Prepared for:

San Bernardino
Associated Governments
1170 W. 3rd Street, 2nd Floor
San Bernardino, CA 92410-1702

Governments
SANBAG
Working Together

Ontario Airport Rail Access Study
FINAL REPORT

November 2014

Prepared by:

HDR Engineering Inc.
In Association with:
Fehr & Peers
Rail Surveyors and Engineers

HDR

ONTARIO AIRPORT RAIL ACCESS STUDY

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Executive Summary

The late Jack Kaiser, former economist with the Los Angeles County Economic Development Council, once said "He [the region] who has the best transportation, wins!" But the best transportation is not just about having good freeways, the best transit network, or a great airport. The real potential for growth comes when the relationships between these systems are understood and they are inter-linked in a way that promotes increased mobility through the region.

Seamlessly connecting airports with the communities they serve through bus and rail transportation has been commonplace for decades in Europe and increasingly in major US metropolitan regions. Good rail-to-airport connections exist at John F. Kennedy International (JFK), Reagan National (DCA), Atlanta Hartsfield Jackson (ATL), Chicago-O'Hare (ORD), Seattle-Tacoma International (SEA), Portland International (PDX) and San Francisco International (SFO). A robust rail transit system connecting to the airport enhances the overall mobility and supports the region's growth.

Currently, twenty-one US airports have rail-to-airport connections and five more are slated to open by 2019. A connection from the regional rail system to Ontario International Airport (ONT) would improve mobility for travelers flying in and out of the region, and thus is worthy of consideration. The Ontario Airport Rail Access Study explores the feasibility of, and evaluates alternatives for, providing transit connections to Ontario Airport from the three regional rail lines that pass within two miles of the airport.

ES.1. Background

ONT is one of five commercial airports providing air travel in the Los Angeles metropolitan area and the only one in the Inland Empire. Carrying the third highest passenger volume, behind Los Angeles International Airport (LAX) and John Wayne Airport (SNA), this is the only airport in the region with significant capacity for growth. Current (2012) passenger activity of approximately 3.9[1] million annual passengers (MAP) is down 43%, from its 2007 peak of 6.9 MAP[2].

Today, access to ONT is almost exclusively by passenger vehicles, accessing the airport via surface streets and the freeway system (Interstate 10 and 15 (I-10, I-15) and State Route 60 (SR 60)). Airport parking is plentiful and convenient; terminal-area parking costs $18 per day and the airport-operated remote parking is $9 per day. Other available modes include airport shuttle services, taxis, and hotel/motel courtesy vehicles. The only available public transportation is Omnitrans Route 61 which travels on Airport Drive but does not enter the terminal area. Although, ONT is within five miles of three Metrolink stations, train schedules and bus links are not timed to coincide with flight arrivals and departures.

Passenger Flight Activity

ONT is currently served by seven airlines, six domestic and one international. The airport handles on average 126 daily passenger flights during weekdays and 122 daily passenger flights during weekends. Peak flight activity occurs during the following hours:

[1] LAWA: http://www.lawa.org/welcome_ont.aspx?id=88
[2] For this report, all airport passenger data is obtained from FAA Airports Data and are slightly different than the volumes reported on the Los Angeles World Airports website (http://www.lawa.org/welcome_ont.aspx?id=810) which shows 7.2 MAP for Ontario Airport in 2007

- 6:00 am to 7:00 am
- 4:00 pm to 5:00 pm
- 8:00 pm to 9:00 pm

In addition to passenger activity, cargo service is a significant part of ONT business. Combined air cargo passing through LAX and ONT comprises about 96% of the region's share, of which about a third is handled by ONT. Despite the loss in overall cargo volume, ONT today has a greater share of regional air cargo volume than it had in 2007 (28% in 2007 vs. 35% in 2012).

Future Growth in ONT Area

Future projections for passenger activity in ONT in 2035 vary significantly, from an estimate of 4.8 MAP by the Federal Aviation Administration (FAA) to an estimate of 30.7 MAP by the Southern California Association of Governments (SCAG). This variation is a result of differences related to passenger caps at other airports in the region.

The area around ONT is planned to grow and intensify substantially in the future with plans for the most intensive land use development in the Inland Empire. The Ontario Airport Metro Center Plan calls for approximately 8,900 residential units and 2.7 million square feet of commercial, retail, and office development in close proximity to ONT.

Origins and Destinations of ONT Users

In order to determine the airport catchment area, ONT users' points of origin and destination to and from ONT were captured from mobile device metadata. The distribution presented in **Figure ES.1** indicates that, in general, the highest usage of the airport is from locations that are closest to the airport. As the airport reaches higher levels of passenger activity in the future, the portion of trips coming from greater distances is expected to increase.

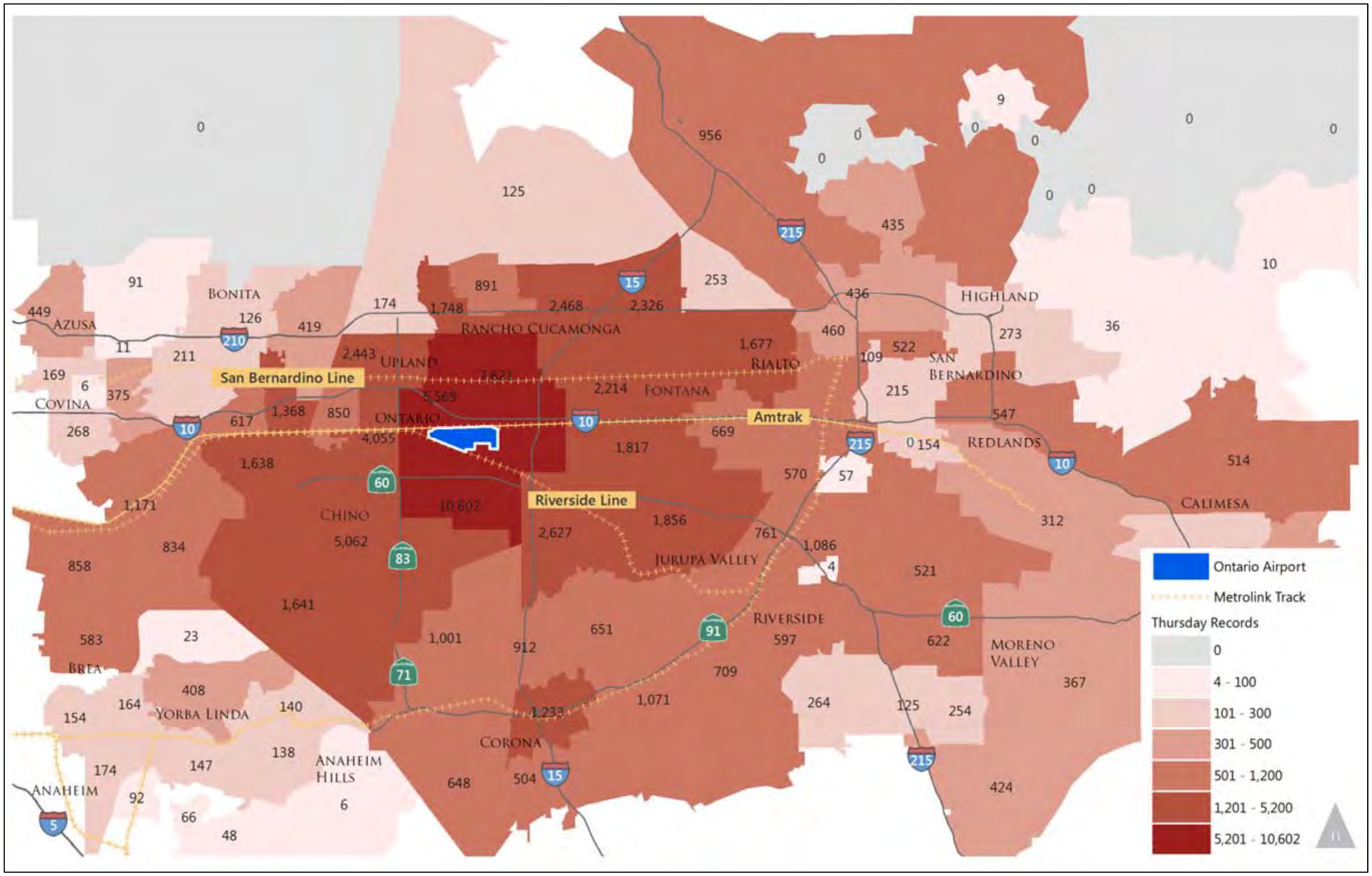
ES.2. Purpose and Need

A Purpose and Need (P&N) statement was developed to guide the study during the process of identifying and evaluating alternatives

The purpose of this project is "*to provide a convenient, reliable, and cost-effective transit service connecting ONT with the regional rail system for air travelers and airport employees*".

The need for the project stems from that fact that today "*air travelers using ONT and employees working at ONT currently have very limited ability to travel to and from the airport via transit. The existing regional rail system, Metrolink, provides a backbone transit service that can carry passengers to Ontario from a wide area. However, Metrolink does not deliver its passengers directly to the ONT terminal area. The available bus transit between Metrolink stations and the airport is neither coordinated with Metrolink services nor with airport flight schedules, and does not stop close to the airport terminals, so transit travel to/from ONT is highly inconvenient. In addition, planned regional rail connections to ONT, such as the California High Speed Rail and the Gold Line are unfunded and not expected to be built for many years*".

Figure ES.1: Travel Patterns to and from ONT



Source: AirSage, 2012

Based on the P&N, the following project objectives were determined:

1. Carry transit passengers directly to/from the ONT terminal area.
2. Make transit travel times to/from ONT more competitive with auto travel.
3. Minimize mode transfers for airport-oriented transit travelers.
4. Provide airport-oriented transit service that is linked with regional rail service.
5. Provide airport-oriented transit service that has operating hours coinciding with airport operating hours, and that has service levels and capacity compatible with airline flight schedules.
6. Maximize potential ridership of the airport-oriented transit service.
7. Implement service improvements that are physically and financially feasible, while considering environmental constraints.
8. Support and enhance other passenger rail operations.
9. Achieve near-term improvement in the convenience of airport-oriented transit travel.
10. Use the airport-oriented transit service to connect Ontario Airport and Metrolink with existing and planned high activity centers located between them.
11. Implement airport-oriented transit service that can be compatible with future regional transit improvements planned to serve Ontario Airport and the surrounding area

ES.3. Initial Set of Alternatives

Based on the P&N statement an initial list of 32 alternatives, comprising of short and long distant rail connections (Alternatives “A” and “C”, respectively), bus connections (Alternative “B”) and light rail connections (Alternative “D”), were developed.

Table ES.1 presents a summary of list of alternatives.

Table ES.1: Initial List of Alternatives

Terminus	Characteristics	Alt #	Mode/ Technology	Route
Rancho Cucamonga	Shorter distant from the east	A-1 A-2 A-3 A-4 A-5	Rail	Via Metrolink San Bernardino Line
		B-1 B-2	Bus	Via Milliken Avenue
Upland	Shorter distance from the west	A-6 A-7 A-8 A-9 A-10	Rail	Via Metrolink San Bernardino Line
		B-3	Bus	Via I-10
East Ontario	Shorter distance from the south	A-11 A-12	Rail	Via Metrolink Riverside Line
		B-4	Bus	Via Haven Avenue

Table ES.1: Initial List of Alternatives (continued)

Terminus	Characteristics	Alt #	Mode/ Technology	Route
Redlands	Longer distant from the east	C-1 C-2 C-2 C-4 C-5	DMU/ commuter rail	Via Metrolink San Bernardino Line
San Bernardino	Longer distant from the east	C-6 C-7 C-8 C-9 C-10	DMU/ commuter rail	Via Metrolink San Bernardino Line
Pomona North	Longer distant from the west	C-11	DMU/ commuter rail	Via Metrolink San Bernardino Line
Riverside	Longer distant from the south-east	C-12	DMU/ commuter rail	Via Metrolink Riverside Line
Pomona	Longer distant from the west	C-13	DMU / commuter rail	Via Metrolink Riverside Line
Montclair	Intermediary distant from the west	D-1 D-2 D-3	Light rail	Gold Line extension

Each alternative was screened against performance criteria that were aligned with the project objectives and were quantified as:

- Amount of walk time to terminals
- Transit travel time improvements
- Number of mode transfers
- Serving peak flight times
- Ridership potential
- A qualitative estimate of capital and operating costs
- A qualitative assessment of the impacts on Metrolink operations
- Potential for serving existing and planned growth around ONT
- A qualitative assessment of the impacts on potential regional transit

From the initial screening, a set of six alternatives were identified for detailed evaluation. This included three rail connections to nearby Metrolink stations (Upland and Rancho Cucamonga), one bus connection from a Metrolink station (Rancho Cucamonga), and two long distance rail connections (Montclair and Redlands) to ONT.

Findings that supported the selection of the six alternatives to move to the next phase of detailed analysis were the following:

- The longer distance rail alternatives provide the greatest improvement in convenience for people traveling to/from the airport. However, they have substantially higher costs than the other alternatives. At least one of these alternatives was selected for further study.

- The bus alternatives involve substantially lower cost than any of the rail/guideway alternatives, and they provide more opportunity to serve the major activity centers in the airport area. However, they do not provide a rail connection to the airport, so they do not achieve that objective. Because of the cost saving potential, at least one of these alternatives was selected for further study.
- The Gold Line extension alternatives perform well in terms of improving service and convenience for airport-oriented transit users, in the corridor west of the airport. At least one of these alternatives was selected for further study.
- The alternatives that use or connect to the Metrolink Riverside Line do not offer substantial improvements in service and convenience for airport-oriented transit users because of the lower level of Metrolink service in this corridor, and the need for very high capital investment in the corridor to accommodate additional regional services. These alternatives were therefore eliminated from further evaluation.
- The alternatives that provide a rail connection from the nearby San Bernardino Line stations to the airport offer the benefits of a direct rail connection to the airport without the high capital and O&M cost of the alternatives with service to distant stations. At least one alternative that connects to the Rancho Cucamonga station and one to the Upland station, was selected for further study.
- All five of the north-south routes for potential rail connection from the San Bernardino Line to ONT seem viable and do not appear to have fatal flaws, so each of these alignments was selected to be studied further as part of the alternatives.

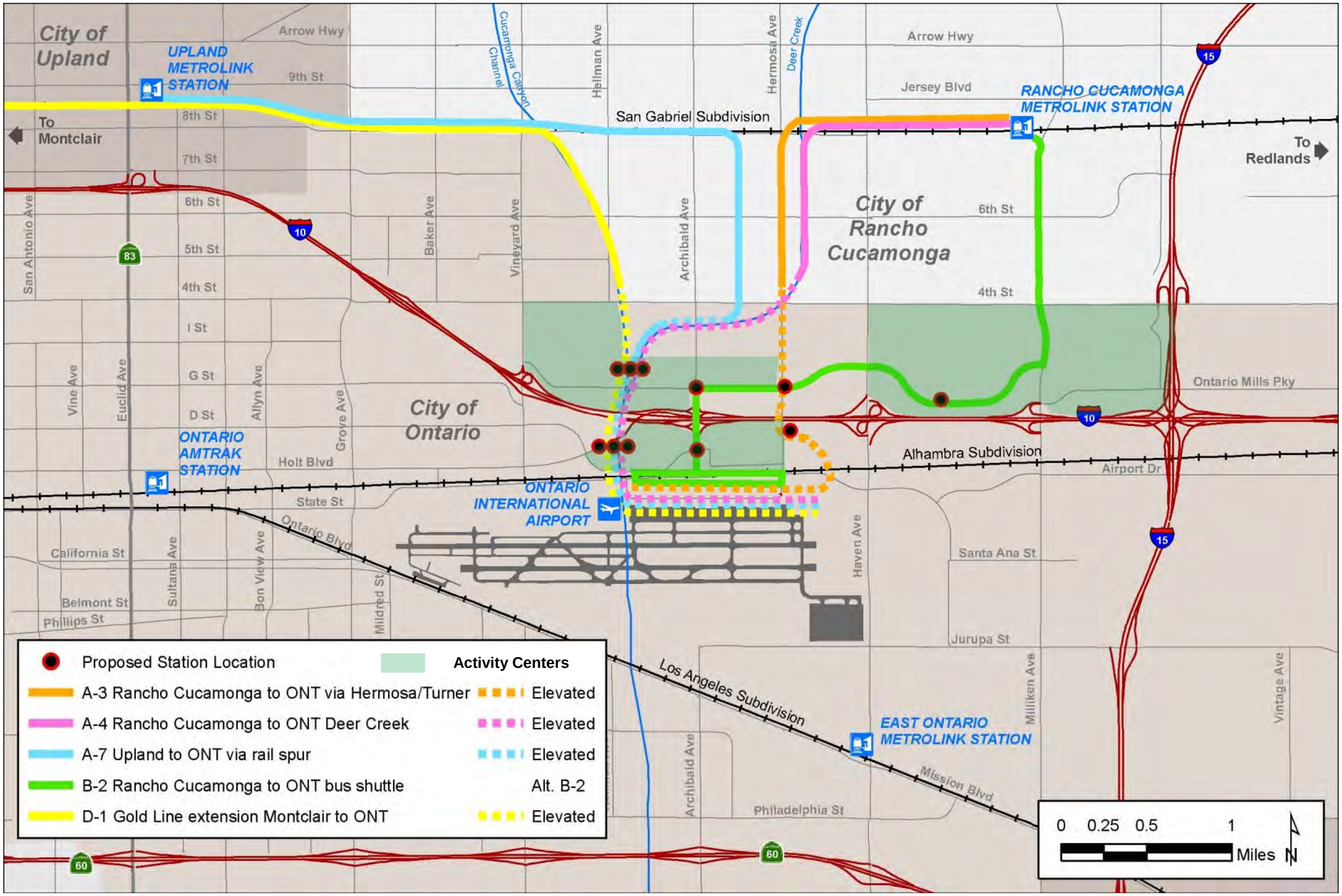
ES.4. Final Set of Alternatives

The six alternatives that emerged from the initial screening and presented in **Figure ES.2** are:

- Alternative A-3: Provides a rail/guideway connection from the Rancho Cucamonga Station to ONT using the Hermosa Avenue/Turner Street alignment.
- Alternative A-4: Provides a rail/guideway connection from the Rancho Cucamonga Station to ONT using the Deer Creek/Cucamonga Creek alignment.
- Alternative A-7: Provides a rail/guideway connection from the Upland Station to ONT using the rail spur/Cucamonga Creek alignment.
- Alternative B-2: Provides a bus connection from the Rancho Cucamonga Station to ONT by way of the Ontario Center and Ontario Mills.
- Alternative C-5: Provides a regional service serving the corridor to the east of the airport with DMU or commuter rail technology connecting Redlands to ONT using Cleveland Avenue and passing through The Ontario Center.
- Alternative D-1: Provides a regional service serving the corridor to the west of the airport by extending the Gold Line to the airport along the San Gabriel Sub and Cucamonga Creek.

For each alternative, new intermediate stations between the ONT terminals and the San Bernardino Metrolink Line were identified as part of this study to enable people in the high activity centers north of the airport to access the regional rail system.

Figure ES.2: Final Set of Transit Alternatives 2014



Source: HDR 2014

ES.5. Evaluation of Alternatives

The six alternatives evaluated in this study were structured to facilitate comparison of various ways to connect the regional rail system to ONT. The alternatives included different service areas, different alignments, and different transit technologies. To a great extent these elements are interchangeable, so that a preferred system does not need to be one of the six systems evaluated, but could be comprised of elements from different alternatives.

In order to recommend a preferred system, each alternative was evaluated to understand its relative advantage and disadvantage to the other alternatives. The evaluation used a set of criteria that stemmed from the objectives outlined in the P&N statement and included system capacity, costs, ridership, cost-effectiveness, travel time, service availability, environmental constraints and impacts on existing and planned regional rail.

System Capacity

System capacity was determined as weekday seats by direction for peak hour during the peak hour of service.

Capital, Operations and Maintenance Costs

Capital cost for each alternative consisted of total cost of all capital improvements associated with new rail lines (for the rail alternatives), utility relocation, station development, right-of-way, rolling stock and buses, etc., and included an appropriate planning level contingency.

Operations and maintenance (O&M) costs represented the annual costs (in 2014$) to operate and maintain the system and equipment.

Ridership

Ridership estimates considered airport users, airport employees, and travelers near the airport, who would use the service to access the regional rail system.

Cost-Effectiveness

Cost effectiveness was measured by calculating the average annualized cost (capital and O&M) per passenger for each alterative.

Travel Time

Transit travel time to and from ONT was calculated for four representative locations – two from the west (Claremont and West Covina) and two from the east (Rialto and Redlands).

Service Availability

Service availability was based on assessing the earliest possible flight departure time and the latest possible flight arrival time for airport passengers traveling from and to the same four representative cities (Claremont, West Covina, Rialto and Redlands).

Environmental Constraints

This analysis identified factors or impacts that could preclude or delay the project or require substantial mitigation.

Impacts on Existing Regional Rail

This criterion evaluated each alternative to determine how its implementation would affect Metrolink operations.

Impacts on Planned Regional Transit

This criterion evaluated anticipated impacts on planned regional transit (Bus Rapid Transit (BRT), Gold Line extension, and California High Speed Rail (CaHSR) if each alternative were implemented.

Based on the evaluation criteria, **Table ES.2** presents an overview of results for each alternative measured against each evaluation criterion.

ES.6. Conclusions and Recommendations

Key conclusions of the analysis are summarized in terms of system elements and attributes:

- Rail vs. Bus: The passenger convenience and system capacity of a rail system will best serve passenger needs and attract the most riders in the long-term future. However, the current and near-term ridership potential is not sufficient to justify the cost of building and operating a high capacity rail system.
- Regional Service vs. Connecting to Metrolink: If service connections at Metrolink stations are scheduled to coincide with Metrolink train arrivals, an airport connection can be almost as attractive as a regional service with a one-seat ride all the way to the airport. A regional rail service, especially one operating the 29-mile route between Redlands and ONT, would be more costly to build and operate than the five-mile route between the Rancho Cucamonga station and ONT.
- Service to East vs. Service to West: The alternatives connecting to Metrolink would primarily serve riders to and from the east in San Bernardino County, while the Gold Line extension would predominantly serve riders to and from the west in Los Angeles County.
- Metrolink Station Connections: Rancho Cucamonga vs. Upland: The operating cost for a connection to Rancho Cucamonga is less than for a connection to Upland because of the shorter distance.
- Rail Alignments: Four of the five rail connection alignments appear feasible. The Cleveland Avenue alignment should be eliminated from further consideration because of its potential effect on the planned golf course redevelopment project. Deer Creek and Cucamonga Creek are the alignment options with the less challenging constraints, and of these two the shorter Deer Creek alignment presents the most cost-effective option. To conveniently serve airport-oriented passengers, the alignment should extend into the airport terminal area.
- Technology: DMU capital costs are typically lower than LRT capital costs, while LRT operating costs are lower than DMU. The design standards for LRT may offer the potential of reducing right-of-way impacts. Since the ONT passenger volume needs to increase substantially before a rail connection is warranted, the decision on a preferred technology should be deferred so that the most cost-effective option can be determined at the time a final alignment is selected and designed.

Table ES.2: Summary of Evaluation of Alternatives

Evaluation Criteria	Evaluation Factor	A-3	A-4	A-7	B-2	C-5	D-1
System Capacity	Weekday peak hour number of seats by direction	368	368	368	120	552	532
Costs	Total estimated capital costs (2014 dollars)	$618-727M $33M more with LRT	$663-776M $209M less with LRT	$629-735M $20M more with LRT	$2-4M n/a	$854-1004M n/a	$600-705 $36M more with LRT
	Estimated annual O&M cost (2014 dollars)	$5.32M 63% less with LRT	$5.32M 63% less with LRT	$6.43M 63% less with LRT	$1.04M n/a	$8.83 n/a	$10.86M 39% less with LRT
Ridership	Estimated average weekday daily ridership	3,416	3,514	3,514	1,252	3,519	3,819
	Estimated total annual ridership	1.08M	1.11M	1.11M	0.40M	1.12M	1.21M
	Estimated daily boardings and alightings by station	393	391	491	430	391	154
	Estimated peak hour peak direction volume on weekdays	181	181	181	49	187	219
	Directional Split of Airport Riders (% from East / % from West)	80% / 20% (E/W)	80% / 20% (E/W)	60% / 40% (E/W)	80% / 20% (E/W)	80% / 20% (E/W)	5% / 95% (E/W)
Cost Effectiveness	Annualized cost (capital + O&M) per trip	$16.45 $14.23 (LRT)	$16.48 $11.53 (LRT)	$17.48 $14.86 (LRT)	$3.36	$23.00	$19.51 $17.43 (LRT)
Travel Times	Transit travel time between Redlands and ONT at selected times*	1:00 1:11 1:26 2:17	0:59 1:00 1:26 2:17	1:10 1:11 1:42 2:17	1:02 1:03 1:42 2:17	n/a 1:05 1:34 n/a	n/a 1:23 1:42 2:17
	Transit travel time between West Covina and ONT at selected times*	n/a 1:11 2:00 n/a	n/a 1:10 2:00 n/a	n/a 1:06 2:00 n/a	n/a 1:13 2:00 n/a	n/a 1:29 2:00 n/a	0:50 0:50 0:51 0:52
	Walk time to/from ONT terminal	0 min.	0 min.	0 min.	0 min.	0 min.	0 min.
	Number of transfers required to travel between selected locations and ONT	Redlands: 1 West Covina: 1	Redlands: 1 West Covina: 1	Redlands: 1 West Covina: 1	Redlands: 1 West Covina: 1	Redlands: 0 West Covina: 1	Redlands: 1 West Covina: 0
Service Availability	Earliest possible flight departure time from ONT for a traveler coming from selected locations* using the transit service alternative on a weekday.	Redlands: 6:16 AM West Covina: 9:07 AM	Redlands: 6:15AM West Covina: 9:06 AM	Redlands: 6:26 AM West Covina: 9:02 AM	Redlands: 6:18 AM West Covina: 9:09AM	Redlands: 7:25 AM West Covina: 9:25 AM	Redlands: 6:35 AM West Covina: 6:03AM
	Latest possible flight arrival time into ONT for a traveler going to selected locations* using the transit service alternative on a weekday.	Redlands: 11:08 PM West Covina: 8:30 PM	Redlands: 11:09 PM West Covina: 8:31 PM	Redlands: 10:58 PM West Covina: 8:39 PM	Redlands: 11:06 PM West Covina: 8:28 PM	Redlands: 9:28 PM West Covina: 8:28 PM	Redlands: 10:45 PM West Covina: 1:10 AM
Environmental Constraints	Identification of factors or potential impacts that could preclude or delay implementation of the project or involve substantial mitigation	Bio: Medium Cultural: High Noise: High Recreation: High	Bio: Medium Cultural: High Noise: Medium Recreation: High	Bio: Medium Cultural: High Noise: High Recreation: High	Bio: Low Cultural: Low Noise: Low Recreation: Low	Bio: High Cultural: Low Noise: Medium Recreation: Medium	Bio: Medium Cultural: High Noise: High Recreation: High
Impacts on Existing Regional Rail	Schedule adherence of existing regional rail service if the transit alternative is operational.	No change	No change	No change	No change	Substantial effect without capital investment	No change
	Capital improvements needed in order to maintain schedule adherence of regional rail service	$0	$0	$0	$0	$285M	$0
Impacts on Planned Regional Rail	Qualitative assessment of how implementation of the transit alternative could inhibit or enhance construction of California High Speed Rail or the Gold Line Extension to Ontario Airport.	Little or no effect	Little or no effect	Little or no effect	No effect	Could inhibit CaHSR being built if Metrolink ROW east of Rancho Cucamonga is selected as preferred alignment for CaHSR	Would complete Gold Line extension to ONT proposed in 2008 feasibility study

*Travel times:
1. Traveling to ONT, arriving at 5:00 AM 2. Traveling to ONT, arriving at 8:00 AM 3. Traveling from ONT, departing ONT at 4:30 PM 4. Traveling from ONT, departing ONT at 10:30 PM
Blue texts are costs related to the LRT sensitivity tests

The recommendations are summarized as follows:

- A rail connection should be planned for the airport's future, and a bus shuttle connecting ONT with the Metrolink Rancho Cucamonga station should be developed in the interim until passenger volumes through ONT reach at least 15 MAP.
- A rail connection from the Rancho Cucamonga station should be carried forward as the preferred long-term concept for connecting the regional rail system to ONT.
- The planned long-term system should provide a rail connection all the way into the airport terminal area.
- Deer Creek and Cucamonga Creek should be carried forward into future planning as the preferred potential alignments between the Metrolink right-of-way and the airport terminals.
- A potential future extension of the Gold Line to ONT should not be precluded by development of a connection to Metrolink.
- Technology options for a rail connection to Rancho Cucamonga should remain open for a determination of the most cost-effective system at the time a preferred alternative is selected and designed.
- A regional rail service from Redlands to ONT should be dropped from further consideration.
- The Cleveland Avenue alignment option should be dropped from further consideration.

