</td>
<td>1,689</td>
<td>1,682</td>
<td>1,689</td>
<td>2,156</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>2028 to Montclair with Enhanced Metrolink</td>
<td>2,076</td>
<td>2,075</td>
<td>2,074</td>
<td>2,085</td>
<td>2,005</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>2042 to Montclair with Enhanced Metrolink</td>
<td>1,417</td>
<td>1,435</td>
<td>1,416</td>
<td>1,431</td>
<td>1,965</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Chinatown</td>
<td>972</td>
<td>974</td>
<td>972</td>
<td>976</td>
<td>1,263</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Ul-Southwest Museum</td>
<td>2,384</td>
<td>2,390</td>
<td>2,383</td>
<td>2,390</td>
<td>2,930</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-Highland Park</td>
<td>2,320</td>
<td>2,324</td>
<td>2,318</td>
<td>2,324</td>
<td>2,866</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-South Pasadena</td>
<td>1,643</td>
<td>1,654</td>
<td>1,649</td>
<td>1,661</td>
<td>1,836</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Sierra Madre Villa</td>
<td>1,903</td>
<td>1,932</td>
<td>1,906</td>
<td>1,929</td>
<td>2,244</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Metro Gold Del Mar</td>
<td>4,422</td>
<td>4,477</td>
<td>4,440</td>
<td>4,493</td>
<td>4,211</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Memorial Park</td>
<td>7,519</td>
<td>7,870</td>
<td>7,567</td>
<td>7,911</td>
<td>9,317</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Ul-Metro Gold Lake</td>
<td>2,319</td>
<td>2,324</td>
<td>2,318</td>
<td>2,324</td>
<td>2,866</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-Metro Gold Allen</td>
<td>1,297</td>
<td>1,351</td>
<td>1,292</td>
<td>1,310</td>
<td>1,847</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Sierra Madre Villa</td>
<td>1,965</td>
<td>1,989</td>
<td>1,966</td>
<td>1,990</td>
<td>2,632</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Gold Arcadia</td>
<td>1,606</td>
<td>1,654</td>
<td>1,649</td>
<td>1,661</td>
<td>1,836</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Metro Gold Del Mar</td>
<td>4,422</td>
<td>4,477</td>
<td>4,440</td>
<td>4,493</td>
<td>4,211</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Gold Inland</td>
<td>3,121</td>
<td>3,154</td>
<td>3,090</td>
<td>3,124</td>
<td>2,888</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Azusa Railroad</td>
<td>2,244</td>
<td>2,257</td>
<td>2,224</td>
<td>2,240</td>
<td>2,208</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Citrus College Park &amp; Ride</td>
<td>3,933</td>
<td>4,186</td>
<td>3,998</td>
<td>4,195</td>
<td>4,324</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Ul-Foothill 2B Glendora Station</td>
<td>1,738</td>
<td>1,735</td>
<td>1,731</td>
<td>1,724</td>
<td>1,853</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Ul-Gold Duarte</td>
<td>1,105</td>
<td>1,126</td>
<td>1,105</td>
<td>1,124</td>
<td>1,147</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Ul-Gold Inland</td>
<td>3,121</td>
<td>3,154</td>
<td>3,090</td>
<td>3,124</td>
<td>2,888</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Azusa Railroad</td>
<td>2,244</td>
<td>2,257</td>
<td>2,224</td>
<td>2,240</td>
<td>2,208</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Ul-Citrus College Park &amp; Ride</td>
<td>3,933</td>
<td>4,186</td>
<td>3,998</td>
<td>4,195</td>
<td>4,324</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Ul-Foothill 2B Glendora Station</td>
<td>1,738</td>
<td>1,735</td>
<td>1,731</td>
<td>1,724</td>
<td>1,853</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Ul-Gold-Euclid Ave</td>
<td>1,497</td>
<td>1,472</td>
<td>1,496</td>
<td>1,474</td>
<td>2,662</td>
<td>-2%</td>
<td>-1%</td>
</tr>
<tr>
<td>Ul-Foothill 2B La Verne Station</td>
<td>1,395</td>
<td>2,087</td>
<td>1,457</td>
<td>2,108</td>
<td>3,013</td>
<td>50%</td>
<td>45%</td>
</tr>
<tr>
<td>Ul-Metrolink Pomona</td>
<td>6,918</td>
<td>3,439</td>
<td>7,058</td>
<td>3,539</td>
<td>3,319</td>
<td>-50%</td>
<td>-50%</td>
</tr>
<tr>
<td>Ul-Metrolink Claremont</td>
<td>-</td>
<td>2,799</td>
<td>-</td>
<td>2,787</td>
<td>3,074</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ul-Metrolink Montclair</td>
<td>-</td>
<td>7,548</td>
<td>-</td>
<td>7,581</td>
<td>7,710</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>61,104</td>
<td>69,688</td>
<td>61,413</td>
<td>69,894</td>
<td>81,174</td>
<td>14%</td>
<td>14%</td>
</tr>
</tbody>
</table>