ES.7. Improvements and Implementation

Since the volume of air travelers through ONT needs to grow substantially before a rail connection is justified, this study recommends a series of phased improvements that can address the P&N until ONT achieves the needed critical mass.

Very Near Term

Work with Omnitrans to bring their fixed-route bus service (likely Route 61) into the airport terminal area to serve airport-oriented transit passengers with more convenient pick-up and drop-off.

Near Term (as soon as practicable)

Implement a shuttle bus service that operates on a route that connects the Rancho Cucamonga Metrolink station to the ONT terminals. The service could be initiated using one or (preferably) two buses, operating during the hours when Metrolink trains serve the Rancho Cucamonga station. To the extent possible, the shuttle service should be scheduled to coincide with train arrivals at the Metrolink station. Omnitrans proposed BRT service (West Valley Connector Rapid Bus[3]) would make this connection but would not likely be scheduled to meet Metrolink train schedules. Parking shuttles or hotel shuttles might initially be used to provide the service.

Mid Term

As ridership builds on the shuttle bus service, increase the number of shuttle buses to provide convenient connections with all trains at the Rancho Cucamonga station. The service goal of the fully-operating shuttle bus

[3] http://www.omnitrans.org/about/reports/pdf/WVC-Info.pdf

system should be to minimize airport-oriented passenger transfer time by: (1) having an airport shuttle waiting when each Metrolink train arrives at the Rancho Cucamonga station; and (2) having a shuttle from the airport arrive at the station a few minutes before each train arrives.

Long Term

Based on the review of United States airports with rail connections, the minimum airport passenger activity level that should be considered for a direct rail connection that is intended primarily to serve the airport is approximately 10 MAP, with Oakland Airport's rail connection (AirBART) being somewhat comparable to Ontario's situation. AirBART has consistently attracted between 7.5-9% of passengers traveling through OAK, which is currently at 10 MAP.

For ONT, the projected rail connection ridership at 10 MAP and 20 MAP would be approximately 3% and 4% of the airport passenger volume, respectively. At 20 MAP, ONT's projected rail ridership potential is comparable to AirBART's current ridership. Hence, based on comparison with other airports and share of ridership, at ONT, 10 MAP does not appear to have the critical ridership mass to justify a rail connection, while the potential with 20 MAP is clearly sufficient to justify a rail connection. Thus, this analysis concludes that airport passenger activity at ONT will need to reach a level of between 15-20 MAP to justify a rail connection.

Chapter 1 - Introduction

Seamlessly connecting airports with the regions they serve through rail transportation has been commonplace for decades in Europe and increasingly in major US metropolitan areas. Twenty-one US airports have rail-to-airport connections, and five more are in development. A robust rail transit system with an airport connection enhances the overall mobility of the region's travelers and supports the region's growth.

Access to Ontario International Airport (ONT) is primarily by passenger vehicles at the present time, and public transit service is available only using bus routes that do not access the airport terminal area. Regional rail service (Metrolink) is available in the airport vicinity, but there are no convenient transit services to connect passengers from the rail stations to the airport terminals.

The Ontario Airport Rail Access Study explores the feasibility of, and evaluates alternatives for, providing transit connections to Ontario Airport from the three rail lines that pass within two miles of the airport. This report documents existing conditions for the airport and its access system; identifies the project Purpose and Need; identifies, screens, and evaluates alternatives for meeting the Purpose and Need; and makes long-term and near-term recommendations for improving rail access to ONT.

Chapter 2 - Background Data

2.1 Location

ONT is located in the Inland Empire (Riverside, San Bernardino, Ontario metropolitan area, consisting of Riverside and San Bernardino County), approximately 35 miles east of downtown Los Angeles in the center of Southern California. It is a medium-hub, full-service airport with commercial jet service to major U.S. cities. It is one of five airports serving commercial air travel in the Los Angeles metropolitan area, and is the only commercial airport in the Inland Empire. Serving 4.3 million annual passengers (MAP) in 2012, ONT has the third highest passenger volume in the region, behind Los Angeles International Airport (LAX) and John Wayne Airport (SNA) in Orange County. In 2007, during its highest passenger level, the airport served 6.9 MAP[4], which translated to an 8% share of regional air traffic volume. Since the recession, the airport has lost about 38% of its air passenger volume, and now handles 5% of the regional share of air passengers.

This airport is also the only one of the five airports in the Southern California Association of Governments (SCAG) region with significant capacity for growth, given terminal constraints or flight restrictions at other airports.

2.2 Airport Activity

2.2.1 Existing Activity Levels

Passenger Flight Activity

ONT is served by seven airlines, six of which are domestic. The domestic airlines include Alaska Airlines/Horizon Air, American Airlines, Delta, Southwest Airlines, US Airways and United Airlines/United Express. The only international carrier that serves the airport is AeroMexico.

[4] For this report, all airport passenger data are derived from Federal Aviation Administration (FAA) Terminal Area Forecasts as reported on the FAA website (https://www.faa.gov/about/ office_org/headquarters_offices/apl/aviation_forecasts/taf_reports/), which show a slightly lower level than the volumes reported on the Los Angeles World Airports website (http://www.lawa.org/welcome_ont.aspx?id=810) which shows 7.2 MAP for Ontario Airport in 2007

Current flight schedules were collected for a mid-week day (Thursday) and a weekend day (Sunday) in November 2013. These days were selected in order to be consistent with the 2012 origin-destination (O-D) data that was gathered for this study (details discussed in **Section 1.4**). Review of the flight schedule indicates a total of 126 daily passenger flights during weekdays (64 departures; 62 arrivals), and 122 daily passenger flights during weekends (61 departures; 61 arrivals).

Departure activities peak in the morning: during weekdays, 13 flights depart between 6:00 am and 7:00 am, while on weekends, this number goes down to 8 flights during the same period. For the remainder of the day, between one and six flights depart each hour, with no departures scheduled between 10:00 pm and 2:00 am.

Arrival activities tend to be different than departure activities. Weekday arrivals start around 7:00 am with a steady flow of arriving flights every hour. However, between 8:00 am and 11:00 am and between 8:00 pm to 11:00 pm the number of arrivals peak (11 arriving flights between 8:00 am and 11:00 am, and 16 arriving flights between 8:00 pm and 11:00 pm). In addition, a late afternoon peak is also experienced between 4:00 pm and 5:00 pm when there are six arriving flights. Weekend arrival activities mimic the weekday arrivals, however, the peak periods during am and pm shift by an hour later. The mid-day peak hour however, remains between 4:00 pm and 5:00 pm. The airport has one midnight arrival/departure flight – the international flight between ONT and Guadalajara (GDL) operated by AeroMexico.

Overall, considering both arrival and departure flight activities in ONT, the following are the three busiest hours at the airport:

- 6:00 am to 7:00 am (13 departures during weekdays, 8 departure flights during weekend days)
- 4:00 pm to 5:00 pm (12 arrival and departures during weekdays, 14 arrival and departures during weekend days)
- 8:00 pm to 9:00 pm (9 arrival and departures during both weekdays and weekend days)

Table 2.1 gives a snapshot of weekday and weekend arrival and departure activity by time of day.

Table 2.1: Passenger Flight Activity (number of flights)

Time of Day	Weekdays			Weekends		
	Arrival	Departure	Total	Arrival	Departure	Total
00:00 – 01:00	1			1		
01:00 – 02:00	-	1	1	-	1	1
02:00 – 03:00	-	-	-	-	1	1
03:00 – 04:00	-	-	-	-	-	-
04:00 – 05:00	-	-	-	-	-	-
05:00 – 06:00	-	2	2	-	2	2
06:00 – 07:00	***-***	***13***	***13***	***-***	***8***	***8***
07:00 – 08:00	2	3	5	-	-	-
08:00 – 09:00	5	2	7	2	4	6
09:00 – 10:00	3	4	7	5	3	8
10:00 – 11:00	4	6	10	2	6	8
11:00 – 12:00	4	3	7	4	4	8

Table 2.1: Passenger Flight Activity (number of flights) - continued

Time of Day	Weekdays			Weekends		
	Arrival	Departure	Total	Arrival	Departure	Total
12:00 – 01:00	2	5	7	2	5	7
01:00 – 02:00	4	2	6	4	2	6
02:00 – 03:00	3	3	6	3	3	6
03:00 – 04:00	2	2	4	2	2	4
04:00 – 05:00	***6***	***6***	***12***	***8***	***6***	***14***
05:00 – 06:00	1	3	4	3	3	6
06:00 – 07:00	4	1	5	4	1	5
07:00 – 08:00	1	3	4	1	3	4
08:00 – 09:00	***5***	***4***	***9***	***5***	***4***	***9***
09:00 – 10:00	4	1	5	4	2	6
10:00 – 11:00	7	-	7	6	1	7
11:00 – 12:00	4	-	4	5	-	5
TOTAL	**62**	**64**	**126**	**61**	**61**	**122**

Source: www.flightstats.com
Peak hours shaded in grey and with bold text

Passenger Volume

Annual air passenger data was collected from the Bureau of Transportation Statistics (BTS). For each passenger airport, the BTS collects passenger data, by month, split into arrival and departure, as well as domestic and international. A comparison of 2007 vs. 2012 annual passenger statistics show that while passenger volume has decreased, August still remains the highest month of air travel and February the lowest. In 2007, there were 660,000 passengers in August, compared to 390,000 in August 2012; and in February, there were 480,000 passengers in 2007, compared to 310,000 in 2012. The decrease in passenger volume was about 40% in August and 34% in February, consistent with an overall annual decrease of about 38%.

Figure 2.1 illustrates the annual distribution of air passengers for 2007 and 2012.

Cargo Volume

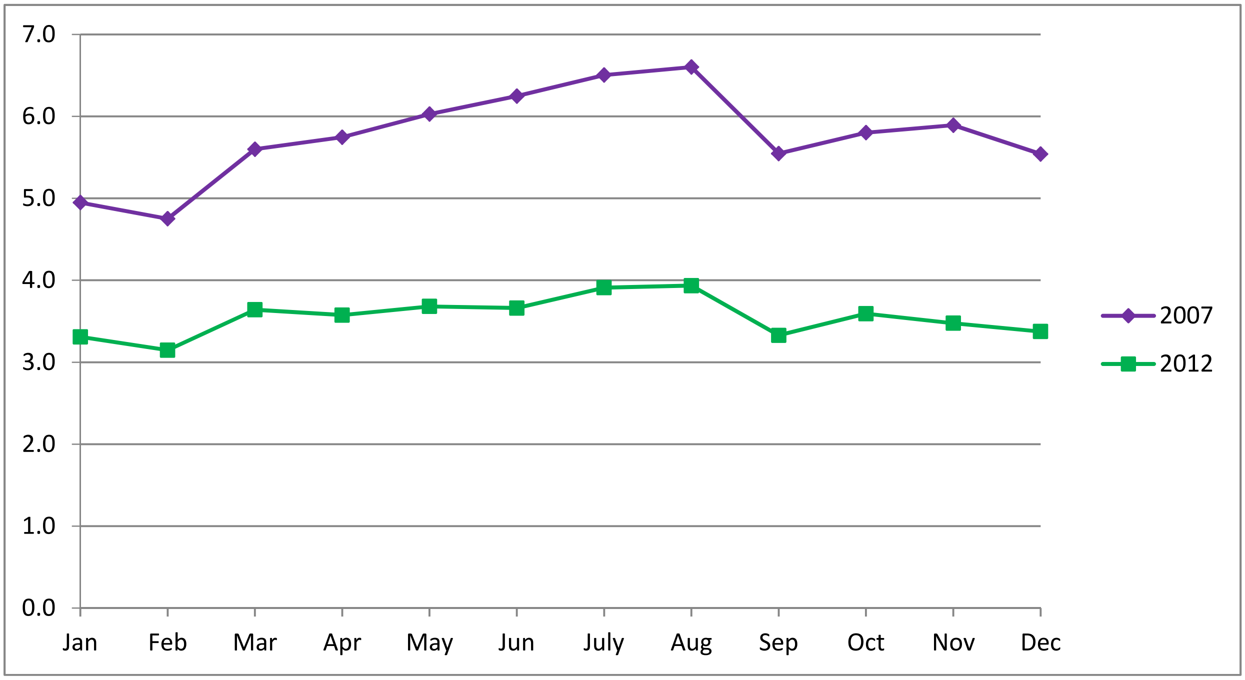
Cargo service is a significant part of ONT business. Combined air cargo passing through LAX and ONT comprises about 96% of the region's share[5]. According to Federal Aviation Administration (FAA) data, in 2012 ONT handled about one-third of the region's air cargo transportation. Cargo activity at ONT was ranked 13th nationally and second in the state. Similar to passenger activity, cargo activity was at its peak in 2007, however, the airport only lost about 15% of its cargo traffic, compared to a 38% drop in passenger activity. Despite the loss in overall cargo volume, ONT today has a greater share of regional air cargo volume than it had in 2007 (28% in 2007 vs. 35% in 2012).

Cargo service in ONT is primarily provided by UPS and FedEx with additional service provided by AmeriFlight, West Air, and Empire Airlines (according to Los Angeles World Airports (LAWA)). A majority of departing cargo

[5] Aviation and Airport Ground Access, 2012-2035 SCAG RTP/SCS

aircraft flights occur between 1:00 am and 6:00 am. Arriving cargo flights occur in two peak periods: the morning peak occurs between 3:00 am and 6:00 am, and the afternoon peak occurs between 4:00 pm and 6:00 pm.

Figure 2.1: Monthly Distribution of Air Passengers (in 100,000) for 2007 and 2012



Source: Bureau of Transportation Statistics

Table 2.2 shows the trend in cargo service at ONT.

Table 2.2: Cargo Activity Trends

Code	Airport	Landed Cargo in Thousand Tons					
		2007	**2008**	**2009**	**2010**	**2011**	**2012**
ONT	Ontario International Airport	1,265	1,225	1,060	1,017	1,050	1,071
LAX	Los Angeles International Airport	3,112	2,609	1,710	1,794	1,834	1,907
	TOTAL REGIONAL	**4,560**	**3,993**	**2,885**	**2,928**	**3,004**	**3,103**
	ONT % of Regional Share	28%	31%	37%	35%	35%	35%

Source: FAA Airports Data (http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/)

Airport Employment

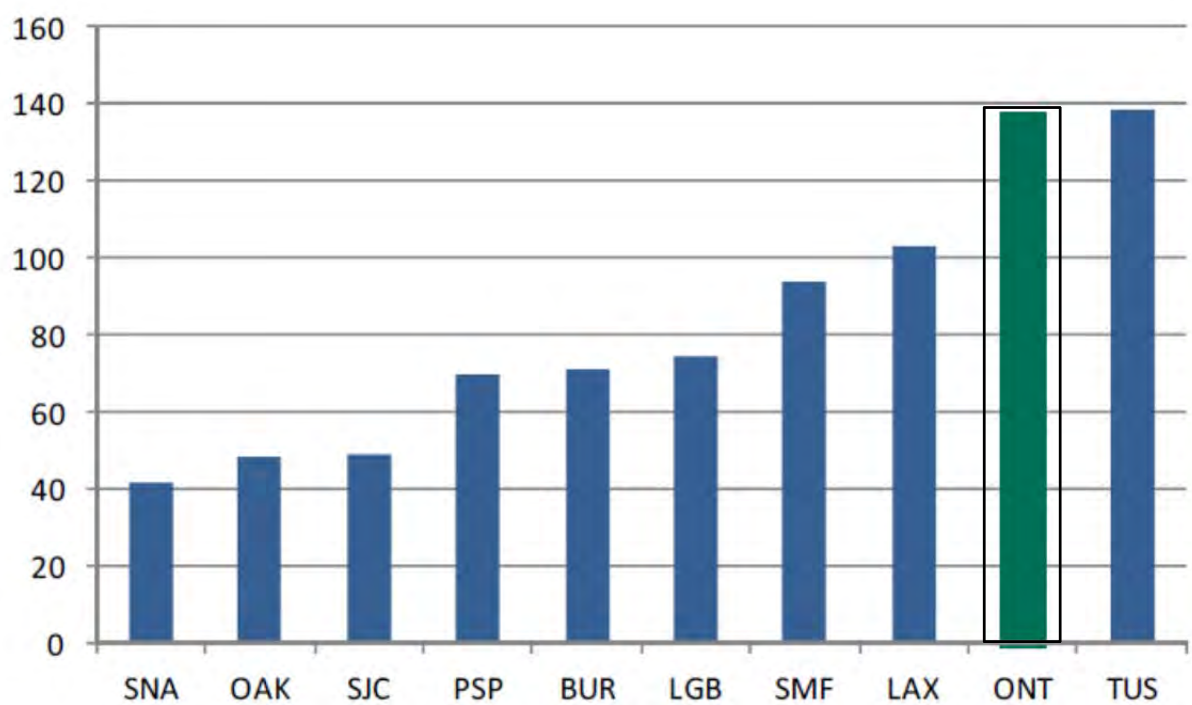
According to a 2012 report[6], ONT has about 140 employees per million enplaned passengers (PAX), one of the highest when compared to other airports in the region. Since the slowdown of ONT, LAWA has taken steps to

[6] Report to the City of Los Angeles regarding Ontario International Airport, September 21, 2012, Acacia Financial Group, William Blair, Axis Consulting

reduce operating costs in order to make the airport more attractive to airlines. In FY 2011-2012 LAWA has reduced ONT (full-time equivalent (FTE)) staffing by 23%, or 75 positions (from 326 to 251). This staffing reduction is effectively 42% when compared to the FY 2007 figures, when the airport employed about 430 employees (FTE).

Figure 2.2 shows that generally the number of employees per PAX is higher than peer airports in California.

Figure 2.2: Employees per Million PAX



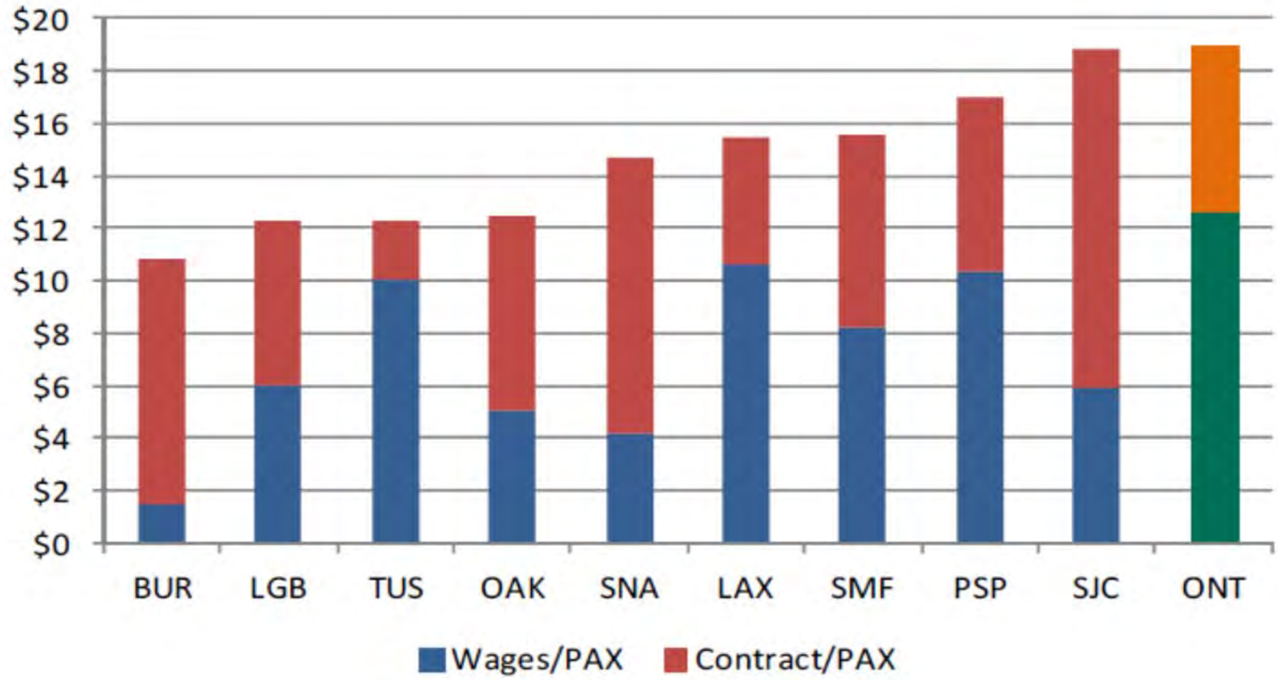
SNA - John Wayne-Orange County Airport, CA
OAK - Metropolitan Oakland International Airport, CA
SJC - Norman Y. Mineta San Jose International Airport, CA
PSP - Palm Springs International Airport, CA
BUR - Burbank Bob Hope Airport, CA
LGB - Long Beach - Daugherty Field Airport, CA
SMF - Sacramento International Airport, CA
LAX - Los Angeles International Airport, CA
ONT - Ontario International Airport, CA
TUS - Tucson International Airport, AZ

Source: Report to the City of Los Angeles regarding Ontario International Airport, September 21, 2012, Acacia Financial Group, William Blair, Axis Consulting

Although LAWA has reduced the employee headcount at ONT, it is constrained in efficiently readjusting to an appropriate employee/PAX ratio given the existing employee contracts. Many, if not all, existing employee contracts limit and/or prohibit the airport's ability to contract out some services that could potentially be achieved more cost-effectively.

Figure 2.3 shows a comparison of wages and contracts per PAX in the region's airports.

Figure 2.3: Employee Wages and Contract Cost per Million PAX



SNA - John Wayne-Orange County Airport, CA
SJC - Norman Y. Mineta San Jose International Airport, CA
BUR - Burbank Bob Hope Airport, CA
SMF - Sacramento International Airport, CA
ONT - Ontario International Airport, CA
OAK - Metropolitan Oakland International Airport, CA
PSP - Palm Springs International Airport, CA
LGB - Long Beach - Daugherty Field Airport, CA
LAX - Los Angeles International Airport, CA
TUS - Tucson International Airport, AZ

Source: Report to the City of Los Angeles regarding Ontario International Airport, September 21, 2012, Acacia Financial Group, William Blair, Axis Consulting

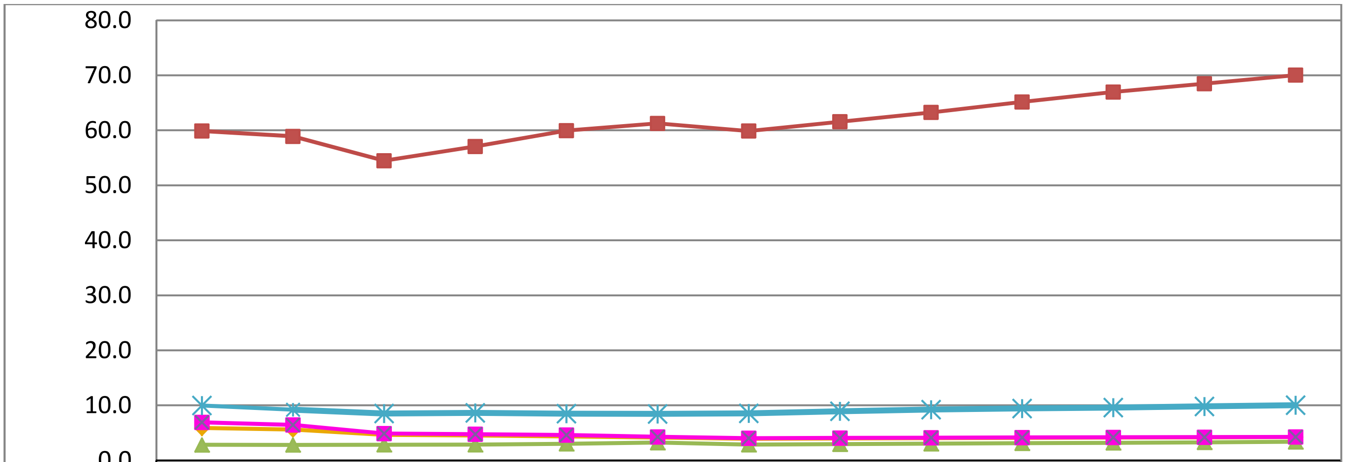
2.2.2 Air Traffic Activity Trends and Forecast

Recent and Near-Term Trends

Annual passenger activity at ONT peaked in 2007 at 6.9 MAP. Historical trends show that air travel through ONT climbed steadily from 1981 until 2007. Post-2007, air travel has plummeted to 4.3 MAP in 2012, and is further forecasted to decrease to about 4.0 MAP in 2013. In comparison, most of the region's airports have shown similar trends of negative growth, however recovery at LAX has been much faster than the other airports.