San Bernadino Line

Table 13 and Table 14 present the boardings by station for the SBL. Extending the GL to Montclair provides small increases in boardings at stations between Union Station and Pomona and reduces ridership at stations to the east of Montclair, with Upland, Rancho Cucamonga, and Rialto losing the largest percentage of boardings. The exceptions to the east are the San Bernardino and San Bernardino DT stations, which both gain a relatively large percentage of riders (32% and 14%, respectively, in Scenario 2).
### TABLE 13. BOARDINGS BY STATION FOR SBL FOR SCENARIOS 1 – 5

<table>
<thead>
<tr>
<th>Station</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2028 Gold Line to Pomona</td>
<td>2028 Gold Line to Montclair</td>
<td>2028 to Pomona with Enhanced Metrolink</td>
<td>2028 to Montclair with Enhanced Metrolink</td>
<td>2042 to Montclair with Enhanced Metrolink</td>
</tr>
<tr>
<td>C-Union Station</td>
<td>4,950</td>
<td>4,867</td>
<td>6,290</td>
<td>5,956</td>
<td>6,363</td>
</tr>
<tr>
<td>C-Cal State LA</td>
<td>854</td>
<td>858</td>
<td>1,202</td>
<td>1,241</td>
<td>1,145</td>
</tr>
<tr>
<td>C-Metrolink El Monte</td>
<td>1,130</td>
<td>1,140</td>
<td>1,475</td>
<td>1,499</td>
<td>1,436</td>
</tr>
<tr>
<td>C-Metrolink Baldwin Park</td>
<td>755</td>
<td>765</td>
<td>993</td>
<td>1,001</td>
<td>924</td>
</tr>
<tr>
<td>C-Metrolink Covina</td>
<td>726</td>
<td>728</td>
<td>940</td>
<td>939</td>
<td>883</td>
</tr>
<tr>
<td>C-Metrolink Pomona</td>
<td>1,270</td>
<td>758</td>
<td>1,768</td>
<td>1,092</td>
<td>1,012</td>
</tr>
<tr>
<td>C-Metrolink Claremont</td>
<td>547</td>
<td>462</td>
<td>733</td>
<td>626</td>
<td>624</td>
</tr>
<tr>
<td>C-Metrolink Montclair</td>
<td>576</td>
<td>891</td>
<td>765</td>
<td>1,200</td>
<td>1,159</td>
</tr>
<tr>
<td>C-Metrolink Upland</td>
<td>600</td>
<td>508</td>
<td>801</td>
<td>682</td>
<td>646</td>
</tr>
<tr>
<td>C-Metrolink Rancho Cucamonga</td>
<td>751</td>
<td>680</td>
<td>936</td>
<td>850</td>
<td>903</td>
</tr>
<tr>
<td>C-Metrolink Fontana</td>
<td>1,712</td>
<td>1,641</td>
<td>2,092</td>
<td>2,024</td>
<td>2,328</td>
</tr>
<tr>
<td>C-Metrolink Rialto</td>
<td>719</td>
<td>615</td>
<td>886</td>
<td>879</td>
<td>977</td>
</tr>
<tr>
<td>C-Metrolink San Bernardino</td>
<td>601</td>
<td>795</td>
<td>755</td>
<td>746</td>
<td>784</td>
</tr>
<tr>
<td>C-Metrolink San Bernardino DT</td>
<td>595</td>
<td>677</td>
<td>735</td>
<td>739</td>
<td>990</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,795</strong></td>
<td><strong>15,385</strong></td>
<td><strong>20,371</strong></td>
<td><strong>19,476</strong></td>
<td><strong>20,172</strong></td>
</tr>
</tbody>
</table>