Figure 2.4 illustrates the recent annual passenger activity trends and near-term forecasts at ONT, and compares it with trends at other regional airports.

Figure 2.4: Passenger Trends at ONT as Compared to Regional Airports



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BUR	5.9	5.6	4.6	4.5	4.3	4.1	3.9	4.0	4.0	4.1	4.1	4.2	4.2
LAX	59.9	58.9	54.5	57.1	60.0	61.3	59.9	61.6	63.3	65.2	67.0	68.5	70.0
LGB	2.8	2.8	2.8	2.8	3.0	3.2	2.8	2.9	3.0	3.1	3.2	3.3	3.4
ONT	6.9	6.4	4.9	4.8	4.6	4.3	4.0	4.1	4.1	4.1	4.2	4.2	4.2
SNA	10.0	9.2	8.5	8.6	8.5	8.4	8.5	8.9	9.2	9.4	9.6	9.8	10.0

BUR - Burbank Bob Hope Airport, CA
LAX - Los Angeles International Airport, CA
LGB - Long Beach - Daugherty Field Airport, CA
ONT - Ontario International Airport, CA
SNA - John Wayne-Orange County Airport, CA

Source: FAA Terminal Area Forecast FFY 2011, 2012

Future Forecasts

FAA prepares an annual Terminal Air Forecast (TAF) summary that forecasts air passenger volume for a 30-year period, aggregated by Federal Fiscal Year (FFY). According to FAA data based on the FFY 2012 TAF, passenger volume for ONT is likely to decrease steadily until 2017, after which it is forecast to rise at a conservative rate, reaching 5.0 MAP in 2040. The TAF is an unconstrained econometric forecast model that relies on historical trends reported by airports and does not account for any locally enforced capacity constraints for each airport.

Appendix A presents a detailed TAF for ONT and other regional airports (LAX, BUR, SNA and LGB) based on the FFY 2012 forecast model.

According to the adopted SCAG 2012-2035 Regional Transportation Plan (RTP)/ Sustainable Communities Strategy (SCS), the air passenger forecast for ONT for 2035 is substantially higher at 30.7 MAP. The SCAG forecast is based on its Baseline/Medium Growth Scenario, assumptions for which are consistent with recent trends. The forecast does not consider the potential impact of the California High Speed Rail (CaHSR) project on regional air traffic demands. In addition, the forecast also assumes the legally-enforceable constraints at LAX and SNA, and physical capacity constraints at LGB and BUR. The forecast, however, does not take into account that the settlement agreement at both SNA and LAX will expire in 2015 and 2020, respectively[7].

In 2006, the Los Angeles City Council approved a settlement of lawsuits filed against the LAX Master Plan[8]. This settlement agreement had a number of key stipulations. The two that are important to this study are: starting from 2010, LAWA will discontinue passenger operations at two narrow body equivalent gates (NBEG) per year at LAX such that by December 2015, the total number of passenger gates are no more than 153. In addition, the LAX Specific Plan Amendment Study will identify amendments that will plan for the modernization and improvement of the airport, consistent with its practical capacity of 78.9 MAP[9]. The settlement will be in effect until 2020.

For SNA, the capacity constraint is required to be in compliance with the airport's Settlement Agreement Amendment of 2002[10]. According to the agreement, capacity at SNA is allowed for expansion to 10.3 MAP until 2011. The capacity then increases to 10.8 MAP until December 31, 2015 and remains at this level unless changed by the county through the California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) process.

The physical capacity constraint at LGB is governed by the Long Beach Terminal Improvement EIR forecast of 4.2 MAP[11], while that for BUR is due to gate constraints at the airport due to unavailability of four remote airport gates for aviation use[12].

Based on these constraints, the SCAG forecast for Ontario Airport for 2035 is 30.7 MAP, since the assumption is that once LAX, LGB and SNA reach their constraint capacities, excess demand will be handled by ONT. The SCAG assumption about demand in excess of the current caps explains the significant difference in forecast volumes for ONT, as the forecast for total regional air traffic demand is comparable between the two methodologies (FAA and SCAG RTP/SCS).

Table 2.3 summarizes the FAA and SCAG forecasts for airport demand in 2035 for ONT and other regional airports.

[7] Aviation and Airport Ground Access Appendix, 2012-2035 SCAG RTP/SCS
[8] http://www.ourlax.org/LAXMPSettlement.aspx
[9] http://www.ourlax.org/stakeholder/pdf/Signed_Stipulated_Settlement.pdf, http://www.ourlax.org/planstudy.aspx
[10] http://www.eltoroairport.org/issues/JWA.htm#2002
[11] Long Beach Airport Terminal Area Improvement Project DEIR No. 37-03 (http://www.longbeach.gov/civica/filebank/blobdload.asp?BlobID=9278)
[12] Aviation and Airport Ground Access Appendix, 2012-2035 SCAG RTP/SCS

Table 2.3: Projected Airport Activity

Code	Airport	FAA	SCAG RTP/SCS	FAA Terminal Area Forecast (TAF)		
		2012	**2035**	**2025**	**2035**	**2040**
ONT	Ontario International Airport	4.3	30.7	4.4	4.8	5.0
BUR	Burbank Bob Hope Airport	4.1	9.4	4.6	5.2	5.6
SNA	John Wayne Airport	8.8	10.8	11.4	14.3	16.0
LAX	Los Angeles International Airport	62.7	78.9	80.2	100.5	112.5
LGB	Long Beach Airport	3.1	4.2	4.0	5.2	6.0
TOTAL REGIONAL		**82.86**	**134.6**	**104.6**	**130.02**	**145.08**
ONT % of Regional Share		5%	23%	4%	4%	3%

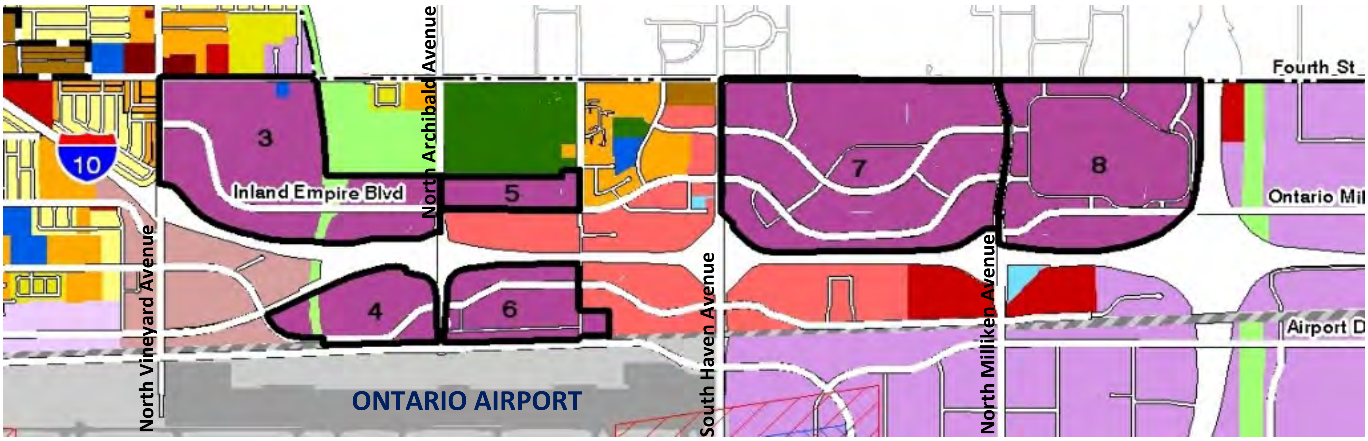
Source: Aviation and Airport Ground Access, 2012-2035 SCAG RTP/SCS
FAA Airports Data (http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/)
Airport passenger data represented in MAP (million annual passengers)

2.2.3 Future Land Use Activity

The Ontario Plan, adopted by the Ontario City Council in 2010, focuses on several areas within the City that present opportunities to respond to the City's current demographic and economic trends. One such focus area is the Ontario Airport Metro Center, located within the immediate vicinity of ONT. This area, located generally on the north and south sides of I-10 between I-15 and Vineyard Avenue, is envisioned as having the most intensive land use development in the Inland Empire. It is proposed to be developed as a robust mix of commercial, retail, offices and residences.

At buildout, the Ontario Airport Metro Center plan calls for approximately 8,900 residential units and 2.7 million square feet of commercial, retail and office development. The land use plan for this development includes Ontario Mills Mall, Guasti Village, the Convention Center, the hospitality area along Vineyard Avenue, offices, commercial and residential centers. **Figure 2.5** illustrates the different elements of the Ontario Airport Metro Center, and **Table 2.4** presents the different elements along with their development intensities.

Figure 2.5: Ontario Airport Metro Center



Source: The Ontario Plan

Table 2.4: Ontario Airport Metro Center Land Use

ID	Project Name	Description	Buildout Land Use	
			Residential (DU)	Commercial/ Office/Retail (TSF)
3	Meredith	Meredith is envisioned an intensive transit oriented development comprising of horizontal and vertical mix of commercial, office, and residential uses.	2,930	7,471
4	Multi-Modal Mixed Use	Location of future multi-modal transit station to link rail, regional, local, and airport transit.	457	2,987
5	Inland Empire Corridor	Development along Inland Empire Boulevard that is intended to provide a connection between Meredith and the Ontario Center.	368	353
6	Guasti	Envisioned as a mixture of high quality office, hotels, retail and residential, this area includes the Guasti Winery.	500	2,361
7	Ontario Center	This area includes low-rise and mid-rise mixed-use buildings, iconic architecture, and regionally significant uses, such as the Events Center and other cultural and entertainment uses.	4,139	9,014
8	Ontario Mills	This area will continue to be a regional retail center. Intensification of the area may include additional retail, entertainment, office, lodging, and potentially residential uses.	479	5,477
		TOTAL	**8,873**	**27,663**

Source: The Ontario Plan (http://www.ontarioplan.org/index.cfm/27925/29769)

DU – Dwelling Unit

TSF – Thousand Square Feet

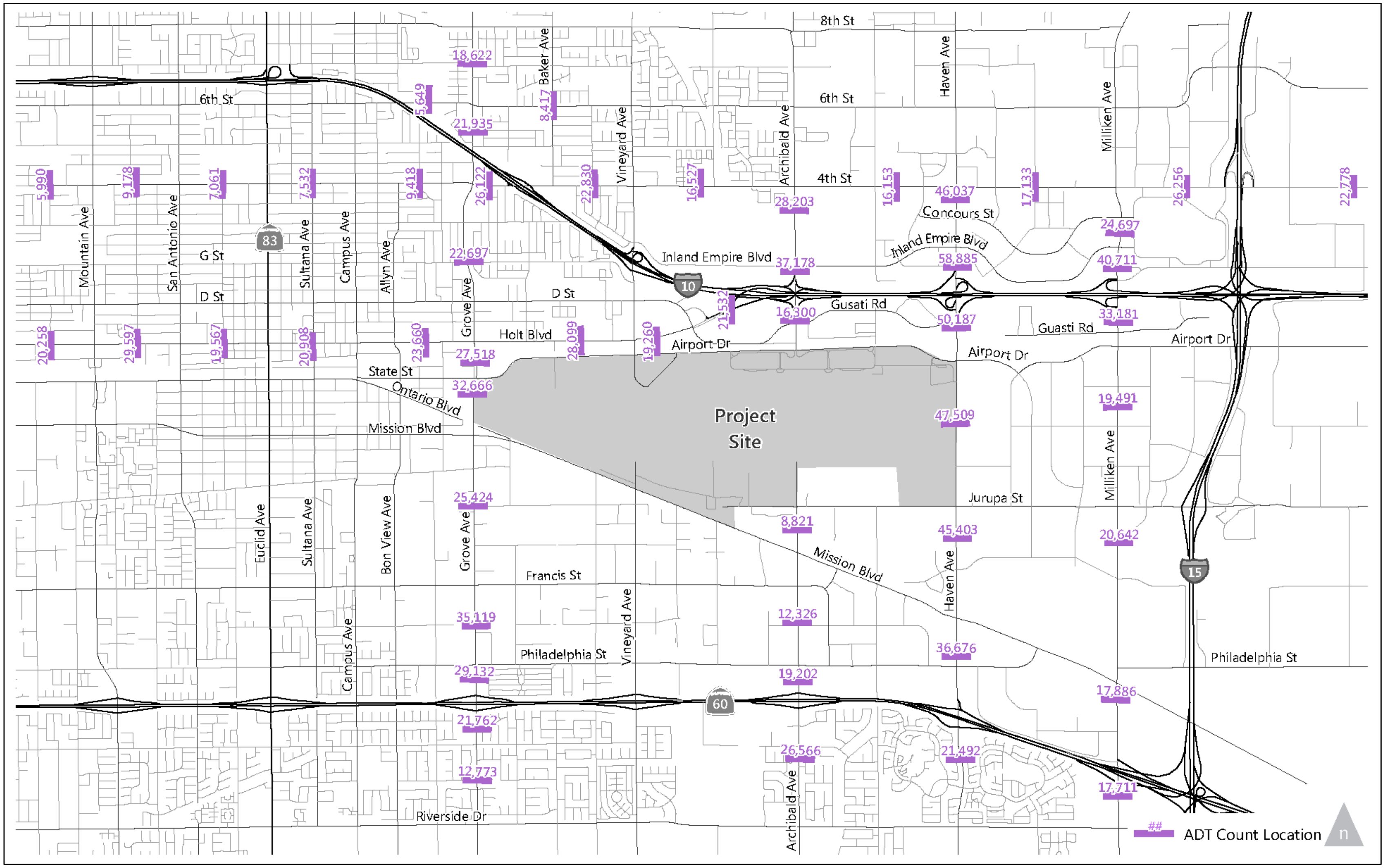
2.3 Airport Ground Access

Currently highway access to the Ontario Airport is provided via major interchanges with State Route 60 (SR 60) and Interstate 10 (I-10). The Vineyard Avenue, Archibald Avenue, Haven Avenue, and Milliken Avenue interchanges from both freeways provide access to the airport area. Additionally, the Jurupa Street interchange on I-15 provides access via I-15.

In addition to the highway interchanges, numerous local roadways provide access in and around the airport. The primary corridors for vehicle access to Ontario Airport are described below, with **Figure 2.6** illustrating daily traffic counts on these primary corridors.

- *4th Street* is an east-west four to six lane roadway north of ONT with a posted speed limit ranging between 35 and 55 mph. On-street parking is generally not permitted on 4th Street, however, for portions of this arterial west of Vineyard Avenue, parking is permitted on both sides of the street without time restrictions. West of North Cucamonga Avenue, East 4th Street is a two-lane roadway.
- *6th Street* is an east-west four-lane roadway north of ONT with a posted speed limit of 45 mph. Between Hermosa Avenue and Archibald Avenue, 6th Street is a three-lane roadway, with two-lanes in the east bound direction and one in the west bound direction. On-street parking is generally not permitted on 6th Street.
- *8th Street* is an east-west two-lane roadway north of ONT with a posted speed limit of 45 mph. On-street parking is generally permitted on 8th Street without time restrictions. 8th street ends at Haven Avenue.
- *Holt Boulevard* is an east-west roadway north of the airport that merges onto I-10 between North Vineyard Avenue and North Archibald Avenue. Holt Boulevard is a four-lane roadway with a posted speed limit of 50 mph. There is no street parking and Holt Boulevard maintains a raised divider between North Corona Avenue and I-10.
- *Arrow Highway* is an east-west roadway north of ONT that becomes 8th street at North Benson Avenue. Arrow Highway is four-lane roadway with a posted speed limit of 35 mph. Parking is permitted on both sides of the street without time restrictions.
- *Foothill Boulevard* is an east-west roadway north of ONT and is otherwise known as the historic Route 66. Foothill Boulevard runs between north Rancho Avenue to the east and Amelia Avenue to the west. It is a four to six lane roadway with a raised divider. The posted speed limit is 45 to 50 mph and street parking is not permitted.
- *Milliken Avenue* is a north-south roadway located east of ONT that crosses SR-60 to the south and SR-210 to the north. Milliken Avenue is a six-lane roadway with a raised divider. There is no street parking and a posted speed limit of 50 mph.
- *Haven Avenue* is a north-south roadway located east of ONT. The roadway runs adjacent to the east side of the airport property between East Airport Drive and East Jurupa Street. Haven Avenue crosses SR 60 to the south and SR 210 to the north. It is an eight-lane roadway with a raised divider down the center. There is no street parking and a posted speed limit of 45 mph.

Figure 2.6: Existing Average Daily Traffic (ADT)



Source: The Ontario Plan

- *Archibald Avenue* is a north-south roadway that runs perpendicular to ONT and ends at east Airport Drive to the north of the Ontario Airport and begins again at East Jurupa Street south of ONT. Archibald Avenue is a four-lane roadway with a posted speed limit of 45 mph and no street parking north of ONT. South of ONT, Archibald Avenue is a four to six-lane roadway with a raised divider. The roadway goes from four-lanes down to two-lanes as it crosses the railroad tracks, and then expands to five-lanes (three southbound lanes and two northbound lanes). At East Cedar Street, Archibald Avenue becomes a six-lane arterial. Street parking is generally not permitted and a posted speed limit of 40 mph.
- *Grove Avenue* is a north-south roadway located west of ONT. The posted speed limit is 45 mph and street parking is generally not permitted. Grove Avenue is a six-lane roadway between East Airport Drive and SR-60.
- *Mission Boulevard* is an east -west roadway south of ONT. It ends at SR-60 to the east. Mission Boulevard is a four-lane roadway with a posted speed limit of 55 mph and no street parking. There is a dirt divider between South Grove Avenue and South Sterling Avenue, and a raised divider west of South Grove Avenue and east of Sterling Avenue.

Local access to the airport is provided via Airport Drive and internal circulation streets within the airport, serving the airport terminals, rental car area, and other airport uses.

2.3.1 Parking

Ontario Airport has a plentiful supply of relatively inexpensive parking located in close proximity to the terminals. As reported on the Ontario Airport Parking website, the airport currently three 24-hour on-site parking facilities located near the terminals. These facilities provide a total of 5,522 public parking spaces for extended and overnight trips and are shown in **Table 2.5** along with the rate structure of the lot. The location of the parking facilities relative to the airport is shown on **Figure 2.7.**

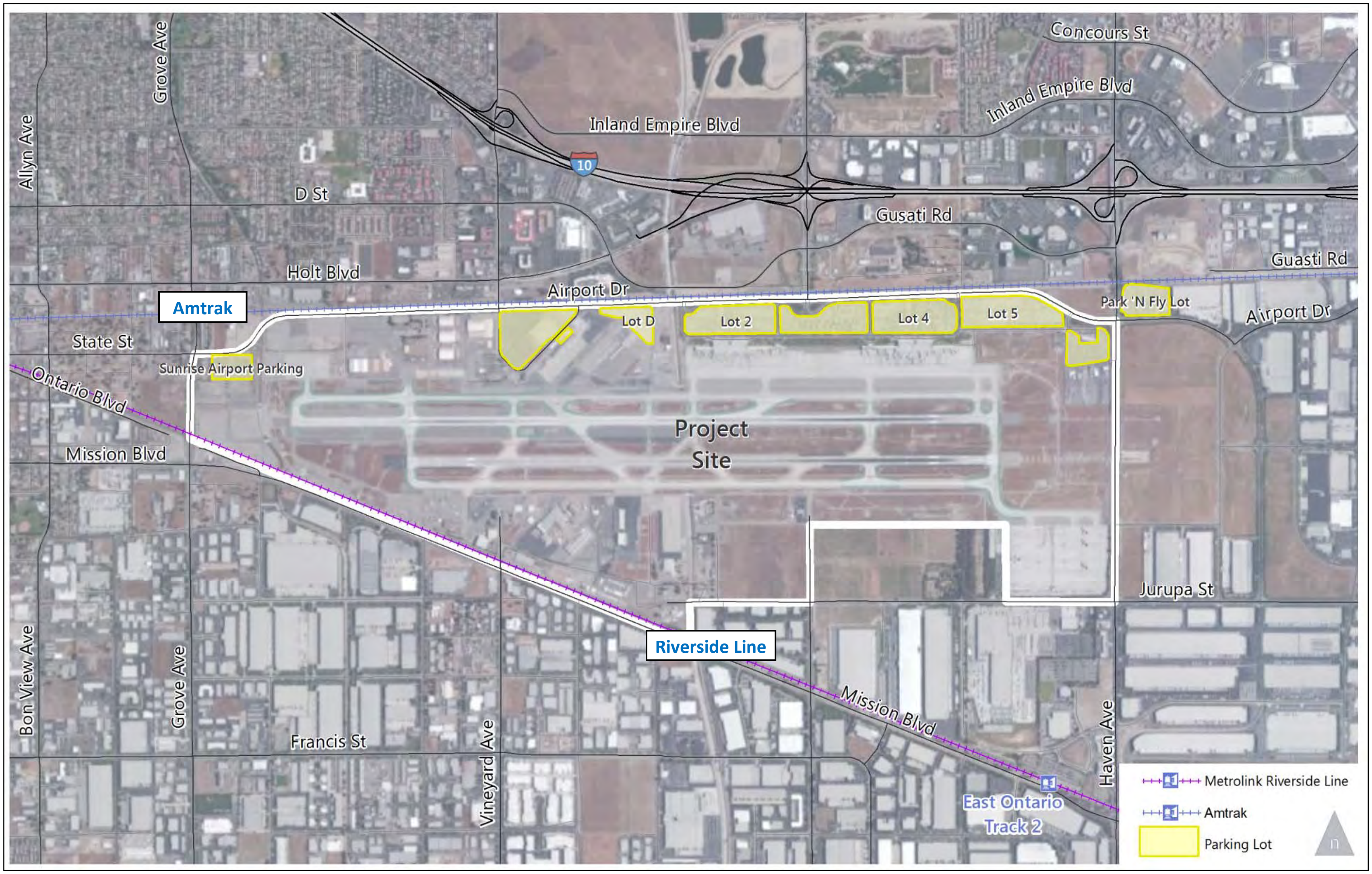
Table 2.5: Parking Lot Characteristics

Parking Lot	Spaces	Rates
Daily Lot 2 (across from Terminal 2)	3,363	\$3.00 for first hour \$2.00 for every subsequent hour \$18.00 per day
Daily Lot 4 (across from Terminal 4)		
Daily Lot 5 (between Terminal 4 and the rental car facility)	2,159	\$3.00 for first hour \$2.00 for every subsequent hour \$9.00 per day
Park N' Fly		\$10 per day
Sunrise Airport Parking		\$8 per day

In addition to on-site parking facilities, airport patrons also have the option to park at the Park 'N Fly Lot or Sunrise Airport Parking Lot. Both off-site parking facilities are located within two miles of ONT and provide shuttle service to access the terminals. For convenience to patrons waiting to pick up arriving passengers, a free 100-space Cell Phone Waiting Lot, located at 1940 East Moore Way, is also available. Parking Lot D, which serves the International Terminal, is currently not in use and hence the airport does not provide any information on pricing or exact number of parking spaces for this lot.

In the future when airport passenger volumes increase and additional terminal buildings are built, it is expected that the current surface lots will be replaced with structured parking to accommodate future parking demand.

Figure 2.7: Location of Parking Lots

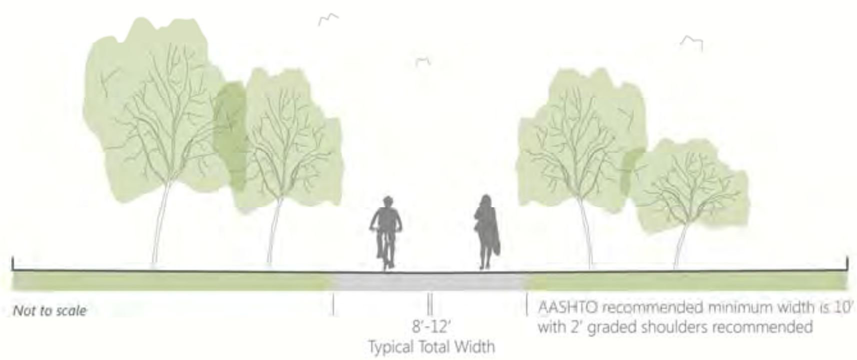


Source: Ontario Airport Parking and Terminal Map

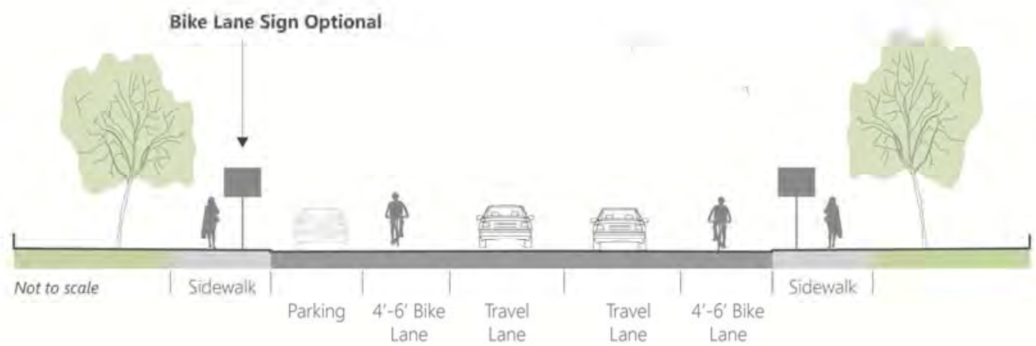
2.3.2 Bicycle Facilities

Bikeway planning and design in California typically relies on guidelines and design standards established by California Department of Transportation (Caltrans) in the *Highway Design Manual* (Chapter 1000: Bikeway Planning and Design and other design documents). Bicycle facilities are comprised of paths (Class I), lanes (Class II), and routes (Class III) as described below and shown on the accompanying figures.

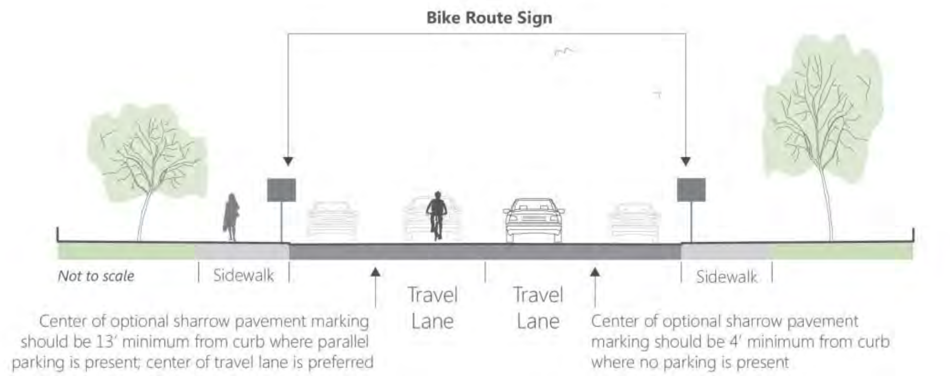
A. *Class I Bikeway (Bicycle Path)* provides a completely separate right-of-way (ROW) and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized.



B. *Class II Bikeway (Bicycle Lane)* provides a restricted ROW and is designated for the use of bicycles with a striped lane on a street or highway. Bicycle lanes are generally four to six feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.



C. *Class III Bikeway (Bicycle Route)* provides for a right-of-way designated by signs or pavement markings (sharrows) for shared use with pedestrians or motor vehicles. Sharrows are a type of pavement marking (bike and arrow stencil) placed to guide bicyclists to the best place to ride on the road, avoid car doors, and remind drivers to share the road with cyclists.



There are no bicycle facilities within ONT. Class III facilities are provided along segments of Grove Avenue and Archibald Street, located just west and north of the airport. Class II facilities are present on Archibald Avenue (north of Base LIne), portions of Haven Avenue, Milliken Avenue, and 4th street. Class I facilities are provided along Philadelphia Street between Walker Avenue and Archibald Avenue, along Walker Avenue between Philadelphia Street and Mission Boulevard, and along Deer Creek Channel in Rancho Cucamonga.

In the future, the City of Ontario plans to expand the bicycle network as a strategy and approach to meet future transportation issues and opportunities. The Ontario Plan has identified future bicycle facilities or improvements along numerous roadway facilities within the vicinity of ONT. For example, Euclid Avenue, Grove Avenue, Mission Boulevard, and Ontario Mills Parkway have been identified as Bicycle Corridors, ideal for bicycle routes. At this time, the exact facility type and alignment of the identified Bicycle Corridors are not known. Class II facilities are planned along portions of Inland Empire Boulevard, 6th Street, and Riverside Drive and a Class III facility is planned along a short segment of Vineyard Avenue to connect the planned G Street and Inland Empire Boulevard bicycle facilities. Additionally, the City of Rancho Cucamonga plans to provide an off-street multipurpose trail along Cucamonga Creek that will serve pedestrian and bicycle travel.

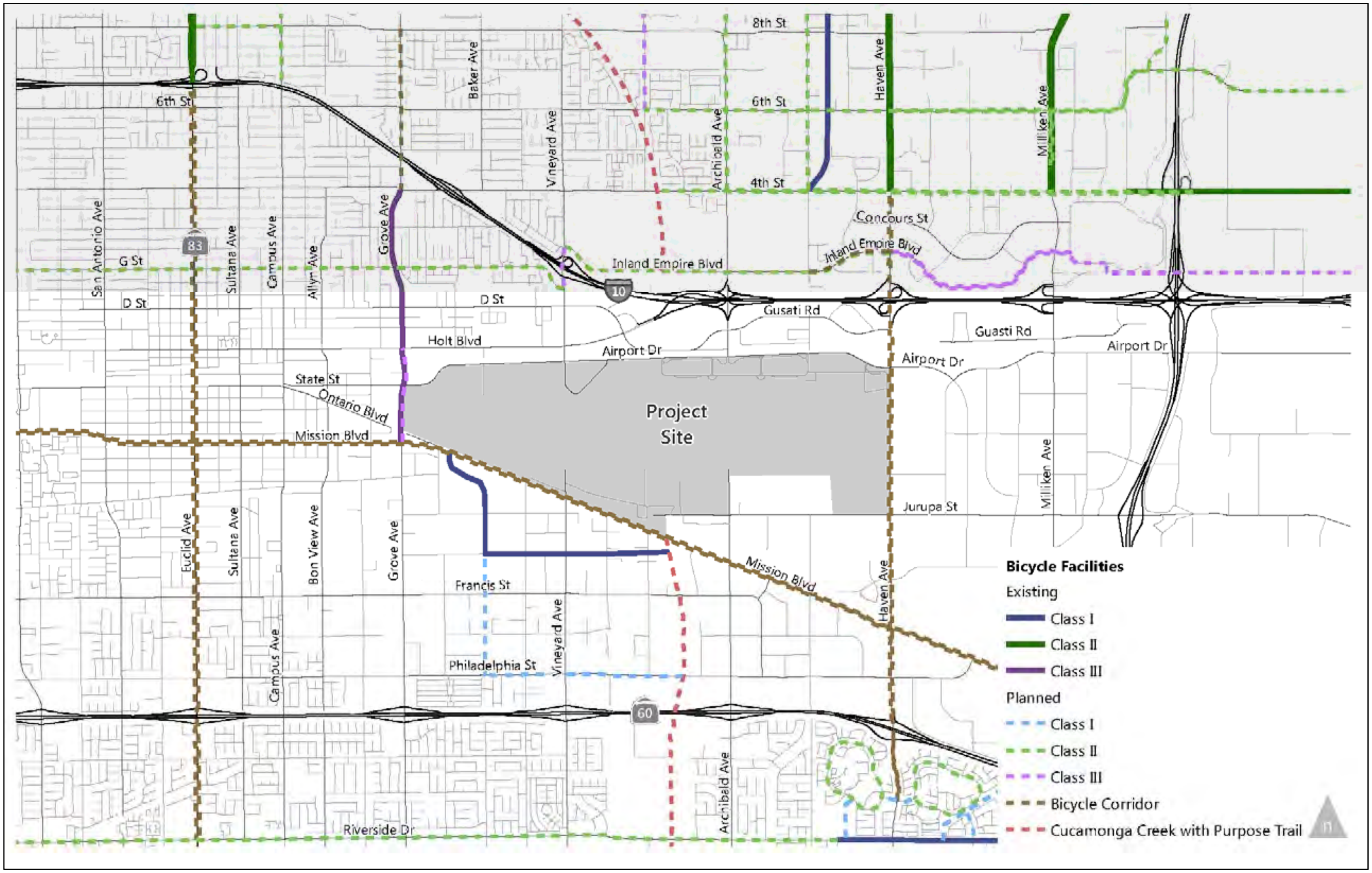
Figure 2.8 illustrates both existing and planned bicycle facilities around the immediate vicinity of ONT.

2.3.3 Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, and pedestrian signals at signalized intersections. Within ONT, pedestrian facilities are well developed along most major roadways. Arrow Highway lacks formal sidewalks on the north side of the roadway between Grove Avenue and Baker Avenue. 8th Street lacks sidewalks on both sides of the roadway east of Vineyard Avenue and across the Cucamonga Channel. Within the immediate vicinity of the airport, pedestrian facilities are limited. Direct pedestrian access to the airport terminals is provided on the north side of the airport facility via Terminal Way and Gausti Road, which provides a sidewalk along one side of the street. Pedestrian access to Terminal Way is provided from the western intersection with Airport Drive. At the Airport Drive and Terminal Way intersection, a crosswalk is only provided along one approach and a sidewalk is only provided along one side of Airport Drive, which eventually continues to one side of Terminal Way. Along Terminal Way there are nine signalized pedestrian crossings, which connect the on-site parking facilities between Airport Drive and Terminal Way to the various airport terminals.

Figure 2.9 summarizes existing gaps in the pedestrian network. Currently, there are no direct pedestrian facilities linking the terminals with destinations (such as the bus stops) since the parking facilities are located between those destinations and the terminals. Additionally, many of the interior airport circulation roadways do not provide pedestrian facilities and only accommodate vehicles.

Figure 2.8: Existing and Planned Bicycle Facilities



Source: The Ontario Plan, 2006 General Plan Update

Figure 2.9: Gaps in Pedestrian Network

Source: HDR, 2014

2.4 Transit Services

2.4.1 Metrolink Services

Metrolink is governed by the Southern California Regional Rail Authority (SCRRA), a joint powers authority comprised of five county agencies: Los Angeles County Metropolitan Transportation Authority (Metro), Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), San Bernardino Associated Governments (SANBAG), and Ventura County Transportation Commission (VCTC). Metrolink provides regional commuter rail service in Southern California. Both the Riverside Line and the San Bernardino Line traverse through the study area and are described below:

- *Riverside Line* – This Metrolink line provides east-west service between Downtown Los Angeles and Riverside. The Riverside Line has limited service and only runs during peak commute times, taking commuters from Riverside to Downtown Los Angeles in the morning and from Downtown Los Angeles to Riverside in the evenings. This line provides no service on weekends. The closest station to Ontario Airport is the East Ontario station, approximately three miles[13] southeast of the airport. There is limited ability to expand Metrolink service on this line due to track ownership by Union Pacific Rail Road (UPRR).

- *San Bernardino Line* – This Metrolink Line provides east-west commuter rail service between Downtown Los Angeles and San Bernardino. The San Bernardino Line operates with more frequent headways during the weekday morning and evening peak hours and has limited service during the midday off-peak period. This line also provides limited service on weekends. The closest station to the Ontario Airport is the Rancho Cucamonga station, approximately five miles northeast of the airport. The other station on the San Bernardino Line close to the Ontario Airport is the Upland Station, approximately 5.5 miles northwest of the airport. This location would be the preferred station when airport patrons approach ONT from the west.

Table 2.6 provides a summary of the two Metrolink lines within the study area, while **Table 2.7** shows the frequency of service at each station, by time of the day and day of the week. Finally, **Table 2.8** provides ridership data for each station within the study area, East Ontario, Rancho Cucamonga and Upland Stations.

Table 2.6: Summary of Metrolink Lines

Line	San Bernardino Line	Riverside Line
Stations	13	7
Route Miles	56.5	59.1
Trains Operated/Weekday	42	12
Trains Operated/Saturday	20	0
Trains Operated/Sunday	14	0
Average Weekday Riders	11,837	5,032
Average Saturday Service Riders	4,732	n/a
Average Sunday Service Riders	3,804	n/a
Average Speed	40 mph	42 mph

Source: Metrolink 2013

[13] Distance is measured as the closest driving distance and not straight-line distance (as the bird flies).

Table 2.7: Frequency of Metrolink Service by Time of Day and Day of Week

Time of Day	Riverside Line				San Bernardino Line											
	East Ontario				Rancho Cucamonga						Upland					
	Weekday		*Weekend*		Weekday		*Saturday*		*Sunday*		Weekday		*Saturday*		*Sunday*	
	EB	WB	*EB*	*WB*	EB	WB	*EB*	*WB*	*EB*	*WB*	EB	WB	*EB*	*WB*	*EB*	*WB*
00:00 – 01:00					1								1			
01:00 – 04:00																
04:00 – 05:00						1	1					1				
05:00 – 06:00		1				3						2				
06:00 – 07:00		2				3						3				
07:00 – 08:00		1			1	2	1	1		1	1	2	1	1		1
08:00 – 09:00		1			1	1		1			1	1		1		
09:00 – 10:00						1					1					
10:00 – 11:00					1		1	1	1	1		1	1	1	1	1
11:00 – 12:00						1	1	1	1	1		1	1	1	1	1
00:00 – 01:00					1					1	1					1
01:00 – 02:00					2	1	1	1	1		2	1	1	1	1	
02:00 – 03:00	1				1	2	1	1	1	1	1	2	1	1	1	1
03:00 – 04:00		1			1	1		1		1	1	1				
04:00 – 05:00					2	1					2	1		1		1
05:00 – 06:00	2				2	1	1	1	1		2	1	1	1	1	
06:00 – 07:00	1				4	1	1	1	1	1	3		1		1	
07:00 – 08:00	2				1	1					1	2		1		1
08:00 – 09:00					1		1				1		1			
09:00 – 10:00					1	1		1			1	1		1		
10:00 – 11:00					1		1		1		1		1		1	
11:00 – 12:00											1					
TOTAL	**6**	**6**	***0***	***0***	**21**	**21**	***10***	***10***	***7***	***7***	**20**	**20**	***10***	***10***	***7***	***7***

Source: Metrolink 2013

Table 2.8: Boardings per Month by Station

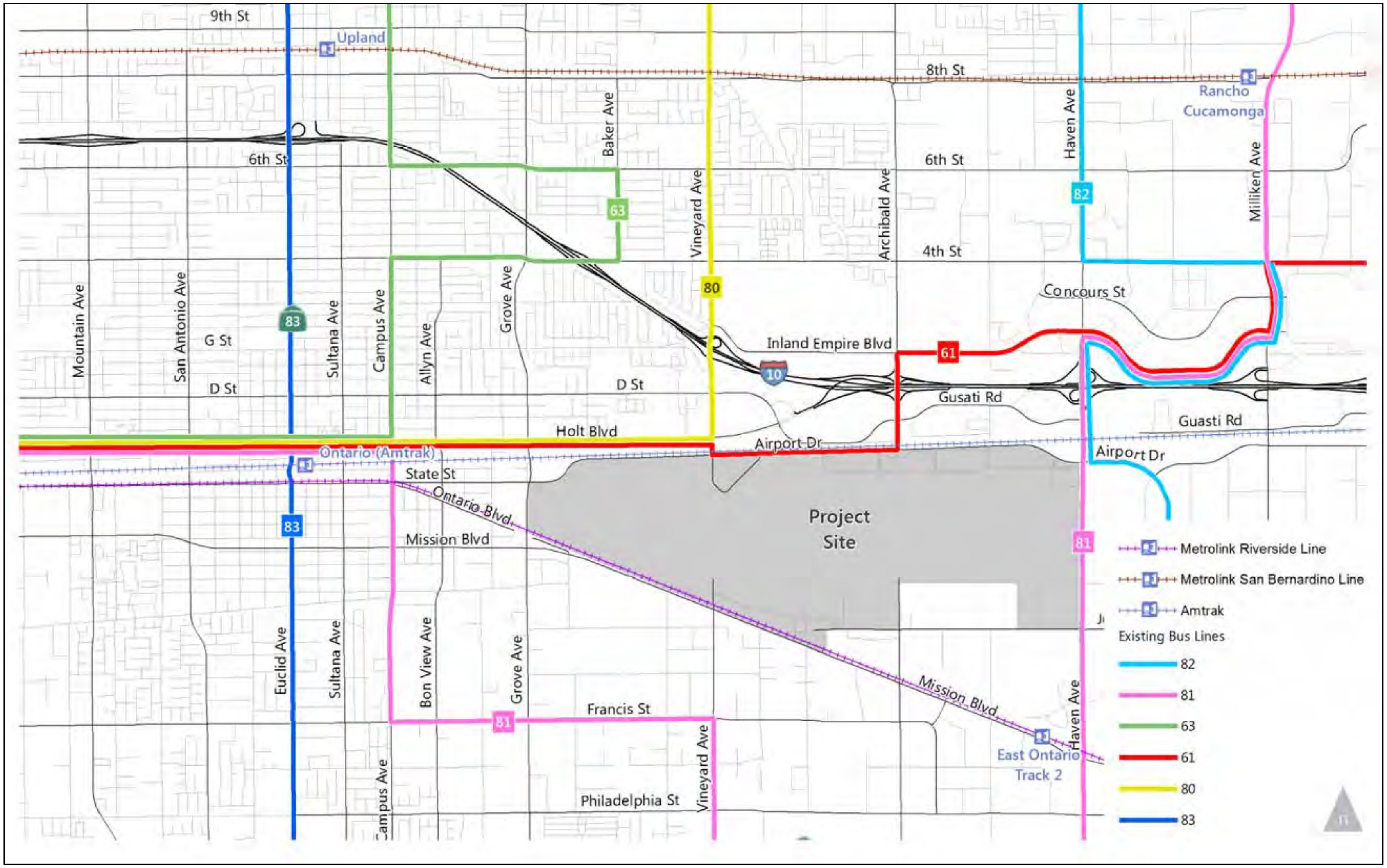
Station	East Ontario	Rancho Cucamonga	Upland
April 2013	465	1,147	606
May 2013	454	1,127	581
June 2013	438	1,108	554
Average Boardings Per Month	**452**	**1,127**	**580**

Source: Metrolink 2013
Ridership estimates are based on ticket sales by origin station and do not reflect transfers

2.4.2 Omnitrans

Currently, there are no direct transit connections between any of the Metrolink stations (Rancho Cucamonga, Upland and East Ontario) and the airport. As shown in **Figure 2.10**, the only available public transportation that comes closest to ONT and travels along Airport Drive is Omnitrans Bus Route 61. This route connects the Downtown Pomona Station on the Metrolink Riverside Line to the Fontana Station on the Metrolink San Bernardino Line. In Ontario, it travels along Airport Drive between Archibald Avenue and Vineyard Avenue, but does not enter the terminal area. The walk from the airport terminals to the Route 61 bus stop is inconvenient to passengers since there is no direct pathway and one would need either to jaywalk or walk across landscaped areas. Walk time from the Airport Drive bus stop to the terminal buildings can vary between 8 to 20 minutes, based on whether the airport patron avails the westbound or eastbound bus to get from the Metrolink stations.

Figure 2.10: Existing Transit Network



Source: Metrolink and Omnitrans

Route 61 operates on average every 15 minutes, 7 days a week, but primarily between 6:15 am and 6:15 pm Monday through Friday, 8:00 am through 6:50 pm on Saturdays, and 8:00 am through 7:00 pm on Sundays. The first bus arrives near ONT at about 5:15 am Monday through Friday, at 6:50 am on Saturdays, and at 7:00 am on Sundays. The last bus arrives near ONT is at 9:25 pm Monday through Friday, at 9:19 pm on Saturdays, and at 7:01 pm on Sundays.

Omnitrans Route 81 has stops near both the Rancho Cucamonga and the East Ontario Metrolink stations, but does not get closer to the airport terminals than the stop at the intersection of Haven Avenue and Airport Drive, which is adjacent to the consolidated rental car facility. At the consolidated rental car facility, airport passengers can use the airport shuttle to deliver them to the terminal. Frequency on Route 81 is one per hour and there is no service during weekends.

Listed below are the existing bus transit options between each of the three Metrolink stations (Rancho Cucamonga, Upland and East Ontario) and the airport:

Upland Station

- Walk from the station to Omnitrans Route 63 (stop location at Campus Avenue and East A Street) and transfer to Omnitrans Route 61 (stop location at Campus Avenue and Holt Boulevard intersection) to ONT.
- Or, walk from the station to the Omnitrans Route 83 (stop location at Euclid Avenue and 8th Street) and transfer to Omnitrans Route 61 (stop location at Euclid Avenue and Holt Boulevard intersection) to ONT.

Rancho Cucamonga Station

- Ride Route 81 from the station to the Haven Avenue and Airport Drive stop, adjacent to the consolidated rental car facility, to use the airport shuttle to access the terminals.
- Or, ride Route 81 from the station and at Ontario Mills, transfer to Omnitrans Route 61 to ONT.

East Ontario Station

- Walk from the station to Route 81 (stop location at the intersection of Haven Avenue and Francis Street) to the Haven Avenue and Airport Drive stop, adjacent to the consolidated rental car facility, to use the airport shuttle to access the terminals.
- Or, ride Route 81 and at Ontario Mills, transfer to Omnitrans Route 61 to ONT.

Due to the amount of walking involved for transfers and the limited schedule of Route 81, airport passengers may find a direct and easier connection via Omnitrans Route 61 from either the Downtown Pomona Station on the Metrolink Riverside Line or the Fontana station on the Metrolink San Bernardino Line. However, neither of these stations is within the approximately 5-miles radius of the airport as the East Ontario or the Rancho Cucamonga stations are, and will not be considered as potential stations for future transit connections to ONT.

2.4.3 Other Transit

Metro operates a rapid transit rail system consisting of six separate lines, including two subway lines (the Red and Purple lines) and four light rail lines (the Blue, Green, Gold, and Expo lines) serving 80 stations in the Los Angeles County area. It connects with the Metrolink commuter rail system at various stations. The Metro Gold Line currently travels between East Los Angeles and Pasadena, through Chinatown, Union Station, and Little

Tokyo. The Gold Line is funded for extension from Pasadena to Azusa and is under construction with an anticipated opening in late 2015[14]. The extension of from Azusa to Montclair is being advanced through Final Design to have it shovel-ready, even though there is uncertainty in the completion schedule for this planned extension since funding has not been identified.

In 2007, a strategic planning study[15] was commissioned to evaluate conceptual light rail routes to determine alternatives for extending Metro Gold Line service nearly eight miles east of its proposed terminus in Montclair, to Ontario Airport. The advantages of Gold Line Service to ONT would be a 15-minute minimum headway all day long and rail services from very early morning to very late at night.

The three preferred alignments that emerged from the strategic planning study include:

- Alignment 2A – Metrolink/Cucamonga Channel—this alignment would operate within the Metrolink San Bernardino Line's ROW until the junction of Vineyard Avenue and the Cucamonga Channel, after which it operates in the Cucamonga Channel ROW. The length of the alignment is 7.3 miles and the travel time is 11.2 minutes between Montclair and ONT. Potential station locations associated with this alignment include:
  - Mountain Avenue Station
  - Upland Station
  - Grove Avenue Station
  - 8th Street Station
  - 4th Street Station
  - ONT Multi-Modal Terminus Station

- Alignment 2B – Metrolink/Vineyard/Holt—this alignment would operate within the Metrolink San Bernardino Line's ROW until the junction with Vineyard Avenue. The alignment continues south along Vineyard Avenue, curbside, and would require an overpass to cross over I-10, before terminating at the Ontario Airport. The length of the alignment is 7.4 miles and the travel time is 12.4 minutes between Montclair and ONT. Potential station locations associated with this alignment include:
  - Mountain Avenue Station
  - Upland Station
  - Grove Avenue Station
  - 8th Street Station
  - 4th Street Station
  - Ontario Convention Center Station
  - ONT Multi-Modal Terminus Station

- Alignment 3B – Baldwin Park Branch/Cucamonga Channel—this alignment would operate for a portion within the existing Baldwin Park Branch ROW, before turning south and operating within the Cucamonga Channel ROW. The length of the alignment is 8.5 miles and the travel time is 14.2 minutes between Montclair and ONT. Potential station locations associated with this alignment include:

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[14] http://www.foothillgoldline.org/construction_phases/pasadena_to_azusa/
[15] http://www.foothillextension.org/construction_phases/ontario_airport_extension/
Strategic Planning Study Report for Metro Gold Line Foothill Extension to LA/Ontario International Airport, KOA Corporation, December 2008

- Mountain Avenue Station
- Downtown Upland Station
- San Antonio Community Hospital Station
- Foothill Boulevard Station
- 8th Street Station
- 4th Street Station
- ONT Multi-Modal Terminus Station

Figure 2.11 shows the planned transit system within the study area, including future Bus Rapid Transit (BRT) currently planned by Omnitrans.

2.4.4 Transit Travel Time

Access to ONT under existing conditions is primarily by automobile. Other available modes include airport shuttle services, taxis, and hotel/motel courtesy vehicles. As noted earlier, regional rail service is available to the airport vicinity, but there are no direct last-mile connections between the train stations in the vicinity and the airport terminals.

Table 2.9 presents transit access from the Metrolink stations to ONT.