### TABLE 14. BOARDINGS BY STATION FOR SBL FOR SCENARIOS 6 – 10

<table>
<thead>
<tr>
<th>Station</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
<th>Scenario 9</th>
<th>Scenario 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2028 Gold Line to Pomona</td>
<td>2028 Gold Line to Montclair</td>
<td>2028 to Pomona with Enhanced Metrolink</td>
<td>2028 to Montclair with Enhanced Metrolink</td>
<td>2042 to Montclair with Enhanced Metrolink</td>
</tr>
<tr>
<td>C-Union Station</td>
<td>4,905</td>
<td>4,813</td>
<td>6,245</td>
<td>5,895</td>
<td>6,316</td>
</tr>
<tr>
<td>C-Cal State LA</td>
<td>852</td>
<td>860.5</td>
<td>1,202</td>
<td>1,244</td>
<td>1,148</td>
</tr>
<tr>
<td>C-Metrolink El Monte</td>
<td>1,119</td>
<td>1,131.5</td>
<td>1,464</td>
<td>1,489</td>
<td>1,426</td>
</tr>
<tr>
<td>C-Metrolink Baldwin Park</td>
<td>760</td>
<td>761</td>
<td>988</td>
<td>997</td>
<td>925</td>
</tr>
<tr>
<td>C-Metrolink Covina</td>
<td>713</td>
<td>714.5</td>
<td>928</td>
<td>924</td>
<td>871</td>
</tr>
<tr>
<td>C-Metrolink Pomona</td>
<td>1,326</td>
<td>769</td>
<td>1,834</td>
<td>1,105</td>
<td>1,028</td>
</tr>
<tr>
<td>C-Metrolink Claremont</td>
<td>551</td>
<td>463</td>
<td>740</td>
<td>628</td>
<td>622</td>
</tr>
<tr>
<td>C-Metrolink Montclair</td>
<td>578</td>
<td>925</td>
<td>769</td>
<td>1,240</td>
<td>1,198</td>
</tr>
<tr>
<td>C-Metrolink Upland</td>
<td>603</td>
<td>509</td>
<td>805</td>
<td>684</td>
<td>644</td>
</tr>
<tr>
<td>C-Metrolink Rancho Cucamonga</td>
<td>756</td>
<td>681</td>
<td>944</td>
<td>852</td>
<td>899</td>
</tr>
<tr>
<td>C-Metrolink Fontana</td>
<td>1,730</td>
<td>1657</td>
<td>2,110</td>
<td>2,043</td>
<td>2,345</td>
</tr>
<tr>
<td>C-Metrolink Rialto</td>
<td>726</td>
<td>619</td>
<td>894</td>
<td>885</td>
<td>987</td>
</tr>
<tr>
<td>C-Metrolink San Bernardino</td>
<td>602</td>
<td>798.5</td>
<td>759</td>
<td>750</td>
<td>785</td>
</tr>
<tr>
<td>C-Metrolink San Bernardino DT</td>
<td>597</td>
<td>676</td>
<td>737</td>
<td>738</td>
<td>995</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,815</strong></td>
<td><strong>15,377</strong></td>
<td><strong>20,415</strong></td>
<td><strong>19,470</strong></td>
<td><strong>20,191</strong></td>
</tr>
</tbody>
</table>
4.4 MARKET ANALYSIS

Geographic Market Analysis

The project team developed a geographic market segmentation for the SBL/Gold Line study to better understand the transit travel patterns resulting from improved transit services in the corridor. The project team evaluated the new transit trips based on a set of super-districts designed for this study area, as shown in Figure 3.