Table 2.9: Transit Access from Metrolink Stations to ONT

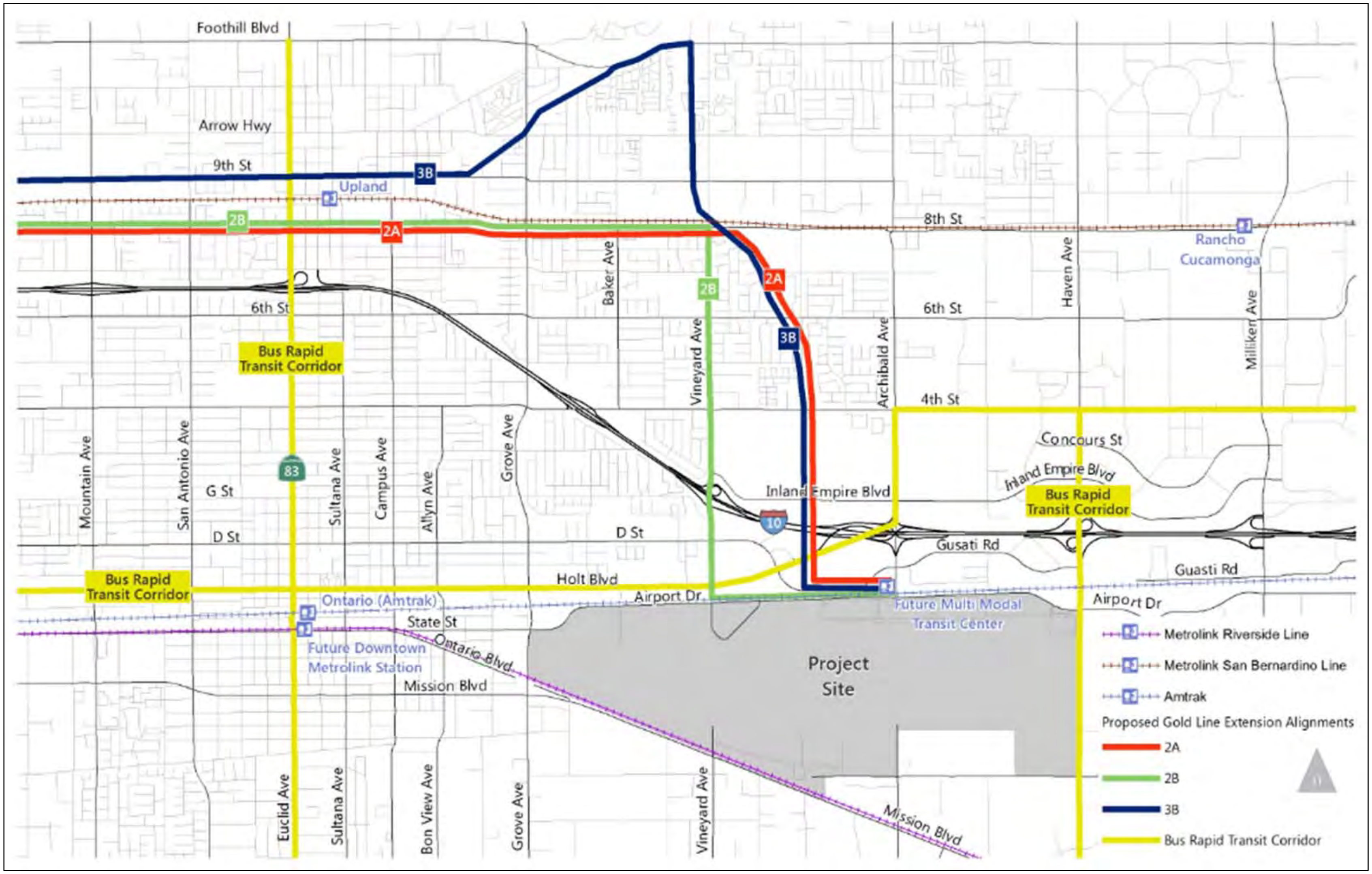
Metrolink Station	Station Stop		# of Transfers	Omni Route	Transit Time		Airport		Headway		Travel Time	
	Dist.	Walk Time[1]			Wait Time[2]	Travel Time[3]	Dist.	Walk Time[4]	M-F	St-Sn	Transit	Auto
Rancho Cucamonga		00:01	1	81/*61*	0:43	0:22	0.4	0:08	60/*15*	n/a/*15*	1:14	0:11
Upland	0.3	00:07	1	63/*61*	0:46	0:30	1.0	0:19	60/*15*	60/*15*	1:42	0:12
East Ontario	0.4	00:08	1	81/*61*	0:27	0:27	0.4	0:08	60/*15*	n/a/*15*	1:10	0:09

Notes: Distance presented in miles
Time presented in hours
[1] Walk time from Metrolink station to the nearest bus stop
[2] Total wait time at transit stops – at the station and at the transfer point
[3] Total travel time between station to transfer point; and transfer point to airport
[4] Walk time from nearest bus stop to airport terminal
Route 61 and its headway during the week is indicated in italics

In order to compare transit and auto travel times for airport trips, three hypothetical origin-destination (O-D) pairs were chosen. These locations were chosen so that one trip would use the San Bernardino Line from the east, one trip would use the San Bernardino Line from the west, and one trip would use the Riverside Line from the east. The three pairs chosen are as follows:

- Redlands – ONT: Using San Bernardino Line from the east
  - Metrolink station pairs: San Bernardino – Rancho Cucamonga
- Claremont – ONT: Using San Bernardino Line from the west
  - Metrolink station pairs: Claremont – Upland
- Moreno Valley – ONT: Using Riverside Line from the east
  - Metrolink station pairs: Downtown Riverside – East Ontario

Figure 2.11: Planned Transit Network



Source: Strategic Planning Study Report for Metro Gold Line Foothill Extension to LA/Ontario International Airport

In addition, the analysis was performed for four different times of day, including peak and non-peak periods. A 6:00 am and an 11:00 am arrival at the airport, and a departure time (from ONT) of 3:00 pm and 6:00 pm were analyzed. Google maps travel path was used to estimate auto travel times between the O-D pairs and to cross-check transit travel time between the pairs. The estimate of door to door transit travel time between each O-D pair was calculated based on train and bus schedules, which are presented in **Appendix B**. For transit trips it was assumed that travelers would drive their auto to the nearest Metrolink station to park and ride, and then use Omnitrans to travel between the Metrolink station and the airport area.

Table 2.10 presents travel time breakdown to and from ONT. It can be seen that there is at least 30 minutes of travel time difference depending on the time of the day. In most cases, Omnitrans bus schedules are not coordinated with arrival and departure times of Metrolink trains. In all cases, Omnitrans does not provide direct access between Metrolink stations and ONT terminals, resulting in very long transit travel times when compared to auto travel. In a few cases, transit options are absent because either Metrolink or Omnitrans services are not available. On an average, auto travel time for each O-D pair is about 30 minutes, compared to at least 1.5 hours with transit.

2.5 Origin and Destination Data

The project team obtained travel data from AirSage, a company that collects location information sent by anonymous mobile wireless device signals. These devices include cell phones, cellular-equipped vehicles, tablets, and other devices that use wireless communications. The data was collected for an area consisting of eastern Los Angeles and Orange Counties, western Riverside County, and south-western San Bernardino County, and aggregated into analysis zones. This mobile device data provides information on the origin and destination of trips that access the airport, illustrating where the ONT service population and employees are located. When future rail alignments and ridership forecasts are developed, this O-D data will assist in ensuring that any potential rail connections to the airport will capture the highest potential ridership.

For purposes of this study, data resolution was developed through coordination with AirSage. ONT was isolated into its own analysis zone, and resolution outside of the airport was tied to a zip-code based analysis zone system (e.g. the data identifies the number of devices from zip codes in the study area to and from ONT). Given some of the unique cell phone usage at the airport, the project team worked with AirSage to ensure that the data was processed correctly. Some of the key components are described below:

- Since this is an airport, phones will “disappear” and “appear” on the network as they are activated/ deactivated from the flight – the data does not include origins or destinations that arrive/depart from the airport via flight
- For O-D outside of the mapped area, the O-D is mapped to the zip code where the record enters the study area (e.g. someone using I-15 from the High Desert area will be mapped to the zip code just north of Silverwood Lake, the northernmost zip code location in the mapped area)

As such, the data provides a realistic estimate of individual (who have an activated cellular device) O-Ds within the study area.

Table 2.10: Travel Time from / to Metrolink Station to / from ONT

Origin-Destination Pairs	Metrolink Station Pairs	Metrolink Connections					Omnitrans Connections						Travel Time		
		Arrival/ Departure at ONT (Goal Time)	Auto Travel Time to Metrolink Station	Dep.	Arr.	Metrolink Travel Time	Omnitrans connecting bus routes	Walk/Wait time to/at Nearest Bus Stop	Wait Time at Transfer Location	Bus Travel Time to and from Metrolink station to ONT	Walk Time to Airport Terminal	Transit Travel Time between Metrolink Station and ONT	Comments on Bus/Train Service	Total Transit Travel Time	Auto Travel Time (uncongested)
														Hour	Hour
Redlands – ONT	San Bernardino – Rancho Cucamonga	Arr: 6:00 am	0:13	4:52 am	5:11 am	0:19	81/61	n/a	n/a	n/a	0:08	n/a	No southbound bus service until 6:05 am	n/a	0:28
		Arr: 11:00 am		9:40 am	9:59 am	0:19		0:31	0:03	0:23		1:05		1:37	
		Dep: 3:00 pm		4:24 pm	4:50 pm	0:26		0:09	0:19	0:39		1:15		1:54	
		Dep: 6:00 pm		7:24 pm	7:50 pm	0:26		0:11	0:33	0:34		1:26		2:05	
Claremont – ONT	Claremont – Upland	Arr: 6:00 am	0:02	n/a	n/a	n/a	63/61	n/a	n/a	n/a	0:19	n/a	No eastbound service until 6:56 am	n/a	0:16
		Arr: 11:00 am		8:43 am	8:51 am	0:08		0:56	0:15	0:29		2:00		2:10	
		Dep: 3:00 pm		4:26 pm	4:34 pm	0:08		0:35	0:10	0:35		1:40		1:50	
		Dep: 6:00 pm		7:03 pm	7:11 pm	0:08		0:12	0:09	0:36		1:17		1:27	
Moreno Valley – ONT	Downtown Riverside – East Ontario	Arr: 6:00 am	0:14	n/a	n/a	n/a	81/61	0:34	0:14	0:25	0:08 n/a	1:21	First westbound service to East Ontario reaches at 5:03 am – not adequate for an arrival time at ONT at 6:00 am	n/a	0:31
		Arr: 11:00 am		n/a	n/a	n/a		n/a	n/a	n/a		n/a	Last am westbound train to East Ontario reaches at 8:36 am. Taking this train gets the traveler to ONT by 9:40 am, almost 1.5 hours early	n/a	
		Dep: 3:00 pm		5:12 pm	5:42 pm	0:30		1:23	0:02	0:44		2:18	Eastbound train prior to 5:12 pm is at 2:11 pm, hence resulting in long wait time at the East Ontario Station	3:02	
		Dep: 6:00 pm		7:31 pm	8:02 pm	0:31		0:43	0:03	0:38		1:33		2:18	

Notes: Least travel time for each O-D pair indicated in the black cells
n/a indicates unavailability of service
Bold green font indicate departure time from ONT

Figure 2.12, **Figure 2.13**, and **Figure 2.14** demonstrate daily O-D information that was obtained from AirSage. The following days were identified by the project team and SANBAG as those that should be included in the data collection:

- November 18, 2012 – A typical weekday (Thursday)
- November 21, 2012 – A typical weekend day (Sunday)
- November 21, 2012 – Holiday travel (Wednesday, the day before the Thanksgiving holiday)

The figures show a "heat map", showing locations where a greater number of records represented an origin or a destination at the airport (e.g. the darker the color the more trips to/from that zip code). Also, the maps show the total number of origins and destinations that occurred in each zip code.

The total number of records that were identified by AirSage are summarized below:

- Typical Weekday – 99,708 records to/from the airport
- Typical Weekend – 33,673 records to/from the airport
- Holiday Travel – 88,837 records to/from the airport

The distribution shows that, in general, the highest usage of the airport is from locations that are closest to the airport. Additionally, the I-15, SR-71, and SR 60 corridors tend to generate the most records to/from the airport during all three days.

2.6 US Airports with Rail Access

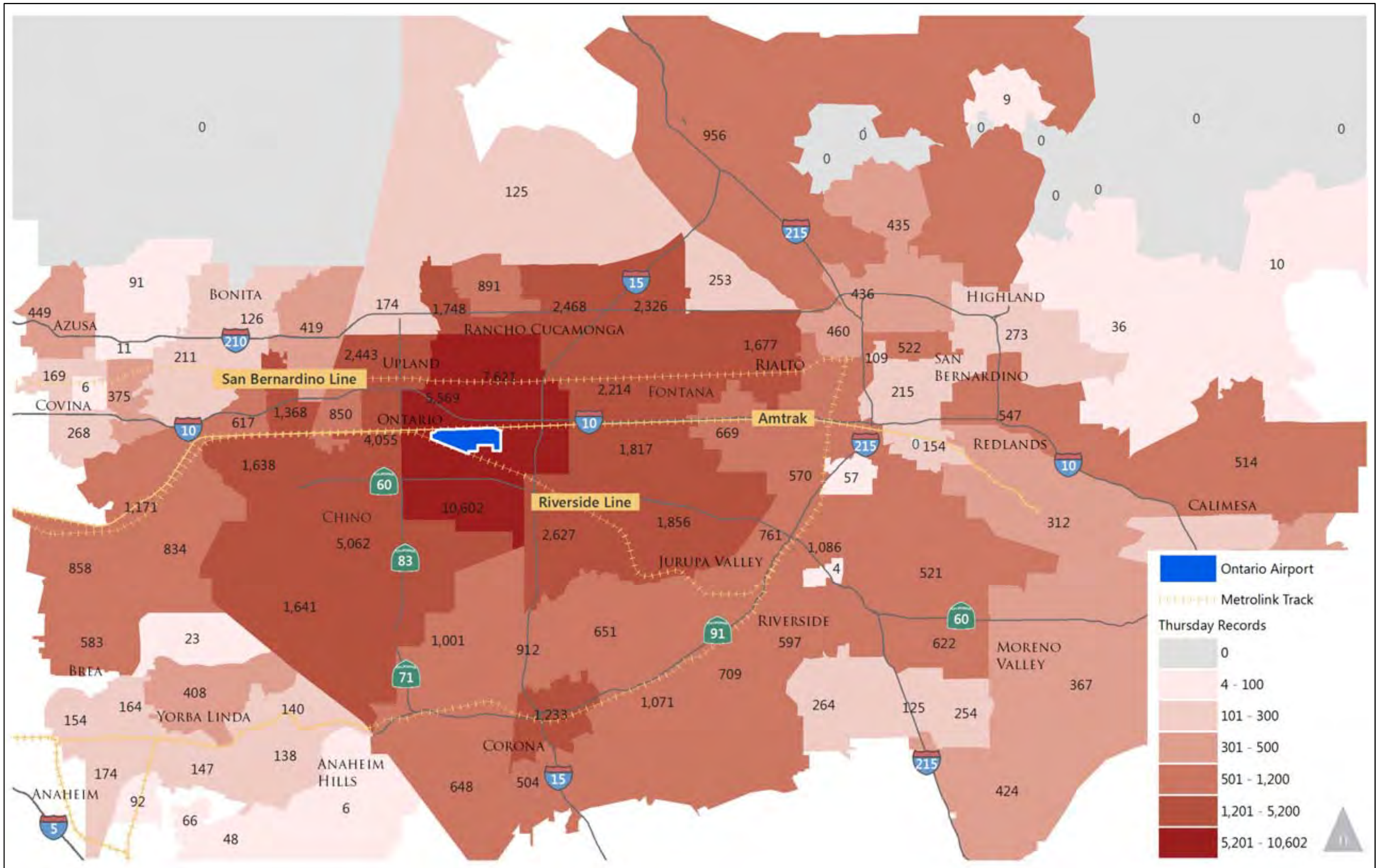
Seamless connection of airports with the communities they serve through bus and rail transportation has been commonplace for decades in Europe and increasingly in major US metropolitan regions. Today, 21 US airports have some kind of rail-to-airport connection including Burbank airport, which is comparable to ONT in air passengers (4.1 MAP in 2012).

In addition to the existing 21 airports, five more have rail access projects underway. These include the following:

- Dallas Fort Worth International Airport (DFW), service through Dallas Area Rapid Transit (DART's) Orange Line, opened on August 18, 2014;
- Denver International Airport (DEN), service through Regional Transportation District (RTD) proposed East Rail, slated for operations in 2016;
- Honolulu International Airport (HNL), service through Honolulu Authority of Rapid Transportation (HART), slated to be fully operational by 2019;
- Oakland International Airport (OAK), service through the Bay Area Rapid Transit (BART), proposed for a start date of Fall 2014; and
- Washington Dulles Airport (IAD), service through Washington Metropolitan Area Transit Authority (WMATA).

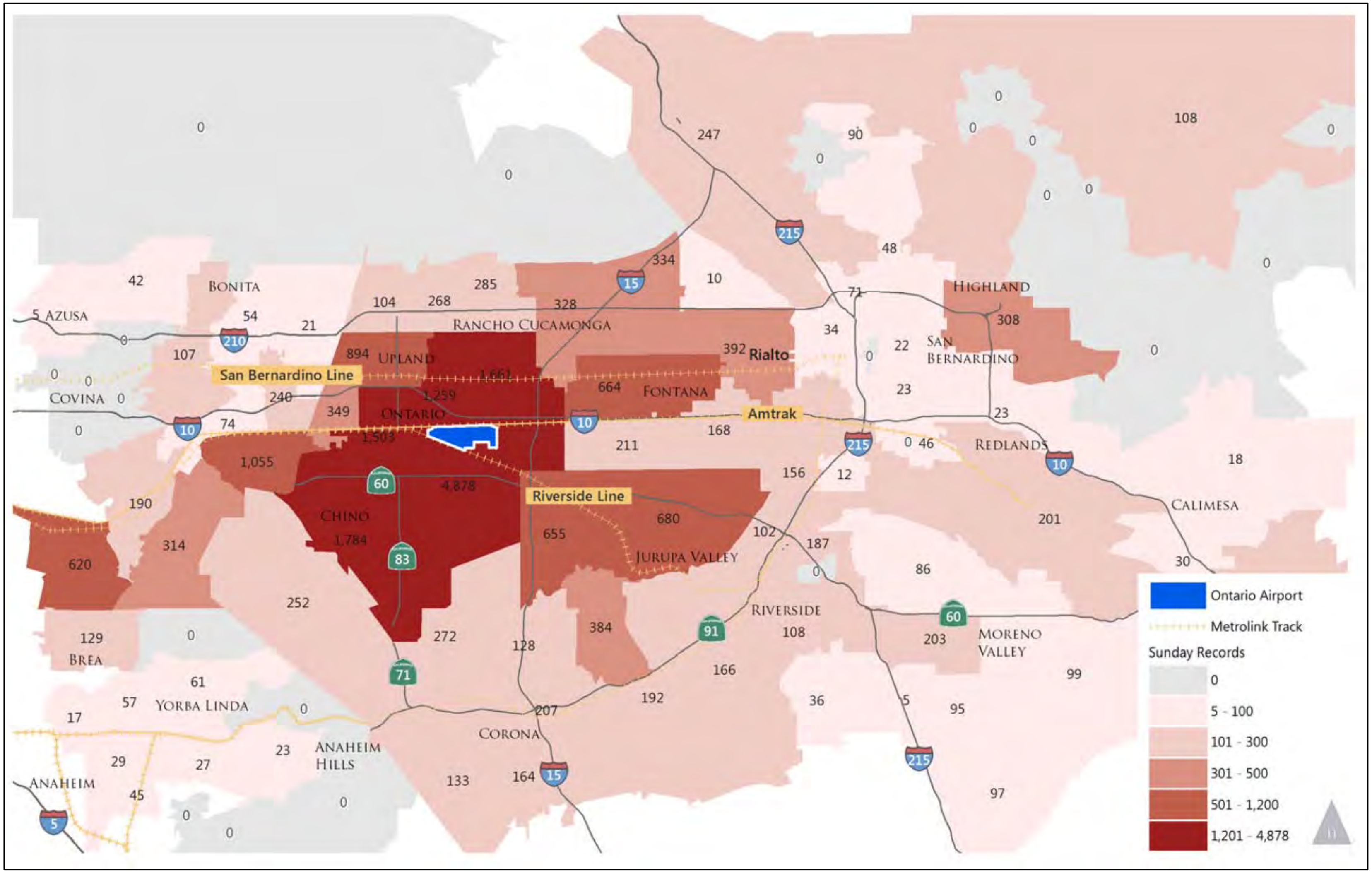
It is generally accepted that a robust rail transit system with healthy ridership, connecting airport passengers to and from the airport, enhances their overall mobility and supports the region's growth. **Table 2.11** presents a comparison of the 21 US airports with rail access.

Figure 2.12: Typical Weekday (Thursday) O-D Data



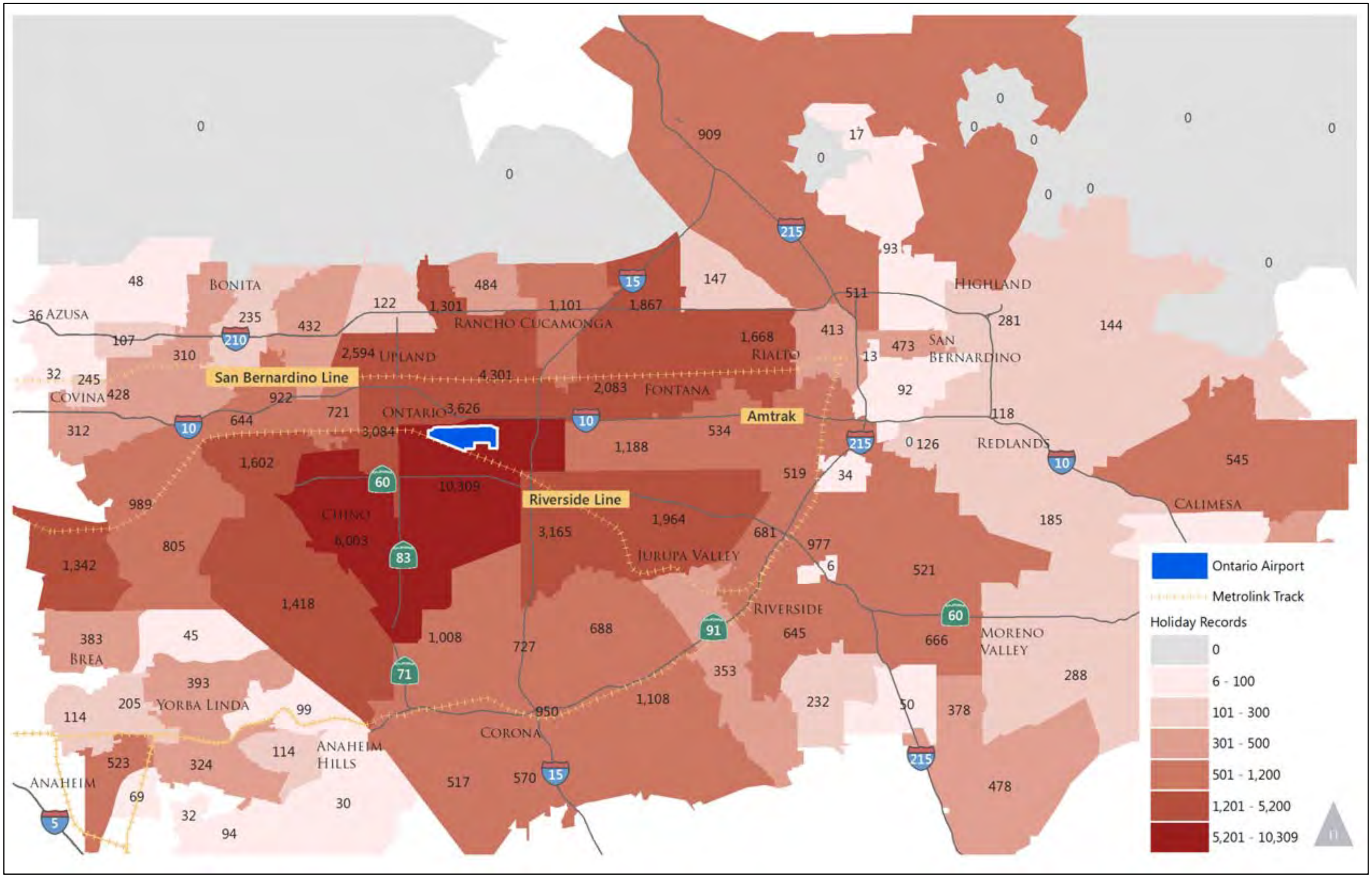
Source: AirSage, 2012

Figure 2.13: Typical Weekend (Sunday) O-D Data



Source: AirSage, 2012

Figure 2.14: Holiday O-D Data (Wednesday before Thanksgiving)



Source: AirSage, 2012

Table 2.11: Domestic Airports with Rail Connections

Code	City	Airport	MAP [1]	Transit Agency	Train	Fare	Frequency		MSA Population (2012 est.)	Average Systemwide Ridership (in 000s)
							Weekday (minutes)	Weekend (minutes)		
ATL	Atlanta	Hartsfield - Jackson Atlanta International	91.6	MARTA	Red Line/Gold Line	$2.50	15-20	20	5,457,831	Heavy Rail - 220.5 **Total - 413.5**
ORD	Chicago	Chicago O'Hare International	64.3	CTA	Blue Line	$5.00	7-15	6-15	7,318,387	Heavy Rail - 729.4 **Total - 1,716.9**
JFK	New York	John F Kennedy International	49.0	MTA	AirTrain	$5.00	3-15	3-15	2,848,506	**Total - 12,086.9**
SFO	San Francisco	San Francisco International	42.6	BART	Pittsburg/ Baypoint	Milbrae - $4.05 Daly City - $7.50	15	15	1,565,174	Heavy Rail - 421.8 **Total - 421.8**
PHX	Phoenix	Phoenix Sky Harbor International	39.1	Valley Metro	Sky Train/Light Rail	$2.00	12-20	12-20	4,329,534	Light Rail - 42.0 **Total - NA**
MIA	Miami	Miami International	38.0	MDTA	Orange Line	$2.25	5-30	15-30	5,762,717	Heavy Rail - 72.3 **Total - 354.0**
EWR	Newark	Newark Liberty International	34.1	MTA	AirTrain	$5.50	3-15	3-15	2,488,817	**Total - 12,086.9**
SEA	Seattle	Seattle-Tacoma International	32.2	Sound Transit	Link Light Rail	$2.75	7.5-15	10-15	3,552,157	Light Rail - 32.3 **Total - 102.2**
MSP	Minneapolis	Minneapolis-St Paul International/Wold-Chamberlain	31.9	Metro Transit	Blue Line (Hiawatha)	$2.25	10-40	10-40	3,422,264	Light Rail - 30.9 **Total - 265.5**
PHL	Philadelphia	Philadelphia International	29.2	SEPTA	Airport Line	$6.50/$5.00 $8.00/$7.00	30	30	2,108,705	Commuter Rail – 127.1 **Total - 1,156.5**
BOS	Boston	General Edward Lawrence Logan International	28.6	MBTA	Blue Line	$2.50	9-13	9-13	1,926,030	Heavy Rail - 551.3 **Total - 1,314.7**
BWI	Baltimore	Baltimore/Washington International Thurgood Marshall	22.4	MTA	Hunt Valley-BWI	$1.60	20	30	2,753,149	Light Rail - 36.1 **Total - 429.5**
SLC	Salt Lake City	Salt Lake City International	19.2	UTA	Green Line	$2.50	15	20	1,123,712	Light Rail - 57.6 **Total - 145.6**
MDW	Chicago	Chicago Midway International	18.9	CTA	Orange Line	$2.25	7-15	10-15	7,318,387	Heavy Rail - 729.4 **Total - 1,716.9**

Table 2.11: Domestic Airports with Rail Connections (continued)

Code	City	Airport	MAP [1]	Transit Agency	Train	Fare	Frequency		MSA Population (2012 est.)	Average Systemwide Ridership (in 000s)
							Weekday (minutes)	Weekend (minutes)		
DCA	Washington D.C	Ronald Reagan Washington National	18.9	WAMATA	Blue Line Yellow Line	Peak: $2.10-$5.75 Off Peak: $1.70-$3.50	High Frequency	12-17 12-15	4,616,051	Heavy Rail - 980.8 **Total - 1,435.8**
PDX	Portland	Portland International	14.3	TriMET	Red Line	$2.50	15-30	17-32	2,289,800	Light Rail - 123.2 **Total - 322.3**
STL	St Louis	Lambert-St Louis International	12.4	Bi-State Dev Agency	Red Line	$2.25	12-20	20	2,795,794	Light Rail - 55.4 **Total - 151.2**
CLE	Cleveland	Cleveland-Hopkins International	8.7	RTA	Red Line	$2.25	15	15	2,063,535	figures unavailable for 2013-Q2
BUR	Burbank	Bob Hope	4.3	SCRRA	Metrolink Bob Hope Airport Line	min $5.25	approx. 30	no service	9,962,789	Commuter Rail - 42.7 **Total - 42.7**
PVD	Providence	Theodore Francis Green State Airport	3.6	MBTA	Providence/ Stoughton Line	$13.50	min 40	no service	1,601,374	Commuter Rail - 127.3 **Total - 1,314.7**
SBN	South Bend	South Bend Airport	0.6	NICTD	South Shore	min $8.75	min 1:06	min 1:10	318,586	Commuter Rail - 12.4 **Total - 12.4**

Source: [1] FAA Airports Data (http://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/)
List of US Airports with Rail Connections: http://www.flightglobal.com/blogs/airline-business/2013/08/a-tale-of-airport-rail-connections-on-two-sides-of-the-pacific/
Transit Ridership for 2013 Quarter 2 - http://www.apta.com/resources/statistics/Documents/Ridership/2013-q2-ridership-APTA.pdf
Census Data – 2012 estimates for population
MSA – Metropolitan Statistical Area

Chapter 3 - Purpose and Need Statement

The following Purpose and Need Statement was developed to guide the identification and evaluation of potential improvements.