Extending the GL to Montclair serves trips within the study area better than if the GL is only extended to Pomona. Table 15 and Table 16 show the transit trips with both ends within the study area, with one endpoint in the study area, and outside the study area. For scenarios that extend the GL to Montclair, about a quarter to a third of trips are within the study area. Meanwhile, for scenarios going to Pomona, only about 13% are within the study area and nearly half are outside the study area.
### TABLE 15. NEW TRANSIT TRIP MARKET SUMMARY FOR SCENARIOS 1 – 5

<table>
<thead>
<tr>
<th>Change in Daily Transit Trips</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Study Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>2,386</td>
<td>371</td>
<td>2,704</td>
<td>10,027</td>
<td></td>
</tr>
<tr>
<td>With 1 Endpoint in Study Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>2,992</td>
<td>1,127</td>
<td>4,016</td>
<td>26,111</td>
<td></td>
</tr>
<tr>
<td>Outside of Study Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>2,824</td>
<td>1,356</td>
<td>3,793</td>
<td>145,535</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>8,202</td>
<td>2,853</td>
<td>10,513</td>
<td>181,672</td>
<td></td>
</tr>
</tbody>
</table>

Compared to 2028 Gold Line to Pomona

### TABLE 16. NEW TRANSIT TRIP MARKET SUMMARY FOR SCENARIOS 6 – 10

<table>
<thead>
<tr>
<th>Change in Daily Transit Trips</th>
<th>Scenario 6</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
<th>Scenario 9</th>
<th>Scenario 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Study Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,159</td>
<td>3,668</td>
<td>1,537</td>
<td>3,989</td>
<td>11,425</td>
<td></td>
</tr>
<tr>
<td>With 1 Endpoint in Study Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,068</td>
<td>5,208</td>
<td>3,194</td>
<td>6,240</td>
<td>28,978</td>
<td></td>
</tr>
<tr>
<td>Outside of Study Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,943</td>
<td>6,858</td>
<td>5,302</td>
<td>7,831</td>
<td>149,400</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>7,171</td>
<td>15,734</td>
<td>10,033</td>
<td>18,060</td>
<td>189,802</td>
</tr>
</tbody>
</table>

Compared to 2028 Gold Line to Pomona
5.0 FARE SENSITIVITY

5.1 APPROACH

A fare sensitivity analysis was performed to test the ridership effects of potential Metrolink and Metro fare policies and parking pricing. The policies to be tested included Metrolink off-peak fare discounts and increased Metro fares. The scenarios tested are shown in Table 17.

<table>
<thead>
<tr>
<th>SCENARIO</th>
<th>METROLINK SBL FARE CHANGE*</th>
<th>METRO GOLD LINE FARE CHANGE**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2.50 (+43%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15% Off-Peak Discount</td>
<td>$3.00 (+71%)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>$3.50 (+100%)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>$2.50 (+43%)</td>
</tr>
<tr>
<td>5</td>
<td>25% Off-Peak Discount</td>
<td>$3.00 (+71%)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>$3.50 (+100%)</td>
</tr>
<tr>
<td>7</td>
<td>Existing Metrolink Fare</td>
<td>$3.50 Metro Fare</td>
</tr>
<tr>
<td>8</td>
<td>25% Off-Peak Metrolink Discount</td>
<td>$1.75 (Existing Metro Fare)</td>
</tr>
</tbody>
</table>

*Metrolink fare changes include the existing 25% discount. **In addition to the $3 Parking at Gold Line stations (excluding Montclair).

Prior to running any fare scenarios, a test of fare sensitivity was done in the base year (2017) for the SBL; the model behaved predictably and a 25% discount in fare resulted in a 5% ridership increase. It should be noted that the model is fare insensitive for Metro rail; for example, doubling fares does not result in a substantial decrease in ridership as one would expect. Due to this insensitivity to fare, caution should be used when evaluating the results, as there are large margins of error.