3.1 Purpose of Project

To provide a convenient, reliable, and cost-effective transit service connecting Ontario International Airport (ONT) with the regional rail system for air travelers and airport employees.

3.2 Need for Project

Air travelers using ONT and employees working at ONT currently have very limited ability to travel to and from the airport via transit. The existing regional rail system, Metrolink, provides a backbone transit service that can carry passengers to Ontario from a wide area. However, Metrolink does not deliver its passengers directly to the ONT terminal area, and available bus transit between Metrolink stations and the airport is not coordinated with Metrolink services or airport flight schedules, and does not stop close to the airport terminals, so transit travel to/from ONT is highly inconvenient. Planned regional rail connections to ONT – California High Speed Rail and the Gold Line – are unfunded and not expected to be built for many years.

3.3 Project Objectives

The following key objectives are established for the project, to define the characteristics that will best achieve the project purpose:

3.3.1 Most Important Objectives

1. Carry transit passengers directly to/from the ONT terminal area.
2. Make transit travel times to/from ONT more competitive with auto travel.
3. Minimize mode transfers for airport-oriented transit travelers.
4. Provide airport-oriented transit service that is linked with regional rail service.
5. Provide airport-oriented transit service that has operating hours coinciding with airport operating hours, and that has service levels and capacity compatible with airline flight schedules.
6. Maximize potential ridership of the airport-oriented transit service.
7. Implement service improvements that are physically and financially feasible, while considering environmental constraints.

3.3.2 Important Objectives

8. Support and enhance other passenger rail operations.
9. Achieve near-term improvement in the convenience of airport-oriented transit travel.
10. Use the airport-oriented transit service to connect Ontario Airport and Metrolink with existing and planned high activity centers located between them.
11. Implement airport-oriented transit service that can be compatible with future regional transit improvements planned to serve Ontario Airport and the surrounding area

Chapter 4 - Initial List of Alternatives and Screening

Based on the Purpose and Need statement an initial list of 32 alternatives was developed by the consultant team in consultation with the study's Technical Working group. These alternatives involve a combination of technology and alignment with the objective of connecting the regional rail system in the airport vicinity to ONT terminals. Additional alternatives were suggested independently by the Southern California Regional Rail Authority (SCRRA) later when the Alternatives Analysis was underway; these suggested concepts were reviewed and determined to either: (1) be similar to one of the 32 alternatives under study; or (2) involve a significant realignment of a current Metrolink line which would add travel time to Metrolink service and thus work against the Purpose and Need.

4.1 List of Alternatives

Table 4.1 presents a summary of the list of alternatives with the following sections elaborating on the concept behind each group of alternatives.

Table 4.1: Initial List of Alternatives

Alt #	Mode/ Technology	Terminus	Route	Operations Notes
A-1	Rail/Guideway	Rancho Cucamonga Metrolink	San Gabriel Subdivision/Cucamonga Creek	Trains timed to meet Metrolink trains
A-2	Rail/Guideway	Rancho Cucamonga Metrolink	San Gabriel Subdivision/Rail Spur/flood channel/ Cucamonga Creek	Trains timed to meet Metrolink trains
A-3	Rail/Guideway	Rancho Cucamonga Metrolink	San Gabriel Subdivision/Hermosa Avenue/Turner Avenue/Guasti Road	Trains timed to meet Metrolink trains
A-4	Rail/Guideway	Rancho Cucamonga Metrolink	San Gabriel Subdivision/flood channel/Cucamonga Creek	Trains timed to meet Metrolink trains
A-5	Rail/Guideway	Rancho Cucamonga Metrolink	San Gabriel Subdivision/ Cleveland Avenue/Arena /Haven Avenue/Airport Drive	Trains timed to meet Metrolink trains
A-6	Rail/Guideway	Upland Metrolink	San Gabriel Subdivision/Cucamonga Creek	Trains timed to meet Metrolink trains
A-7	Rail/Guideway	Upland Metrolink	San Gabriel Subdivision/Rail Spur/flood channel/Cucamonga Creek	Trains timed to meet Metrolink trains
A-8	Rail/Guideway	Upland Metrolink	San Gabriel Subdivision/ Hermosa Avenue/Turner Avenue/Guasti Road	Trains timed to meet Metrolink trains
A-9	Rail/Guideway	Upland Metrolink	San Gabriel Subdivision/flood channel/Cucamonga Creek	Trains timed to meet Metrolink trains
A-10	Rail/Guideway	Upland Metrolink	San Gabriel Subdivision/ Cleveland Avenue/Arena/Haven Avenue/Airport Drive	Trains timed to meet Metrolink trains
A-11	Rail/Guideway	East Ontario Metrolink	Commerce Parkway/Airport Drive	Trains timed to meet Metrolink trains
A-12	Rail/Guideway	East Ontario Metrolink	Los Angeles Subdivision/Alhambra Subdivision	Trains timed to meet Metrolink trains
B-1	Bus/shuttle	Rancho Cucamonga Metrolink	Milliken Avenue/Airport Drive	Bus timed to meet Metrolink trains
B-2	Bus/shuttle	Rancho Cucamonga Metrolink	Milliken Avenue/Inland Empire Boulevard/ Archibald Avenue	Bus timed to meet Metrolink trains

Table 4.1: Initial List of Alternatives (continued)

Alt #	Mode/ Technology	Terminus	Route	Operations Notes
B-3	Bus/shuttle	Upland Metrolink	8th Street/I-10/Vineyard Avenue/Inland Empire Boulevard/Archibald Avenue	Bus timed to meet Metrolink trains
B-4	Bus/shuttle	East Ontario Metrolink	Haven Avenue/Airport Drive	Bus timed to meet Metrolink trains
C-1	DMU/ commuter rail	Redlands	Redlands Rail/San Gabriel Subdivision/Cucamonga Creek	
C-2	DMU/ commuter rail	Redlands	Redlands Rail/San Gabriel Subdivision/Rail Spur/flood channel/Cucamonga Creek	
C-3	DMU/ commuter rail	Redlands	Redlands Rail/San Gabriel Subdivision/Hermosa Avenue/Turner Avenue/Guasti Road	
C-4	DMU/ commuter rail	Redlands	Redlands Rail/San Gabriel Subdivision/Flood channel/ Cucamonga Creek	
C-5	DMU/ commuter rail	Redlands	Redlands Rail/San Gabriel Subdivision/Cleveland Avenue/ Arena/Haven Avenue	
C-6	DMU/ commuter rail	San Bernardino	San Gabriel Subdivision/Cucamonga Creek	
C-7	DMU/ commuter rail	San Bernardino	San Gabriel Subdivision/Rail Spur/flood channel/Cucamonga Creek	
C-8	DMU/ commuter rail	San Bernardino	San Gabriel Subdivision/Hermosa Avenue/Turner Avenue/Guasti Road	
C-9	DMU/ commuter rail	San Bernardino	San Gabriel Subdivision/Flood channel/Cucamonga Creek	
C-10	DMU/ commuter rail	San Bernardino	San Gabriel Subdivision/Cleveland Ave/Arena/Haven Avenue	
C-11	DMU/ commuter rail	Pomona North	San Gabriel Subdivision/Cucamonga Creek	
C-12	DMU/ commuter rail	Riverside	Los Angeles Subdivision/Alhambra Subdivision	
C-13	DMU / commuter rail	Pomona	Los Angeles Subdivision/Alhambra Subdivision	
D-1	Light rail	Montclair	San Gabriel Subdivision/Cucamonga Creek – Alternative 2A	Operates as part of Gold Line
D-2	Light rail	Montclair	San Gabriel Subdivision/Vineyard – Alternative 2B	Operates as part of Gold Line
D-3	Light rail	Montclair	Baldwin Park Branch/Cucamonga Creek – Alternative 3A	Operates as part of Gold Line

4.1.1 Rail/Guideway Service from Nearby Metrolink Stations

Alternatives in "Group A" are new rail or guideway services connecting patrons at nearby Metrolink stations (Upland or Rancho Cucamonga on the San Bernardino Metrolink line, and East Ontario station on the Riverside Metrolink Line) with ONT. Following are the key assumptions for this service and **Figure 4.1** illustrates the alignment of alternatives A-1 to A-12:

- From the Rancho Cucamonga or Upland station, the rail/guideway follows the Metrolink tracks, then traverses south to the ONT terminals using five alternate routes.
- From East Ontario, one route goes around the east end of the airport's No Build Zone and Runway Protection Zone, and one route goes around the west end (using a new "balloon track" that would be built to connect the Los Angeles and Alhambra subdivisions).
- Specific technology options were considered in next phase of analysis (**Chapter 5**).
- Whether new tracks are needed within Metrolink ROW would depend on technology.

4.1.2 Rubber Tire Service from Nearby Metrolink Stations

Alternatives in "Group B" are new rubber tire (bus/shuttle) services connecting nearby Metrolink stations (Upland or Rancho Cucamonga on the San Bernardino Metrolink Line, and East Ontario on the Riverside Metrolink Line) with ONT. Following are the key assumptions for this service and **Figure 4.2** illustrates the alignment of alternatives B-1 to B-5:

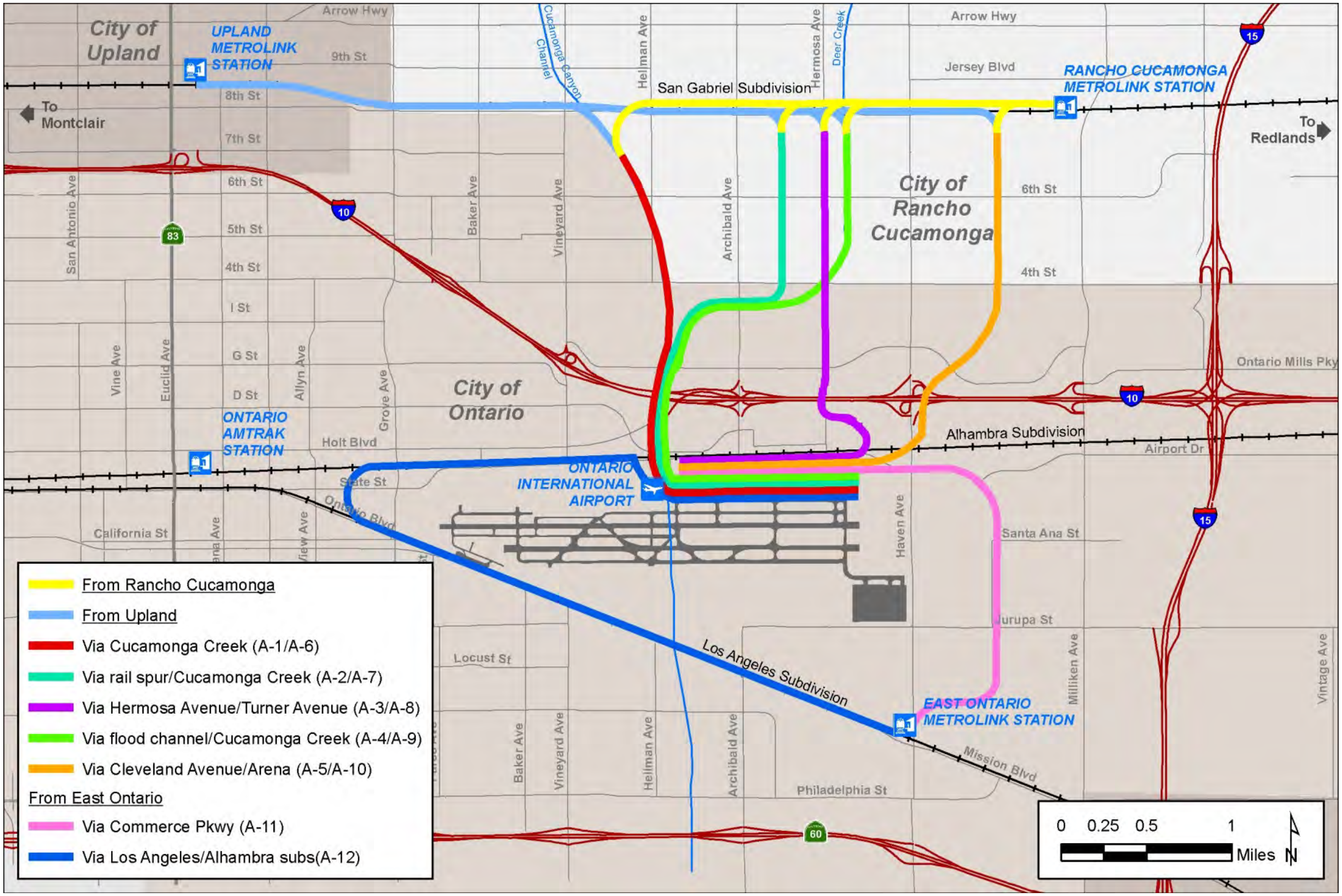
- From the Rancho Cucamonga or East Ontario stations, an alternative was identified to follow the most direct route to the ONT terminals.
- From the Rancho Cucamonga station, an alternate route was identified to serve the high-density development areas planned in the Ontario Metro Center between Milliken Avenue and Archibald Avenue.
- The identified route option from the Upland station utilizes I-10 as the most direct route to the airport area, and also serves the Ontario Metro Center area between Vineyard Avenue and Archibald Avenue.
- Only a limited number of bus/shuttle route options were identified because the stated goal of the study was to identify a desirable direct rail connection to the airport. The direct routes and the route options serving the high-activity areas were deemed sufficient to indicate the performance range of bus/shuttle options.

4.1.3 Rail Service on Metrolink Tracks from Distant Stations

Alternatives in "Group C" are new rail services connecting patrons from more distant stations, along the San Bernardino Metrolink line, with ONT. Following are the key assumptions for this service and **Figure 4.3** illustrates the alignment of alternatives C-1 to C-13:

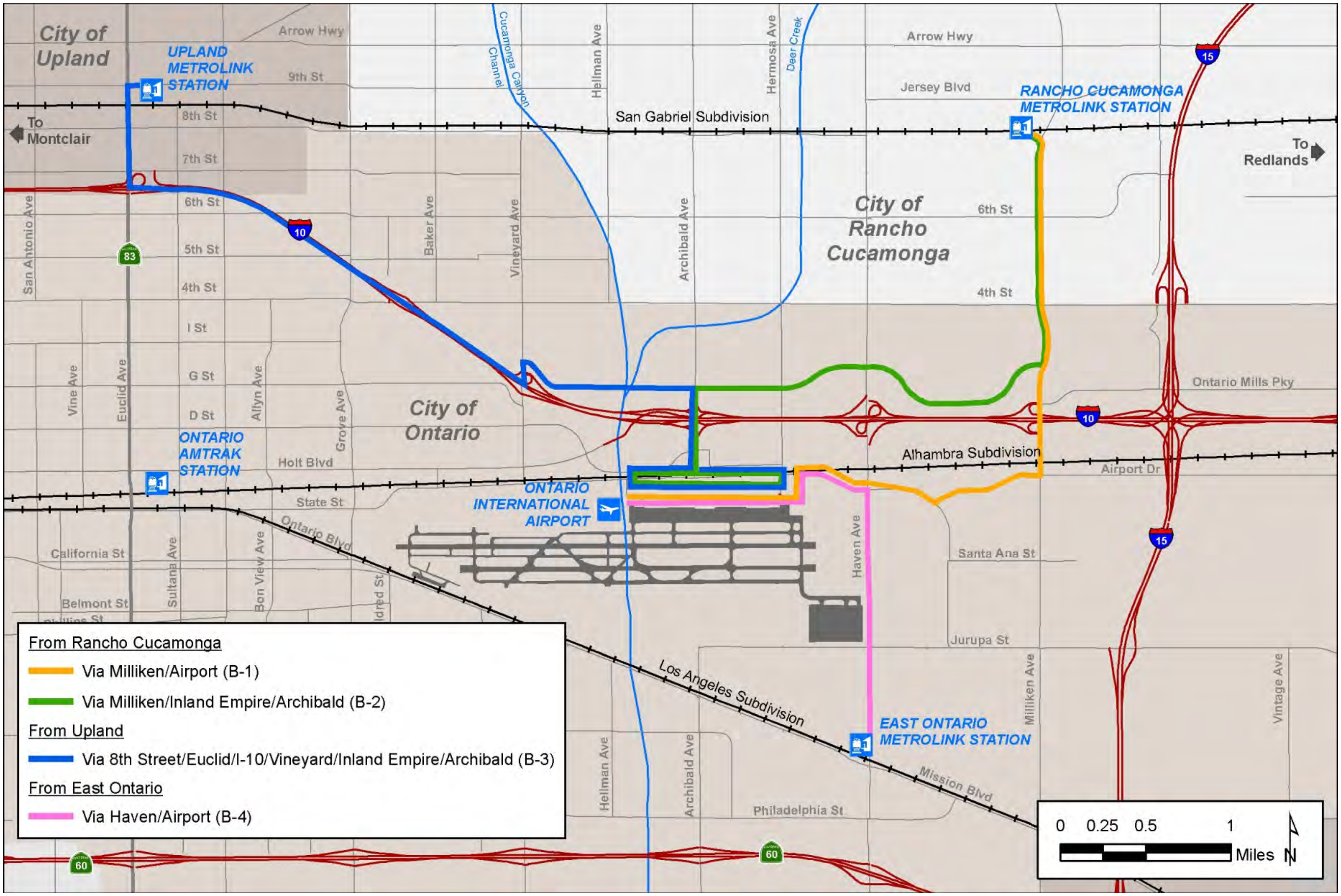
- These services would operate on existing rail corridors that carry freight, so the technology would be either commuter rail or Diesel Multiple Units (DMU). (Note: DMU is a multiple-unit train powered by on-board diesel engines. To operate on any of the freight rail corridors, a DMU would need to be the type that complies with Federal Railroad Administration (FRA) standards required for operation on freight rail corridors, though a non-FRA compliant DMU could be operated on a separate line connecting a Metrolink station to the airport.)

Figure 4.1: Alternatives "Group A" - Rail/Guideway Service from Nearby Metrolink Stations



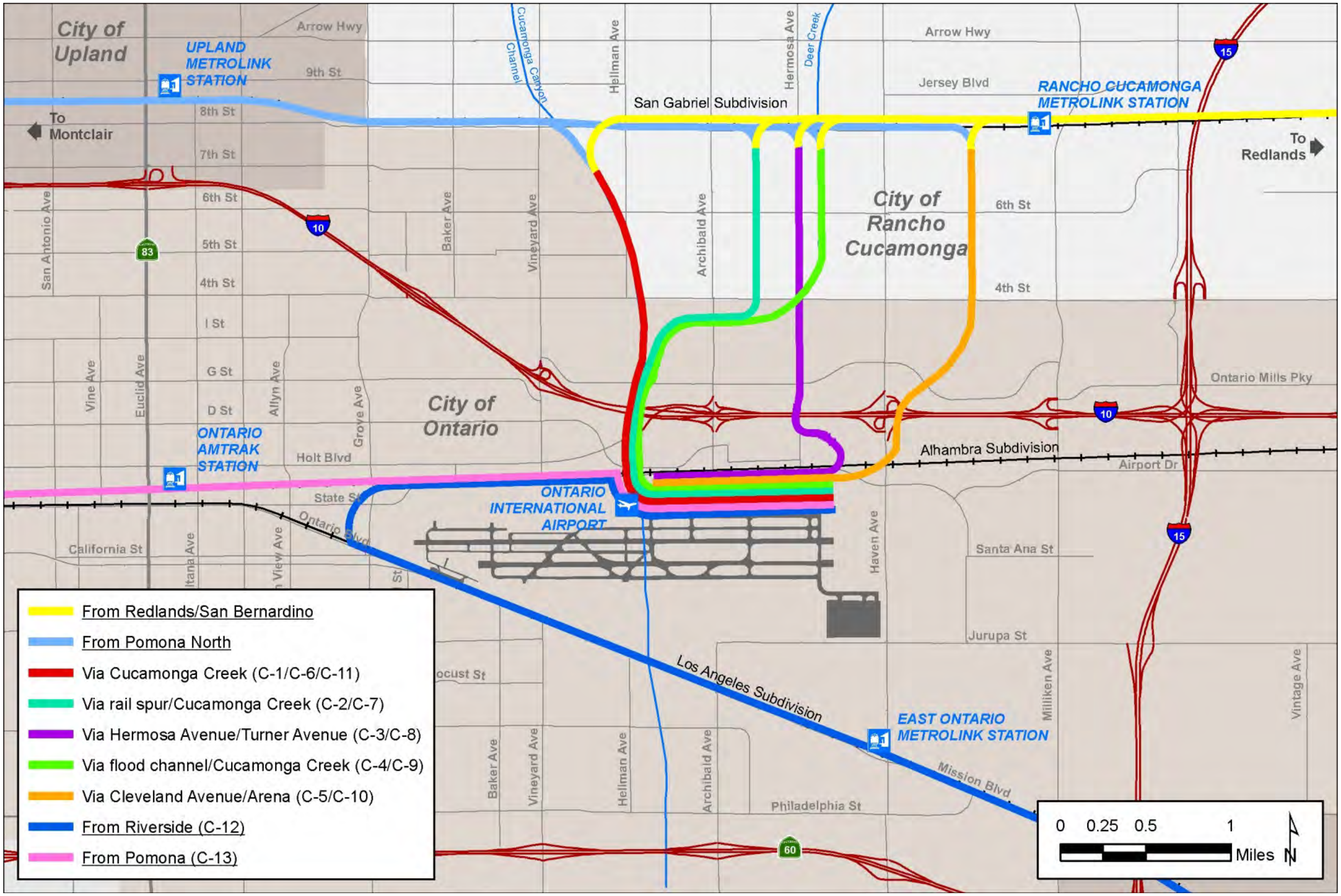
Source: HDR, 2014

Figure 4.2: Alternatives "Group B" - Rubber Tire Service from Nearby Metrolink Stations



Source: HDR, 2014

Figure 4.3: Alternatives "Group C" - Rail Service from Distant Metrolink Stations



Source: HDR, 2014

- Redlands was considered the eastern terminus if commuter rail or DMU technology used for Redlands Rail was utilized for this service; San Bernardino was considered an alternate eastern terminus.
- Coming from Redlands/San Bernardino the route follows the Metrolink tracks, then uses the five north-south route options to connect to the ONT terminals.
- Pomona North was the western terminus for this type of service along the San Bernardino Line to utilize double tracking that ends west of Pomona.
- Coming from Pomona North, the route follows the San Bernardino Metrolink Line, then uses the five north-south route options to the ONT terminals.
- Coming from Riverside, the route would go around the west end of the airport runways and use a new rail connection that would be built between Los Angeles subdivision and Alhambra subdivision.
- Coming from Pomona, the route would follow the Alhambra subdivision where the Metrolink Riverside Line veers southeast on the Los Angeles subdivision.
- Whether new tracks are needed within Metrolink ROW would depend on operating parameters to be determined when detailed analysis is conducted, as well as ROW availability.

4.1.4 Extension of Gold Line Service from Montclair

Alternatives in "Group D" are three Gold Line extension alternatives discussed under **Section 2.4.3,** except the alignments have been modified from the 2008 study to extend into the ONT terminal area in order to meet P&N objective (#1) to "carry transit passengers directly to/from the ONT terminal area". Following are the key assumptions for this service and **Figure 4.4** illustrates the alignment of alternatives D-1 to D-3:

- Assumes that Gold Line has been completed to Montclair.
- Uses the three preferred alignment alternatives from the 2008 study "Strategic Planning Study Report for Metro Gold Line Foothill Extension to LA/Ontario International Airport".
- Operations to the ONT airport would be as part of the overall Gold Line operations.
- A rail connection from Upland to ONT (see options in **Section 4.1.1**) could be designed to be compatible with Gold Line Standards and connected to the Gold Line once it gets to Montclair.