Example fare scenarios are presented in Figure 4 for Union to Pomona station and Union to Montclair station. These include both fares and parking to understand full costs for these examples.
FIGURE 4. EXAMPLE FARES SCENARIOS

The following set of assumptions were made when performing the fare sensitivity analysis:

- Fares were converted from 2019 dollars to 2011 dollars for inclusion into the Metro model.
- GL fare assumptions are applied to the entire North-South line in 2028 because the Metro model assigns fares by line for Metro Rail.
- The base fare for North-South line in the Metro model is $1.75 in 2019 dollars, converted to 2011 dollars for consistency in the Metro model.
- The Gold Line boardings reported for 2028 represent the portion of the North-South line from Union Station to Montclair.
- The Blue Line boardings that are part of the North-South line in the Metro model for 2028 are not reported.
- There were no changes to transfer fares in these fare scenarios.
- All fare scenario results were compared to Scenario 4 with 8-minute peak headways on the Gold Line and Enhanced Metrolink services.
- The Metrolink fare reductions are for off-peak trips only.
5.2 RESULTS

Transit Trips and Boardings

Table 18 shows the fare sensitivity tests for scenarios 1 – 6, which assume 8-minute peak headways and a GL extension to Montclair with enhanced Metrolink service as the base line scenario. In these scenarios, fare has a relatively small effect on the overall number of transit trips. These results are not surprising, since they are systemwide results rather than line-specific.

**TABLE 18. FARE SENSITIVITY TRANSIT TRIPS AND BOARDINGS FOR SCENARIOS 1 - 6**

<table>
<thead>
<tr>
<th>Scenarios with 8-minute peak headways on Gold Line</th>
<th>Base Line</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
<th>Scenario 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 to Montclair with Enhanced Metrolink 2028 and 15% off</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
</tr>
<tr>
<td>2028 $2.50 and 15% off</td>
<td>1,557,774</td>
<td>1,554,342</td>
<td>1,552,236</td>
<td>1,550,157</td>
<td>1,554,417</td>
<td>1,552,311</td>
<td>1,550,232</td>
</tr>
<tr>
<td>2028 $3.00 and 15% off</td>
<td>N/A</td>
<td>-3,432</td>
<td>-5,538</td>
<td>-7,617</td>
<td>-3,357</td>
<td>-5,463</td>
<td>-7,542</td>
</tr>
<tr>
<td>2028 $3.50 and 15% off</td>
<td>-0.2%</td>
<td>-0.4%</td>
<td>-0.5%</td>
<td>-0.2%</td>
<td>-0.4%</td>
<td>-0.5%</td>
<td></td>
</tr>
</tbody>
</table>

**Change in Transit Trips by Area**

| Change in trips within Study Area | -760 | -1,226 | -1,689 | -747 | -1,214 | -1,677 |
| Change in trips with one endpoint in study area | -828 | -1,344 | -1,856 | -801 | -1,315 | -1,827 |
| Change in trips outside study area | -1,844 | -2,967 | -4,071 | -1,810 | -2,934 | -4,038 |

Fare sensitivity scenarios 7-8 assumed a GL extension to Pomona with enhanced Metrolink service. Neither set of pricing scenarios tested had a large affect on overall transit trips (see Table 19).

**TABLE 19. FARE SENSITIVITY TRANSIT TRIPS AND BOARDINGS FOR SCENARIOS 7 - 8**

<table>
<thead>
<tr>
<th>Scenarios with 8-minute peak headways on Gold Line</th>
<th>Base Line</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>2028 to Pomona with Enhanced Metrolink 2028 Metro GL SBL 25% off</td>
<td>70,878,957</td>
<td>70,878,957</td>
<td>70,878,957</td>
</tr>
<tr>
<td>2028 Metro GL $3.50</td>
<td>1,550,080</td>
<td>1,543,059</td>
<td>1,550,219</td>
</tr>
<tr>
<td>2028 $3.00 and 25% off</td>
<td>-7,021</td>
<td>139</td>
<td></td>
</tr>
<tr>
<td>2028 $3.50 and 25% off</td>
<td>-0.5%</td>
<td>0.0%</td>
<td></td>
</tr>
</tbody>
</table>

**Change in Transit Trips by Area**

| Change in trips within Study Area | -1,492 | 26 |
| Change in trips with one endpoint in study area | -1,674 | 50 |
| Change in trips outside study area | -3,854 | 63 |
Mode Shifts

While the overall number of transit trips do not change substantially, at the line level, the model produces relatively large decreases in boardings on the GL as fares increase, losing up to 6% of boardings (Table 20 and Table 21). The model produces modest gains in boardings on the SBL as a result of the fare discount.

### TABLE 20. FARE SENSITIVITY SHIFTS BY MODE AND OPERATOR FOR SCENARIOS 1 - 6

<table>
<thead>
<tr>
<th>Scenarios with 8-minute peak headways on Gold Line</th>
<th>Base Line</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
<th>Scenario 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boardings by Line</td>
<td>2028 to Montclair with Enhanced Metrolink</td>
<td>$2.50 and 15% off</td>
<td>$3.00 and 15% off</td>
<td>$3.50 and 15% off</td>
<td>$2.50 and 25% off</td>
<td>$3.00 and 25% off</td>
<td>$3.50 and 25% off</td>
</tr>
<tr>
<td>Gold Line Boardings</td>
<td>65,542</td>
<td>63,809</td>
<td>62,754</td>
<td>61,705</td>
<td>63,812</td>
<td>62,760</td>
<td>61,695</td>
</tr>
<tr>
<td>Change in GL Boardings</td>
<td>0</td>
<td>-1,732</td>
<td>-2,787</td>
<td>-3,837</td>
<td>-1,729</td>
<td>-2,781</td>
<td>-3,847</td>
</tr>
<tr>
<td>Percent change GL Boardings</td>
<td>0%</td>
<td>-2.6%</td>
<td>-4.3%</td>
<td>-5.9%</td>
<td>-2.6%</td>
<td>-4.2%</td>
<td>-5.9%</td>
</tr>
<tr>
<td>San Bernardino Boardings</td>
<td>19,475</td>
<td>19,688</td>
<td>19,718</td>
<td>19,764</td>
<td>19,806</td>
<td>19,833</td>
<td>19,881</td>
</tr>
<tr>
<td>Change in SBL Boardings</td>
<td>213</td>
<td>243</td>
<td>289</td>
<td>331</td>
<td>358</td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>Percent change SBL Boardings</td>
<td>1.1%</td>
<td>1.2%</td>
<td>1.5%</td>
<td>1.7%</td>
<td>1.8%</td>
<td>2.1%</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 21. FARE SENSITIVITY SHIFTS BY MODE AND OPERATOR FOR SCENARIOS 7 - 8

<table>
<thead>
<tr>
<th>Scenarios with 8-minute peak headways on Gold Line</th>
<th>Base Line</th>
<th>Scenario 7</th>
<th>Scenario 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boardings by Line</td>
<td>2028 to Pomona with Enhanced Metrolink</td>
<td>2028 $3.50 and 25% off</td>
<td></td>
</tr>
<tr>
<td>Gold Line Boardings</td>
<td>57,496</td>
<td>54,023</td>
<td>57,552</td>
</tr>
<tr>
<td>Change in GL Boardings</td>
<td>-3,474</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Percent change GL Boardings</td>
<td>-6.0%</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>San Bernardino Boardings</td>
<td>20,371</td>
<td>20,525</td>
<td>20,688</td>
</tr>
<tr>
<td>Change in SBL Boardings</td>
<td>154</td>
<td>317</td>
<td></td>
</tr>
<tr>
<td>Percent change SBL Boardings</td>
<td>0.8%</td>
<td>1.6%</td>
<td></td>
</tr>
</tbody>
</table>

### Boardings by Operator

| Total Boardings | 2,527,923 | 2,521,015 | 2,516,497 | 2,512,121 | 2,521,192 | 2,516,674 | 2,512,288 |
| Change in Total Boardings | -6,908 | -11,426 | -15,802 | -6,731 | -11,249 | -15,635 |
| Total Metro Boardings | 1,852,068 | 1,845,788 | 1,842,020 | 1,838,214 | 1,845,825 | 1,842,057 | 1,838,261 |
| Change in Metro Boardings | -6,281 | -10,048 | -13,854 | -6,243 | -10,011 | -13,807 |
| Total Metrolink Boardings | 73,811 | 73,994 | 74,003 | 74,022 | 74,114 | 74,127 | 74,130 |
| Change in Metrolink Boardings | 183 | 192 | 211 | 302 | 315 | 318 |
6.0 SUMMARY

The SBL/GL study ridership forecasts are reasonable based on this analysis of ridership and fare sensitivity. The evaluation begins with the 2028 GL to Pomona and evaluates the impacts of improved Metrolink service, as well as extending the GL to Montclair.