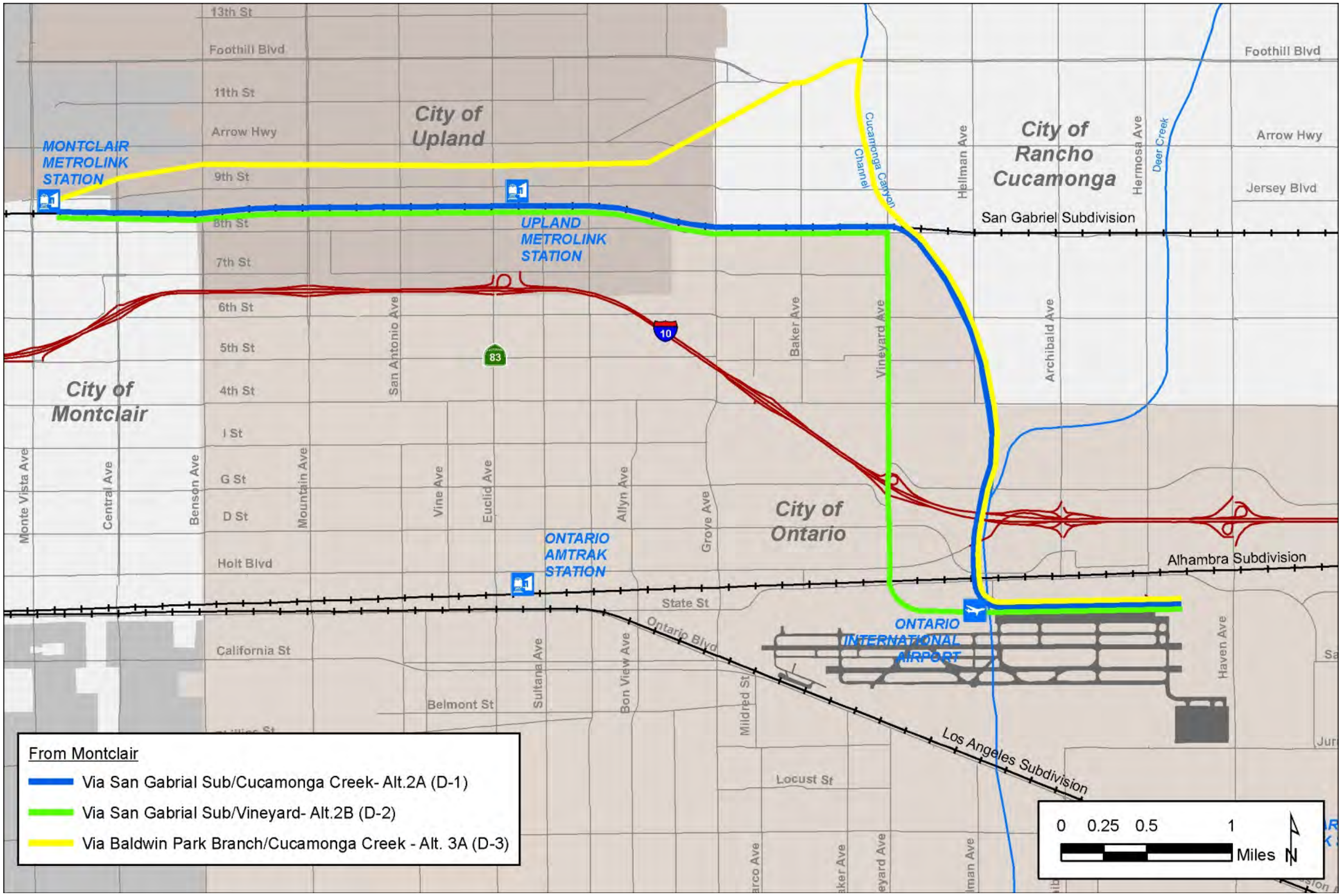
4.2 Screening Criteria and Methods

Screening criteria were identified based on the objectives defined in the Purpose and Need Statement. For each criterion, a general methodology was identified, along with a description of the outcome that would result from each criterion. These criteria and methods, shown in **Table 4.1**, were developed in consultation with the study's Technical Working Group (TWG) prior to the screening analysis.

4.3 Screening Process

For each screening criterion, a number of factors were identified that determine each alternative's performance relative to that criterion. The evaluation matrices (see **Appendix C)** show which factors apply to each alternative, then present a summary result that accounts for the various factors applicable to that alternative, and conclude with an overall result represented by a colored dot (also shown in **Table 4.4**) ranging from blue (best) to red (worst). The following discussion describes the factors and key assumptions that have been used to evaluate each criterion.

Figure 4.4: Alternatives "Group D" - Gold Line Extension from Montclair



Source: HDR, 2014

Table 4.2: Initial Screening Criteria and Methodology

MOST IMPORTANT OBJECTIVES			
Purpose and Need	**Screening Criterion**	**Screening Methodology**	**Evaluation Outcome**
1. Carry transit passengers directly to/from the ONT terminal area.	Walk distance to terminal	Calculate walk time to terminals	Minutes of walking to ONT terminal
2. Make transit travel times to/from ONT more competitive with auto travel.	Travel time for travel to ONT by transit	Qualitative evaluation of potential to reduce current travel times to ONT by transit	Transit travel time reduction: Low, medium, high, very high
3. Minimize mode transfers for airport-oriented transit travelers.	Number of mode transfers required for trip	Count number of transfers required	# of transfers to get to ONT terminal
4. Provide airport-oriented transit service that is linked with regional rail service.	Direct connection to Metrolink or Gold Line	Not a screening criterion, since a direct connection will be a requirement for all	No evaluation necessary
5. Provide airport-oriented transit service that has operating hours coinciding with airport operating hours, and that has service levels and capacity compatible with airline flight schedules.	Serves peak hours of ONT arrivals and departures	Determine if passengers could use the service for access to/from flights during peak ONT flight times (5-6 am, 3-4 pm, 7-8 pm)	Yes/no for access to flights during: early morning, afternoon, evening
6. Maximize potential ridership of the airport-oriented transit service.	Ridership potential	Qualitative evaluation based on: service area characteristics (airport users, population, employment), service frequency, and service convenience	Ridership potential: Very low, low, medium, high, very high (relative to other alternatives)
7. Implement service improvements that are financially feasible.	Capital cost, operating cost	Qualitative evaluation based on typical unit cost levels and applicable distance	For capital cost, and for operating cost: very low, low, medium, high, very high (relative to other alternatives)
IMPORTANT OBJECTIVES			
Purpose and Need	**Screening Criterion**	**Screening Methodology**	**Evaluation Outcome**
8. Support and enhance Metrolink commuter rail operations	Potential impact on existing Metrolink operations	Qualitative determination of whether the alternative could disrupt, enhance, or have little effect on existing Metrolink operations	Significant disruption, moderate disruption, little/no disruption, moderate enhancement, significant enhancement
9. Achieve near-term improvement in the convenience of airport-oriented transit travel	Feasibility of short-term improvements	Not a screening criterion, since alternatives relate to long term future and all alternatives will accommodate phased improvements	No evaluation necessary
10. Use the airport-oriented transit service to connect Ontario Airport and Metrolink with existing and planned high activity centers located between	Potential for intermediate station(s)/stop(s) to serve planned high activity	Qualitative evaluation of route's ability to have stop(s) for Ontario Metro Center and planned TOD in Ontario and Rancho Cucamonga	None, low, medium, high, very high
11. Implement airport-oriented transit service that can be compatible with future regional transit improvements planned to serve ONT and the surrounding area	Potential impact on CAHSR, Gold Line, BRT	Qualitative determination of whether the alternative would compete/conflict, support/enhance, or have little effect on potential future CAHSR, Gold Line, or BRT service	Competes/conflicts, supports/enhances, or little/no effect.

4.3.1 Walk time to Terminals

This measures how close to the airport terminals the alternative brings its passengers. For this analysis it has been assumed that:

- Bus alternatives will stop at the nearest shuttle island outside each terminal
- Rail/guideway alternatives will be elevated between the terminal loop road and the parking area with a station across from each terminal building
- Gold Line extension alternatives will terminate at the proposed Multimodal Center in the southwest quadrant of I-10 and Archibald Avenue, as indicated in the Gold Line feasibility study[16]

4.3.2 Transit Travel Time Improvements

Factors used in this evaluation are those that can most significantly improve transit travel times to the airport compared to the existing condition. These include:

- Providing a direct transit connection from a nearby Metrolink station to the airport
- Connecting to a regional rail line with all-day service in both directions
- Reducing the headways compared to existing rail service
- Reducing the number of transfers for transit trips to the airport
- Increasing transit travel speeds by avoiding operation in street traffic

4.3.3 Number of Mode Transfers

This measures the number of transfers required for transit riders to reach the airport terminals if traveling to and from the east (Redlands), the west (Claremont), and the southeast (Moreno Valley). It assumes that the proposed service is added to the existing transit system, so if an alternative does not improve airport-oriented transit service in a particular corridor then a rider in that corridor would have the same number of transfers as a rider using today's system within that corridor. For example, if an alternative improves airport transit service for users of the San Bernardino Line, users of the Riverside Line would be assumed to use the transit routes available today.

4.3.4 Serving Peak Flight Times

This analysis considers whether the alternative can serve air travelers who are flying in or out of ONT during the hours with the most flights. For departures it has been assumed that the traveler must be able to arrive at the airport 75 minutes before the flight. For arrivals it has been assumed that the traveler must be able to leave the airport 60 minutes after the flight lands. For "A" and "B" alternatives, existing Metrolink schedules have been used to determine the earliest and latest flight times that could be served. For the "C" alternatives (which provide service from distant cities directly to the airport) it has been assumed that operating hours could be set to serve the earliest and latest flights in and out of ONT. For the "D" alternatives (Gold Line extensions) existing schedules have been assumed as being adjusted such that the first train to arrive and depart to/from ONT are

[16] Strategic Planning Study Report for Metro Gold Line Foothill Extension to LA/Ontario International Airport, KOA Corporation, December 2008

roughly within the same timing that the trains arrive and depart to/from the current terminus at Sierra Madre Villa (arriving at 4:25 am, departing at 4:36 am).

4.3.5 Ridership Potential

Ridership potential was estimated by considering the future (2035) population and employment within a route's catchment area, along with the attractiveness of each route. The catchment area population and employment total was quantified in hundreds of thousands. Then, the score was adjusted or penalized for attractiveness. The metrics used to define attractiveness were service frequency, travel speed, number of required transfers, and the expected reliability of the service. The service frequency and travel speed metrics awarded either zero points for low frequency or speed, one point for medium and two points for high. The required transfer metric penalizes the alternative two points for every required transfer. The expected reliability refers to expectations of rail and bus service with high scoring one point and low scoring zero. Since bus service has little control over the roadway network it operates in, bus alternatives were given a low reliability result. The overall result used the final score to rate the ridership potential from very low to very high.

4.3.6 Capital and Operating Costs

For this criterion factors were identified that indicate relative levels of capital investment as well as operations and maintenance (O&M) costs.

For capital costs, the lowest investment involves only purchase of vehicles. New rail lines or guideway built from a Metrolink station to the airport would involve a mid-level capital investment. For the alternatives that run service all the way to Redlands or Claremont, it would be necessary to double-track portions of the San Bernardino Line, so this would involve a high-level capital investment. For an alternative that adds a new light rail between Montclair to ONT, capital cost would be in the high-level range. To add passenger service along the Riverside Line, there is the potential that Union Pacific (the line's owner) would require that a new (third) rail line be constructed for passenger rail through the corridor, which would be a very high capital investment.

For O&M costs, the factors considered include the type of technology and the distance involved. Typically the cost of bus operation is lower than the others, light rail is higher than bus, DMU is somewhat higher than light rail, and commuter rail is highest. Longer distance alternatives would involve higher operating costs roughly proportional to the distance. For a Gold Line extension there would probably be economies of scale that would somewhat mitigate the factor in O&M cost.

4.3.7 Impact on Metrolink Operations

Factors were identified that could disrupt or enhance Metrolink operations. If an alternative adds trains in a Metrolink corridor, this is considered an enhancement because more frequent service is available. It was assumed that the alternatives providing service to distant Metrolink stations would include the regional track improvements necessary to have both enhanced Metrolink operations and the airport-oriented service (such as double-tracking portions of the San Bernardino Line or adding a passenger rail track to the Riverside Line). As a result of this enhancement, none of the alternatives would involve any significant disruption to Metrolink service (except during construction period), and the increased track capacity would make it possible for Metrolink to increase service. Since the Gold Line runs essentially parallel to Metrolink to Pasadena and Los Angeles, an extension to ONT would compete with Metrolink for passengers in that corridor, so this is considered a potential disruption to Metrolink. It was assumed that the alternatives would be designed so that crossover maneuvers and other operations near Metrolink stations would have only minor effects on Metrolink operations.

4.3.8 Potential for Serving Intermediate Activity Centers

Five centers planned for land uses with high activity levels were identified in the area surrounding ONT: the Meredith site, Ontario Center, Ontario Mills, Guasti Center, and the planned multimodal transportation center. The analysis notes which of these could be served by each alternative.

4.3.9 Impact on Potential Regional Transit

Three potential future regional transit systems are being planned or considered through the ONT area: Bus Rapid Transit (BRT), California High Speed Rail (CaHSR), and the Gold Line extension. None of the alternatives would either conflict with or enhance BRT, so BRT was not included as a factor in the analysis.

CaHSR alignment is being studied on the Alhambra Sub west of ONT, on either the Alhambra Sub or the Los Angeles Sub through the ONT area, and on the I-15 Corridor to the south or the San Bernardino Line to the east once it passes the ONT area.[17] Airport access alternatives that use those same corridors have been identified as possible conflicts with CaHSR, however, due to unidentified funding sources and a lack of viable implementation time line, potential conflicts with CaHSR were not further analyzed.

Since the Gold Line could follow the Cucamonga Creek channel, DMU or commuter rail alternatives that would use that alignment are not identified as a potential conflict since these technologies can be converted to LRT, provided they are constructed with a potential future conversion in mind. Alternatives that would build new rail along Cucamonga Creek from either the Upland or the Rancho Cucamonga Metrolink station could be built using technology compatible with light rail and connected with the Gold Line when it is extended from Montclair to ONT. Hence, these alternatives have been considered to possibly support and/or enhance the Gold Line. The "D" alternatives are "modified alignment" of all potential extensions of the Gold Line from Montclair to ONT, so they are considered to support/enhance the Gold Line.

Table 4.3 illustrates the legend to identify the color grades associated with the overall results and **Table 4.4** presents the overall results of all alternatives across all screening criteria. Detailed results for each screening criterion for each alternative are presented in **Appendix C**.

[17] California High-Speed Train – Section Refinement Report, Los Angeles to San Diego via Inland Empire Section, HNTB, July 2013

Table 4.3: Qualitative Summary Evaluation Legend

Screening Criteria	Description	Criteria Ratings				
1	Walk Time to Terminals	Average of 0-3 minutes	Average of 3-5 minutes	Average of 5-10 minutes	Average of 10-20 minutes	Average of >20 minutes
2	Improving Transit Travel Time to ONT	≥ 8 factors improve travel time	6 - 7 factors improve travel time	4 - 5 factors improve travel time	3 factors improve travel time	<3 factor improve travel time
3	Number of Mode Transfers	Average Transfer = 1-2 Min Transfer =1	Average Transfer = 2 – 2.5 Min Transfer =1	Average Transfer = 2 – 2.5 Min Transfer =2	Average Transfer = 2.5 – 3.0 Min Transfer =2	Average Transfer ≥ 3 Min Transfer =3
4	Service for Peak Flight Times	Connects to ≥ 24 peak hours (EB+WB)	Connects to 20 - 24 peak hours (EB+WB)	Connects to 15 - 20 peak hours (EB+WB)	Connects to 10 - 15 peak hours (EB+WB)	Connects to ≤10 peak hours (EB+WB)
5	Ridership Potential	Very high	High	Medium	Low	Very Low
6	Capital and Operating Cost	Very Low (C/O&M: VL/VL)	Low (C/O&M: M/M)	Medium (C/O&M: H/M)	High (C/O&M: H/H)	Very High (C/O&M: VH/VH)
7	Impact on Metrolink Operations	Significant Enhancement	Moderate Enhancement	Little/No Disruption	Moderate Disruption	Significant Disruption
8	Potential for Serving Intermediate Activity Centers	Very High (>4 centers)	High (3 centers)	Medium (2 centers)	Low (1 center)	None (0 centers)
9	Potential Impact on Regional Transit	Supports/ enhances	Possible enhancement	Little/no effect	Possible conflict	Competes/ conflicts

Table 4.4: Qualitative Summary Evaluation of Alternatives

Criteria		Alternatives																														
		A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	B-1	B-2	B-3	B-4	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12	C-13	D-1	D-2	D-3
#1	Walk time to Terminal	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Blue	Blue	Blue	Blue	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow
#2	Improving Transit Travel Time to ONT	Green	Green	Yellow	Green	Yellow	Green	Green	Yellow	Green	Yellow	Yellow	Yellow	Orange	Orange	Orange	Orange	Blue	Blue	Green	Blue	Green	Blue	Blue	Green	Blue	Green	Blue	Green	Green	Blue	Green	Blue
#3	Number of Mode Transfers	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Orange	Yellow	Yellow	Yellow	Orange	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Green	Green	Blue	Blue	Blue
#4	Service for Peak Flight Times	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red	Yellow	Yellow	Yellow	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Blue	Blue	Green	Green	Green
#5	Ridership Potential	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Red	Red	Orange	Orange	Green	Red	Blue	Blue	Blue	Blue	Blue	Green	Green	Green	Green	Green	Blue	Orange	Blue	Blue	Blue	Blue
#6	Capital and Operating Cost	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Blue	Blue	Blue	Blue	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Red	Red	Yellow	Yellow	Yellow
#7	Potential Impact on Metrolink Operations	Yellow	Orange	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Blue	Blue	Orange	Orange	Orange
#8	Potential for Serving Intermediate Activity Centers	Yellow	Yellow	Orange	Yellow	Orange	Yellow	Yellow	Orange	Yellow	Orange	Red	Red	Yellow	Blue	Green	Red	Yellow	Yellow	Orange	Yellow	Orange	Yellow	Yellow	Orange	Yellow	Orange	Yellow	Red	Red	Yellow	Orange	Yellow
#9	Potential Impact on Regional Transit	Green	Green	Yellow	Green	Yellow	Green	Green	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Red	Red	Blue	Blue	Blue

4.4 Results and Findings

4.4.1 Findings from Screening

Several important findings emerge from the screening analysis, and these findings lead to conclusions about which alternatives should be carried forward. The following discussion presents the key findings that emerge from consideration of each criterion and identifies issues needing further study.

Walk time to terminals. Alternatives that drop off and pick up passengers very close to their airport terminal will provide better service and be more attractive for the airport-oriented travelers. In the detailed analysis of alternatives, an objective of the design analysis should be to identify feasible means of bringing rail into the airport terminal area. Also, at least one rail alternative should terminate at the proposed Multimodal Transportation Center rather than in front of the terminals, so the effects of different terminus locations can be assessed.

Transit Travel Time Improvements. Alternatives that offer the greatest potential for improving transit travel time to/from the airport are those that provide a one-seat ride from distant stations to ONT. Other factors that differentiate alternatives for this criterion include providing the airport-oriented service to/from the Metrolink San Bernardino Line (because Metrolink operates all day in both directions on weekdays and weekends on this line, with better frequency of weekday services) and having a service that doesn't have to operate in mixed traffic.

Number of Mode Transfers. Each alternative substantially reduces the number of transfers for travelers in the corridor being served. Also, the alternatives that serve either the corridor to the east of ONT or the corridor to the west reduce the number of transfers for people traveling from the other direction (for example, Alternative A-1 primarily serves airport-oriented travelers to/from the east, but it also provides the opportunity for a traveler from the west to ride Metrolink and transfer to the airport at the Rancho Cucamonga station).

Serving Peak Flight Times. Alternatives with service to distant stations provide the best opportunity to serve a greater number of peak flight times, since existing operating hours of Metrolink service are not suitable for early morning departures or late evening arrivals at ONT. Alternatives that connect with the Metrolink San Bernardino Line can serve a much greater range of flight times than alternatives connecting with the Riverside Line because of the limited amount of Metrolink service on the latter.

Ridership Potential. Population and employment are the most important factors driving the evaluation of ridership potential, and the corridor with the highest projected future (2035) population and employment is the corridor east of the airport that extends all the way to Redlands (Alternatives C-1 to C-5), followed by the corridor west of the airport (Alternatives A-6 to A-10, B-3, C-11, C-13, and D-1 to D-3). The corridor east of ONT that extends only to San Bernardino has somewhat lower projected population and employment, and the corridor extending southeast to Riverside has less than any of the others. The detailed analysis of alternatives needs to include ridership forecasts so the effects of all factors contributing to ridership can be evaluated.

Capital and Operating Costs. The cost of each alternative – both capital and operating cost – depends primarily on the length of the route and the mode of transit. Costs of alternatives with service to distant stations would be substantially higher than that of alternatives that connect a nearby Metrolink station to ONT. Costs of bus alternatives would be much lower than the costs of any of the rail alternatives.

Impact on Metrolink Operations. For alternatives using Metrolink lines to provide service to distant stations, substantial capital investment would be necessary to make the corridor rail capacity sufficient to add service without substantial negative effects on Metrolink operations. So the analysis assumed that these investments would be made as part of those alternatives. Other than that, none of the alternatives would have significant negative operational effects on Metrolink. Extension of the Gold Line to ONT would result in some competition for riders between the Gold Line and Metrolink in the corridor west of ONT. In the detailed analysis of alternatives, an objective of the analysis should be to identify designs that minimize or eliminate potential operational conflicts at or near Metrolink stations and routes.

Potential for Serving Intermediate Activity Centers. As the planned major activity centers are all on the north side of ONT, the alternatives connecting to the Riverside Line do not serve any of them. The bus alternatives have the potential to serve more activity centers because of their routing flexibility (B-2 serves four of the centers and B-3 serves three). Several rail alternatives serve two of the activity centers.

Impact on Potential Regional Transit. Alternatives that add new rail in the Los Angeles Sub, the Alhambra Sub, or the San Gabriel Sub east of I-15 have potential conflicts with the High Speed Rail alignments under study. Alternatives that would use the Cucamonga Creek alignment with a DMU or commuter rail technology have the potential to be converted to LRT technology. When detailed analyses are conducted, plans would include provisions for future catenary poles. Existing Metrolink's track spacing would allow LRT poles to be placed in between the tracks with enough room for a center emergency walkway while conforming with CPUC clearance requirements.

4.5 Conclusions and Recommendations from Screening Analysis

From these findings, the following conclusions have been drawn in relation to the alternatives which should be moved forward for further evaluation:

- The one-seat ride alternatives (Group "C") provide the greatest improvement in convenience for people traveling to/from the airport. However, they have substantially higher costs than the other alternatives. At least one of these alternatives was selected for further study.
- The bus alternatives (Group "B") involve substantially lower cost than any of the rail/guideway alternatives, and they provide more opportunity to serve the major activity centers in the airport area. However, they do not provide a rail connection to the airport, so they do not achieve that objective. Because of the cost saving potential, at least one of these alternatives was selected for further study.
- The Gold Line extension alternatives (Group "D") perform well in terms of improving service and convenience for airport-oriented transit users, in particular for the corridor west of the airport. At least one of these alternatives was selected for further study.
- The alternatives that use or connect to the Los Angeles Sub (A-11, A-12, B-4, C-12, and C-13) do not offer substantial improvements in service and convenience for airport-oriented transit users because of the lower level of Metrolink service in this corridor, and the potential of very high capital investment in the corridor to accommodate additional regional services. These alternatives were therefore eliminated from further evaluation.
- The alternatives that provide a rail connection from the nearby San Bernardino Line stations to the airport (A-1 through A-10) offer the benefits of a direct rail connection to the airport without the high capital and O&M cost of the alternatives with service to distant stations. At least one alternative that connects to the Rancho Cucamonga station and one to the Upland station, was selected for further study.

- After the initial screening all five of the north-south routes for potential rail connection from the San Bernardino Line to ONT seem viable and do not appear to have fatal flaws, so each of these alignments were selected for further study.

Based on the findings and conclusions above, the following six alternatives are recommended for further evaluation:

- Alternative A-3: Provides a rail/guideway connection from the Rancho Cucamonga Station to ONT using the Hermosa Avenue/Turner Street alignment.
- Alternative A-4: Provides a rail/guideway connection from the Rancho Cucamonga Station to ONT using the Deer Creek/Cucamonga Creek alignment.
- Alternative A-7: Provides a rail/guideway connection from the Upland Station to ONT using the rail spur/Cucamonga Creek alignment.
- Alternative B-2: Provides a bus connection from the Rancho Cucamonga Station to ONT by way of the Ontario Center and Ontario Mills.
- Alternative C-5: Provides a regional service serving the corridor to the east of the airport with DMU or commuter rail technology connecting Redlands to ONT using Cleveland Avenue and passing through The Ontario Center.
- Alternative D-1: Provides a regional service serving the corridor to the west of the airport by extending the Gold Line to the airport along the San Gabriel Sub and Cucamonga Creek.

The rail alternatives were selected so that each of the five north-south alignments could be studied, with the two more westerly alignments connecting to alternatives from the west (Upland or Montclair) and the three more easterly alignments connecting to the east (Rancho Cucamonga or Redlands). It is to be noted, that each rail route could use different type of technology (DMU/LRT etc.) Alternative B-2 was selected as the bus option because connecting to the Metrolink San Bernardino Line at the Rancho Cucamonga station involves less distance and shorter travel time to ONT than the Upland station, and because the B-2 route has the most potential to serve riders traveling to intermediate locations.

Chapter 5 - Alternatives for Detailed Analysis

5.1 Description of Alternatives

5.1.1 Alternative A-3

The A-3 alignment is approximately a 4.6 mile rail alignment that begins at the Rancho Cucamonga Metrolink Station and travels west along the south side of the San Gabriel Subdivision (San Bernardino Metrolink Line) before turning south onto Hermosa Avenue/Turner Avenue. Continuing along Hermosa Avenue/Turner Avenue, the alignment crosses I-10, turning east to run along Guasti Road, then south through the existing Ontario Airport (ONT) parking lot, crossing over the UPRR tracks and finally turning west on John Bangs Drive to the ONT terminals along Terminal Way. The technology assumed for this alternative is DMU.