The ridership forecasts produce 1,547,228 linked transit trips in 2028 with the GL extended to Pomona at 8-minute headways and no improvements to Metrolink service. Extending the GL to Montclair will increase GL boardings by about 8,100 but reduce boardings on the SBL slightly (by about 400 boardings). If Metrolink services are improved, both the SBL and GL should see ridership increases, particularly when the GL is extended to Montclair. Metrolink SBL will slow between 2028 and 2042, while GL ridership will continue to grow.

Both services are relatively insensitive to fare discounts, with few riders being attracted to the services due to lower fares, which indicates that the systems are serving relatively separate markets.
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APPENDIX 5: TECHNICAL NOTE ON METROLINK SBL FAREBOX REVENUE AND SUBSIDY CALCULATION
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1. Introduction

This technical memorandum presents the methodology and the results of a calculated estimate for the subsidy to operate the San Bernardino Line in 2028, following the start of the Foothill Gold Line Extension Phase 2B services to Montclair.

The current actual operating cost, farebox revenue and subsidy for Metrolink SBL are only available for FY2018/2019. These are reported in the Metrolink FY2019/2020 Budget Handbook as annual figures. However, the ‘SBL/Gold Line Study’ ridership estimates and the calculated farebox revenue estimates for 2028 are only defined as daily (weekday) average ridership and daily (weekday) farebox revenues.

The approach to estimating the 2028 subsidy has therefore been to annualize the 2028 daily revenues, then estimate the 2028 annual operating costs and use the difference to estimate the 2028 subsidy. The outline of the method used is as follows;

**Calculate 2028 Annual Operating Costs**
- Using operating cost unit rates provided by Metrolink;
  - Calculate weekday operating costs for 2018 using the existing 38 trains per day service.
  - Calculate weekday operating costs for 2028 using ‘Enhanced’ Metrolink service scenario assuming 70 trains per day.
- Using the net difference (increase) in weekday operating costs between 2018 to 2028, estimate the 2028 annual operating costs assuming 255 operating weekdays per year.

**Calculate 2028 Annual Farebox Revenues**
- Using average weekday fares provided by Metrolink;
  - Calculate the average weekday farebox revenue for 2018 using 2018 observed weekday ridership numbers.
  - Calculate the average weekday farebox revenue for 2028 using the ridership modelling estimates of average weekday ridership.
- Use the net difference (increased) average weekday farebox revenue between 2018 to 2028, derive the 2028 annual revenues.
2. **Assumptions**

The following assumption have been used for calculation:

- All rates, costs and the estimated subsidy are in 2019 dollars.
- Metrolink SCORE program and headway improvements will be fully implemented by 2028.
- Metrolink’s FY2019/2020 Budget Handbook has been used as the source of 2018/2019 actual annual operating cost and actual fare box revenues.
- The number of Metrolink operating weekdays per year is 255.
- The existing Metrolink service levels are 18 peak trains, and 8 reverse-peak trains per day. All other trains have been considered “off-peak.”.
- Metrolink service patterns for Monday to Thursday have been used for the calculation (and we have not included the two late Friday trains, one in each direction).
- The Metrolink 2028 service scenario is for an ‘Enhanced Metrolink Service’ delivering 20min peak headways (30min reverse peak) and 30min off peak headways.

3. **Weekday Operating Cost for 2018 and 2028**

The following illustrative unit rates were provided by Metrolink (email form Roderick Diaz, 4/6/2020) and have been used to estimate the 2018 and 2028 variable weekday operating costs.

- **Peak Rate:** $3,025 per 1-way train per day
- **Reverse-Peak Rate:** $404 per 1-way train per day
- **Off-Peak Rate:** $889 per 1-way train per day

The train numbers and trains categories (peak, reverse peak and off-peak) have been derived from the current timetable for 2019 services (assumed to represent the 2018 timetable) and from the ‘Enhanced Metrolink Service Scenario’ for 2028. Each of these is illustrated in Attachment 1 – Service Scenarios. The calculation of the 2018 and 2028 variable weekday operating costs are presented in Table 1, as follows;

<table>
<thead>
<tr>
<th></th>
<th>Existing Service (2018)</th>
<th>Enhanced Service (2028)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ Rate # Trains Cost</td>
<td>$ Rate # Trains Cost</td>
<td></td>
</tr>
<tr>
<td>Peak $3,025 18 $54,450</td>
<td>$3,025 20 $60,500</td>
<td></td>
</tr>
<tr>
<td>Reverse Peak $404 8 $3,232</td>
<td>$404 13 $5,252</td>
<td></td>
</tr>
<tr>
<td>Off Peak $889 12 $10,668</td>
<td>$889 37 $32,893</td>
<td></td>
</tr>
<tr>
<td>Total 38 $68,350</td>
<td>70 $98,645</td>
<td></td>
</tr>
<tr>
<td>Change in Daily Operating Cost</td>
<td></td>
<td>$30,295</td>
</tr>
</tbody>
</table>

**Table 1 - Existing SBL Timetable**

Using the change in daily variable cost, the increase in annual operating costs has been calculated as; $30,295 per day x 255 days = $7,725,225 ($7,725k used).
The existing annual operating cost from the FY2019-2020 Metrolink Budget Handbook; FY 2018 Operating Cost (w/MOW) = $50,453k

Therefore the 2028 annual operating costs is estimated as $50,453k + $7,725k = $58,178k

A contingency of +15% on the estimated annual operating cost has been included to account for weekend operation and the uncertainty of the future schedule and train service rosters. This contingency increases the estimated annual operating cost to **$66,905k**.

### 4. Estimated Annual Revenues for 2028

The following average weekday fares have been provided by Metrolink for fare revenue calculation purposes;

- Average weekday fare for non-transferring riders = $6.57
- Average weekday fare for transferring riders = $3.55

For the existing (observed 2018) Metrolink service the average weekday revenue is calculated as;

- Total Number of weekday trips = 10,071
- Average weekday revenue = 10,071 x $6.57 = **$66,166**

For the ‘Enhanced Metrolink Service’ when Gold Line is extended to Pomona (Montclair scenario is shown in red parenthesis)

- Total Number of weekday boardings = 20,371 (19,476)
- Revenue from the transferring trips = 1,500 x $3.55 = **$5,325**
- Revenue from the non-transferring trips = (20,371-1500) x $6.57 = **$123,983 (118,102)**
- Estimated average weekday total revenue = 5,325 + 123,983 = **$129,308 (123,427)**

The pro-rated increase in daily revenue from 2018 to 2028 is therefore **129,308 / 66,166 = 1.95**

Therefore, the estimated annual revenue for FY 2028 is;

- FY2018 Farebox revenue = $20,693k
- FY2028 Farebox Revenue = 20,693 x 1.95 = **$40,440k (38,601k)**

### 5. Estimated Increase in Subsidy

The estimated annual subsidy for FY 2028 has been calculated using the difference between the estimated annual operating cost and the estimated annual revenues; = **$66,905 – $40,440 = $26,465k**

The FY2018 Subsidy as reported in the FY2019-2020 Metrolink Budget Handbook = $26,094k. Therefore, the estimated subsidy change is negligible.

If ‘other revenues’ are included i.e. dispatching and MOW contribution from Class 1 and Amtrak the estimated FY2028 subsidy would be further reduced. The actual ‘other revenues’ for FY2018 reported in the Metrolink Budget Handbook is $3.666m.
Attachment 1 – Illustrated 2018 and 2028 Train Service Schedule

2019 Timetable

2028 Timetable