The alignment will run adjacent to a variety of land uses, ranging from residential, industrial, commercial, and office to open space. The alignment uses ROW controlled by the Cities of Rancho Cucamonga and Ontario, railroads (Metrolink and UPRR) and the San Bernardino County Flood Control District.

Beginning from 4th Street and moving southward, the alignment will be elevated and will include grade separations over the following facilities: 4th Street, Inland Empire Boulevard, I-10, Guasti Road, UPRR tracks, East Airport Drive, John Bangs Drive and Terminal Way. At-grade crossings are assumed for the following streets: 8th Street and 6th Street. It should be noted that, during review of the engineering concepts the City of Rancho Cucamonga indicated that it would likely require grade separations at arterial crossings and would not likely approve at-grade track alignments due to significant negative impacts to roadway capacity and property access.

5.1.2 Alternative A-4

Similar to A-3, Alternative A-4 is a 4.8 mile rail alignment that begins at the Rancho Cucamonga Metrolink Station and travels west along the south side of the San Gabriel Subdivision (San Bernardino Metrolink Line), turning south to run along either side of the Deer Creek, converging east of Archibald Avenue, before crossing I-10 and the UPRR tracks, and finally turning east to serve the airport terminals along Terminal Way. The technology assumed for this alternative is DMU.

The alignment will run adjacent to industrial, office and open space. The alignment uses ROW controlled by cities, railroads and the flood control district.

Beginning from 4th Street and moving southwards, the alignment will be elevated and will include grade separations over the following facilities: 4th Street/Hermosa Avenue intersection, Archibald Avenue, Inland Empire Boulevard, I-10, Holt Boulevard, Guasti Road, UPRR tracks, East Airport Drive and Terminal Way. At-grade crossings are assumed for the following streets: 8th Street and 6th Street. Similar to Alternative A-3, it should be noted that, during review of the engineering concepts the City of Rancho Cucamonga indicated that it would likely require grade separations at arterial crossings and would not likely approve at-grade track alignments due to significant negative impacts to roadway capacity and property access.

5.1.3 Alternative A-7

Alternative A-7 is a 6.7 mile rail connection that starts at the Upland Metrolink Station and travels east along the south side of the San Gabriel Subdivision (San Bernardino Metrolink Line), then turns south on the existing BNSF industrial lead, crossing over and continuing along Deer Creek, crossing I-10, the UPRR tracks, and finally turning east to serve the ONT terminals along Terminal Way. The technology assumed for this alternative is DMU.

The alignment is adjacent to residential, industrial, commercial, and open space. The alignment uses ROW controlled by cities, railroads and the flood control district.

Beginning from 4th Street and moving southwards, the alignment will be elevated and will include grade separations over the following facilities: 4th Street, Archibald Avenue, Inland Empire Boulevard, I-10, Holt Boulevard, Guasti Road, UPRR tracks, East Airport Drive and Terminal Way. At-grade crossings are assumed for the following streets: South Campus Avenue, North Grove Avenue, North Baker Avenue, Vineyard Avenue, Hellman Avenue, 8th Street, and 6th Street. As with other alternatives, during review of the engineering concepts the City of Rancho Cucamonga indicated that it would likely require grade separations at arterial crossings and would not likely approve at-grade track alignments due to significant negative impacts to roadway capacity and property access.

5.1.4 Alternative B-2

B-2 is the only bus alternative that is being evaluated as part of this analysis. Beginning at the Rancho Cucamonga Metrolink station, this bus route alignment would travel south along Milliken Avenue, west on Inland Empire Boulevard, south on Archibald Avenue, and then on Terminal Way to serve the ONT terminals.

5.1.5 Alternative C-5

The C-5 alignment, a rail connection to ONT, would be an extension of the proposed DMU service traveling westward from Redlands to San Bernardino. It would use the existing San Gabriel Subdivision (San Bernardino Metrolink tracks) from San Bernardino to the Rancho Cucamonga Metrolink Station, then turn south along Cleveland Avenue, then traveling southwest through The Ontario Center to cross I-10 just east of Haven Avenue. After crossing I-10, the alignment continues south parallel to Haven Avenue, turning west to travel along John Bangs Drive and Terminal Way to serve the ONT terminals. The alignment length for alternative C-5 is 18.4 miles (ONT to Rancho Cucamonga Station is 3.8 miles; Rancho Cucamonga Station to San Bernardino is 14.6 miles), however, the length the alignment from the University of Redlands to ONT is 28.6 miles)

The alignment will traverse adjacent to industrial, commercial, office and open space. The alignment uses ROW controlled by cities, railroads and the flood control district.

Beginning from 4th Street and moving southwards, the alignment will be elevated and will include grade separations over the following facilities: 4th Street, Concours Street, Via Asti, Inland Empire Boulevard, Porsche Way, I-10, Guasti Road, UPRR tracks, East Airport Drive, Haven Avenue, and Terminal Way. At-grade crossings are assumed for the following streets: 7th Street and 6th Street. As with other alternatives, during review of the engineering concepts the City of Rancho Cucamonga indicated that it would likely require grade separations at arterial crossings and would not likely approve at-grade track alignments due to significant negative impacts to roadway capacity and property access. For this alignment in particular, the City of Rancho Cucamonga also expressed concerns regarding noise impact created by rail alignments along city streets in close proximity to developments.

This alternative would serve all stations on the Redlands Rail line and all Metrolink stations on the San Bernardino line from San Bernardino to Rancho Cucamonga.

5.1.6 Alternative D-1

The D-1 alignment would generally follow the alignment of Alternative 2A in the 2008 Gold Line extension feasibility study, except in this study the alignment will extend south of its previously proposed terminus at the Ontario Multimodal Center to serve the ONT terminal area similar to the other rail alternatives. In general, from Montclair this alignment will run east along the south side of the existing San Bernardino Metrolink tracks, then south along both sides of the Cucamonga Canyon Channel for a distance, before converging to cross I-10 and the UPRR tracks, finally turning east to serve the ONT terminals along Terminal Way. The total alignment length from Montclair to ONT is 7.7 miles. Even though an extension of the Gold Line would likely be implemented using light rail technology and operating the service as part of the Gold Line, for purposes of analyzing this alternative DMU technology has been assumed so the cost analysis will produce results that can be more directly compared to the other alignment alternatives. The analysis of capital and operating costs also includes information on the cost differential if this alternative were to be built and operated as LRT.

The alignment is adjacent to residential, industrial, commercial and open space. The alignment uses ROW controlled by cities, railroads and the flood control district. Similar to the other rail alignments, beginning from 4th Street and moving south, the alignment for D-1 will be elevated and will include grade separations over the following facilities: 4th Street, Inland Empire Boulevard, I-10, Holt Boulevard, Guasti Road, UPRR tracks, East Airport Drive and Terminal Way. At-grade crossings are assumed for the following streets: Central Avenue, Benson Avenue, Mountain Avenue, San Antonio Avenue, Euclid Avenue, 2nd Avenue, Campus Avenue, Grove Avenue, Baker Avenue, Vineyard Avenue, East 8th Street, East 6th Street, and Hellman Avenue. As with other alternatives, during review of the engineering concepts the City of Rancho Cucamonga indicated that it would likely require grade separations at arterial crossings and would not likely approve at-grade track alignments due to significant negative impacts to roadway capacity and property access.

For reference, grade separation assessment at locations where each rail alignment intersects an arterial is presented in **Section 6.3**.

The six recommended alternatives are shown on the map in **Figure 5.1**.

5.2 Intermediate Station Locations

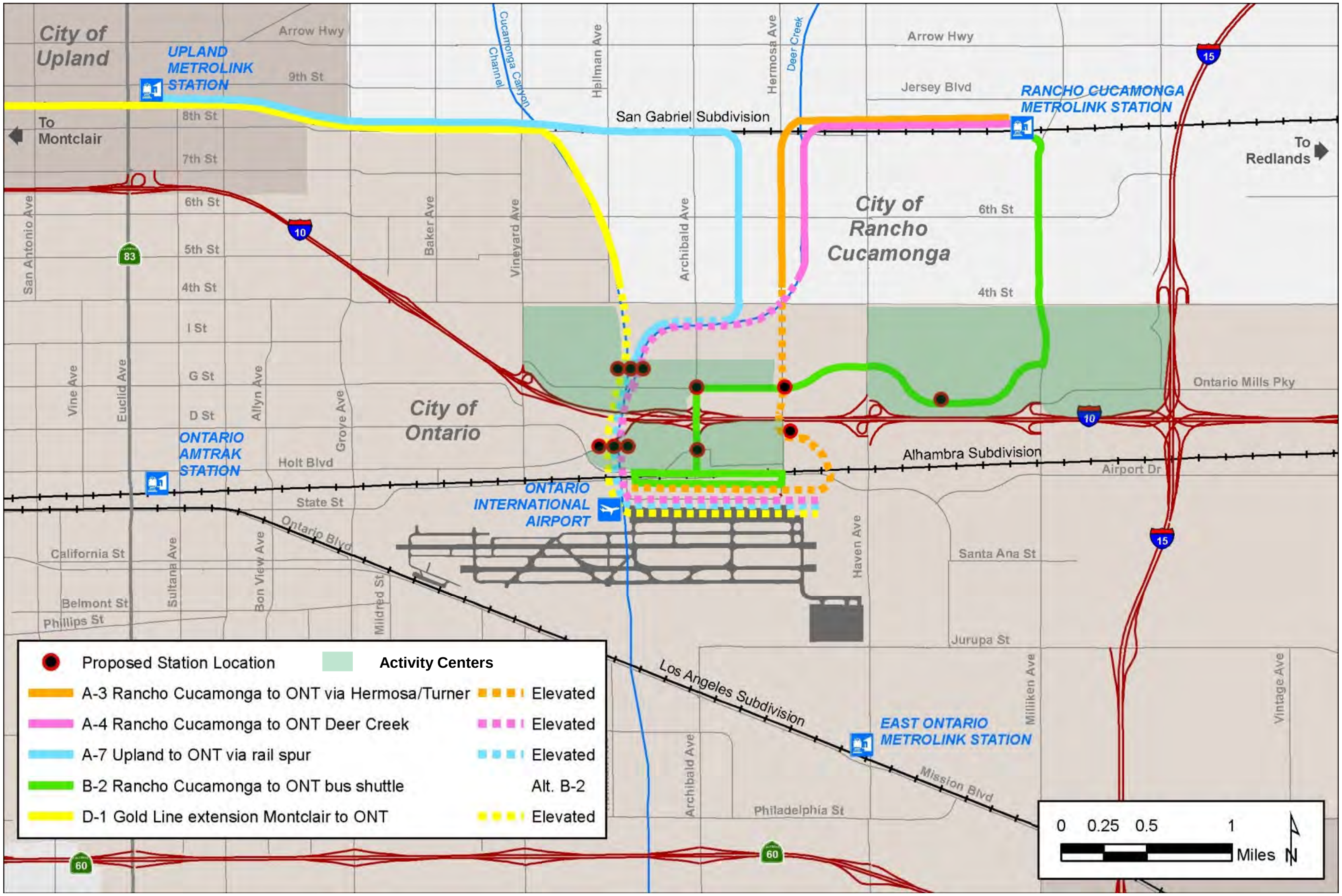
Figure 5.1 presents each of the six transit alignments along with station locations and activity areas these stations are likely to serve.

New intermediate stations between the ONT terminals and the Metrolink Line are identified as part of this study to enable people in the high activity centers north of the airport to access the regional rail system. Criteria for locating intermediate stations for each alignment were determined based on whether the alternative was a rail or a bus alignment and are presented below.

Rail Alternatives:

- Locate stations where alignment passes through or adjacent to major activity centers (Meredith, Ontario Center, Guasti, Multimodal Transportation Center).
- Maximum of two intermediate stations between the Metrolink station (Rancho Cucamonga or Upland) and the ONT terminal area.
- Minimum of one station north of I-10 on each alignment. If an alignment does not pass one of the activity centers, locate an intermediate station near the area of maximum planned intensity.

Figure 5.1: Transit Alternatives with Station Locations and Activity Areas



Source: HDR, 2014

Bus Alternative:

- Locate stops where route passes through or adjacent to major activity centers (Meredith, Ontario Center, Guasti, Multimodal Transportation Center).
- Maximum of three intermediate stops between the Rancho Cucamonga Metrolink station and the ONT terminal area.
- Do not provide stops for retail activity centers (Ontario Mills, east end of Ontario Center).

Based on those criteria, the following were selected as intermediate station locations for each alignment:

Alternative A-3

The alignment has two intermediate stations. One is located on Hermosa Avenue between 4th Street and Inland Empire Boulevard, and the other is located south of I-10 along Guasti Road. Both stations are aerial stations.

Alternaive A-4

The alignment has two intermediate stations, one located just north of Inland Empire Boulevard and the other just north of Guasti Road, east of the Cucamonga Creek Channel. Both stations are aerial stations.

Alternative A-7

The alignment has two intermediate stations, one of which is located just north of Inland Empire Boulevard, and the other is located just north of Guasti Road. Both stations are aerial stations.

Alternative B-2

Three intermediate stops have been assumed for this alignment: along Inland Empire Boulevard near Mercedes Lane (east of Haven Avenue); at the intersection of Archibald Avenue and Inland Empire Boulevard; and at the intersection of Archibald Avenue and Guasti Road.

Alternative C-5

This alternative would have one intermediate station between the Rancho Cucamonga Metrolink station and the ONT terminals, within The Ontario Center near Citizen's Business Bank Arena. This station is an aerial station.

Alternative D-1

For this alternative, two intermediate stations, one located just north of Inland Empire Boulevard and the other just north of Guasti Road, west of the Cucamonga Creek Channel. Both stations are aerial stations.

5.3 Characteristics of Alternatives

Table 5.1 summarizes the key elements of each alternative, including locations of intermediate stations.

Table 5.1: Summary of Alternatives

Alternative	Mode/Technology	Route	Terminus	Length (miles)	Stations	Grade Separated Crossings
A-3	Rail (DMU)	San Gabriel Subdivision / Hermosa Avenue / Turner Avenue / Guasti Road	Rancho Cucamonga Metrolink Station	4.6	• Between 4th Street and Inland Empire Boulevard • South of I-10 on Guasti Road	4th Street Inland Empire Boulevard I-10 Guasti Road UPRR tracks John Bangs Drive Terminal Way
A-4	Rail (DMU)	San Gabriel Subdivision / Deer Creek / Cucamonga Canyon Channel	Rancho Cucamonga Metrolink Station	4.8	• North of Inland Empire Boulevard, east of Deer Creek • North of Guasti Road, east of Cucamonga Canyon Channel	4th Street/Hermosa Avenue Archibald Avenue Inland Empire Boulevard I-10 Holt Avenue Guasti Road UPRR tracks East Airport Drive Terminal Way
A-7	Rail (DMU)	San Gabriel Subdivision / Rail Spur / Deer Creek / Cucamonga Canyon Channel	Upland Metrolink Station	6.7	• North of Inland Empire Boulevard, east of Deer Creek • North of Guasti Road, east of Cucamonga Canyon Channel	4th Street Archibald Avenue Inland Empire Boulevard I-10 Holt Avenue Guasti Road UPRR tracks East Airport Drive Terminal Way
B-2	Bus	Milliken Avenue / Inland Empire Boulevard / Archibald Avenue	Rancho Cucamonga Metrolink Station	5.7	• Inland Empire Boulevard, near Mercedes Lane • Intersection of Archibald Avenue and Inland Empire Boulevard • Intersection of Archibald Avenue and Guasti Road	N/A
C-5	Rail (DMU)	Redlands Rail / San Gabriel Subdivision / Cleveland Avenue / Haven Avenue	University of Redlands	18.4	• Within The Ontario Center, near Citizens' Business Bank Arena	4th Street Concours Street Via Asti Inland Empire Boulevard Porsche Way I-10 Guasti Road UPRR tracks East Airport Drive Haven Avenue Terminal Way
D-1	Rail (DMU)	Metrolink SB / Cucamonga Creek – Alt. 2A	Montclair	7.7	• Between 4th Street and Inland Empire Boulevard • South of I-10 on Guasti Road	4th Street Inland Empire Boulevard I-10 Holt Avenue Guasti Road UPRR tracks East Airport Drive Terminal Way

Note: Length of C-5 from University of Redlands to ONT is 28.6 miles, while that from San Bernardino to ONT is 18.4 miles (ONT to Rancho Cucamonga Station is 3.8 miles; Rancho Cucamonga Station to San Bernardino is 14.6 miles)

5.4 Operations

Operating characteristics were based on the type of regional rail system that each alternative would connect to. Three general types of operational parameters were assumed – for systems connecting to the nearby Metrolink stations, for an extension of the Redlands Passenger Rail, and for an extension of the Gold Line from Montclair to ONT.

5.4.1 Connecting to Nearby Metrolink Stations

Alternatives A-3, A-4, A-7 and B-2 provide transit connection with Metrolink stations. Hence, for A-3, A-4 and B-2, operating schedules should coincide with existing Metrolink arrival and departure times at Rancho Cucamonga, and for A-7 the operation should be in sync with the arrival and departure schedule of Metrolink trains at the Upland station. The assumed transfer time between Metrolink trains and the airport service is five minutes, though it could be slightly more or less than that if an eastbound and a westbound train arrives at the station within five minutes of each other.

Thus, the earliest start of service (from Rancho Cucamonga) for A-3, A-4 and B-2 is at 4:27 am, 7:27 am, and 7:24 am on weekdays, Saturdays and Sundays, respectively. For A-7, the earliest start of service (from Upland) is at 4:34 am, 7:18 am, and 7:31 am on weekdays, Saturdays and Sundays, respectively.

The last connection for A-3, A-4 and B-2 is at 12:05 am, 12:39 am, and 10:14 pm on weekdays, Saturdays and Sundays, respectively. For A-7, last service is at 11:58 pm, 12:32 am, and 10:07 pm on weekdays, Saturdays and Sundays, respectively.

5.4.2 Connecting to Proposed Redlands Passenger Rail

Alternative C-5, which is an extension of Redlands Passenger Rail (RPR) to Rancho Cucamonga and ONT, will share tracks and other pertinent infrastructure with Metrolink services on the San Bernardino Line. Trains will operate every half hour during the peak and every hour during off-peak and weekends, consistent with the planned operating schedule for Redlands Passenger Rail. Peak hours of operations are from 6:00 am to 9:00 am in the morning and 3:00 pm to 7:00 pm in the afternoon.

The first weekday and weekend service from the University of Redlands is at 5:00 am; while that from ONT is at 4:55 am. The last weekday service departing the University of Redlands is at 10:00 pm, while that from ONT is at 9:55 pm. These start and end times are consistent with the planned RPR service between Redlands and San Bernardino, however, if Alternative C-5 were built to ONT, the service hours could be adjusted to better serve air travelers.

In addition, due to positive train control (PTC) requirements, a minimum of 20 minutes is assumed to change operating ends of the train at each terminus.

5.4.3 Proposed Gold Line Extension

Operational characteristics for D-1 are assumed to match existing Gold Line schedules. Weekday and weekend headways of 6 minutes are assumed during the peak periods (6:00 am to 9:00 am; 3:00 pm to 7:30 pm), while during the rest of the day, headways are in the range of 10 to 15 minutes. It is assumed that the first train to arrive at ONT is at 4:25 am and the first to depart is at 4:36 am. The last train to reach ONT is at 2:41 am and the last to depart ONT is at 2:09 am.

Chapter 6 - Methodologies and Assumptions for Alternatives Analysis

6.1 Ridership Forecast Methodology

For the rail ridership estimates, a Direct Ridership Model (DRM) was utilized. The DRM models incorporate station area characteristics and compare ridership generated at the station level from existing systems to that occurring at the station level for this proposed system. For estimating ridership for the rubber tired alternative, ridership was estimated by applying a mode split model which estimated the percentage of riders that would be captured by that system.

The specifics of these ridership forecasts are discussed further below:

6.1.1 Rail Direct Ridership Models

For this effort, three different types of Direct Ridership Models were utilized. In order to estimate local ridership from intermediate stations, a Light Rail Transit (LRT) DRM model was applied. This LRT DRM, based on an existing DRM ridership model from the Sacramento LRT system was utilized to estimate intermediate ridership for light rail and rail/fixed guideway systems. For heavy rail intermediate stations, the existing Bay Area Caltrain Heavy/ Commuter Rail DRM model was applied. These DRMs were chosen since they are models that have been successfully applied to forecast ridership for similar situations in California.

Some of the key input variables that were reviewed and refined to estimate intermediate station ridership include:

Land Use

- Half Mile Walkshed (if feasible), including:
    - Households
    - Total Jobs
    - Retail Jobs
- Catchment Area – same quantities as above
- Catchment Area outside ½ mile – same quantities as above
    - This is equal to (catchment land use) – (½ mile land use). It is meant to capture the stations' captive markets that aren't within walking distance and can potentially be used in combination with the half mile land use to show diminishing returns as distance from the station increases.
- Jobs / Housing Ratio
- Job Mix (Retail / Non-Retail) Ratio

Station Characteristics

- Station automobile parking spaces (total)
- Station automobile parking spaces by type (reserved, free, paid, carpool, midday)
- Station bicycle parking spaces (total)
- Station bicycle parking spaces by type (racks, lockers)
- Station neighborhood on-street unrestricted (i.e. no meter, no time limit) parking supply within ¼ mile and/or ½ mile.

- Station parking spaces minus the sum of nearest neighbor stations' parking spaces
- Indicator – presence or absence of a parking lot

Accessibility Measures

- Feeder transit frequency
- Station surroundings (underground / overground integrated / near freeway integrated / near freeway isolated)
- Number of station access points
- Number of directions from which station can be directly accessed
- Polygons within ½ mile in the street network
- Station "typology" with respect to pedestrian accessibility (subjective – try to quantify it as best as you can)

System Characteristics

- Number of routes
- Number of trains leaving the station per hour
- Number of transfers required
- In-vehicle travel time weighted by some destination station characteristic (such as jobs)
- Fare for in-vehicle travel weighted by some destination station characteristic (such as jobs)
- Transit vs. Auto "impedance" weighted by some destination station characteristic (such as jobs) – one would calculate Transit and Auto travel times and costs for each O-D combination, converting time to cost with some generally-accepted factor
- Parking fee

6.1.2 LRT Intermediate Station Forecasts

When applying the above referenced variables in developing the ridership model for the LRT system, the following key variables were found to explain the majority of the ridership potential for the Sacramento LRT system (R-squared value of 0.81, showing a good correlation between ridership and the following variables):

- Number of on-site parking spaces provided
- Number of feeder bus routes
- Population and employment within ¼ mile of the station

The following coefficients from the regression model were applied to develop ridership at the intermediate station:

- Constant: -63.39
- Parking Spaces: +1.65
- Number of Bus Routes Serving the Station: +116.8
- Population and Employment within ¼ mile: +0.14

6.1.3 Heavy/Commuter Rail Intermediate Station Forecasts

When applying the potential variables in developing the ridership model for the Heavy/ Commuter rail system, the following key variables were found to explain the majority of the ridership potential for the Caltrain system (R-squared value of 0.93, showing a good correlation between ridership and the following variables):

- Number of trains per hour
- Number of shuttle routes connecting to the station
- Number of on-site parking spaces provided
- Number of off-site parking spaces provided

The following coefficients from the regression model were applied to develop ridership at the intermediate station for Alternative C-5:

- Trains per Hour:+72.44
- Number of Shuttle Routes: +20.674
- On-Site Parking: +2.81
- Off-Site Parking: +1.44

6.1.4 Airport-Related Rail Ridership

To estimate airport-related ridership, a new DRM model was created that utilizes data from existing airports that are served by rail transit. Review of the regression assessment results showed that some airports skewed the results in a direction that was inappropriate given some of the unique characteristics of the airport locations. For example, San Francisco has extremely high ridership but some of the other variables for the area are low (such as population). As such, the ridership estimates included only data from airports where the relationship of metropolitan characteristics were found through the regression assessment to show ridership trends that is expected to be consistent with the Ontario Airport. Therefore, although data from all of the airports listed below were reviewed and evaluated in the regression assessment, only airports that are listed in ***bold-italic*** font are airports where their characteristics were incorporated into the regression assessment.

- ***Chicago O'Hare (ORD)***
- ***Seattle-Tacoma (SEA)***
- ***Portland (PDX)***
- ***Indiana South Bend (SBN)***
- ***Philadelphia (PHL)***
- ***Reagan (DCA)***

- Chicago Midway (MDW)
- Miami (MIA)
- Phoenix Sky Harbor (PHX)
- San Francisco (SFO)
- Boston (BOS)

Variables that were reviewed to determine what characteristics affected airport ridership include:

- Annual airport ridership (MAP)

- Transit system service population
- Average headway or number of trains per hour
- Transit route ridership per route mile
- Presence of feeder bus service
- Metropolitan population
- Transit fare
- Number of rail lines linked to the system
- Total rail network ridership
- Total fixed guideway directional route miles
- Speed of the transit system
- Cost of parking

A regression analysis was completed to determine which of the variables above affect airport-related ridership. The key factors, and their respective coefficients, were applied to estimate ridership for the rail connection alternatives described above (R-squared value of 0.99, showing a strong correlation between ridership and the following variables):

- MAP: +110.35
- Number of rail routes linked: +252.35
- Network ridership per route mile: +724.03
- Number of trains per hour: +105.04
- Metropolitan service area (MSA) population: -0.00017

The negative correlation between MSA population and the ridership forecasts should be noted. Review of the data indicates that this is a "correction" for the high coefficients associated with the number of rail routes linked and the network ridership per route mile. As such, the resulting forecasts provide reasonable numbers and, given the high correlation, are considered accurate for this project.

6.1.5 Rubber-Tired Ridership Estimates

The DRM methods described above relate to rail connections to the airport. However, Alternative B-2 is a Rubber Tire alternative (bus or shuttle) that would connect the Ontario Airport to the Rancho Cucamonga Metrolink Station. Unfortunately, there are no DRM-type models for rubber-tire transit connection alternatives.

Therefore, to estimate ridership associated with a shuttle or bus system, ridership potential was estimated based on mode split estimates to and from the airport and assuming a 1% mode capture of the airport MAP for that travel mode. This 1% mode split was compared back to the rail DRM ridership information to ensure that the rubber-tired alternative was "less attractive" than a fixed-guideway alternative (which typically attract higher ridership than a bus/shuttle system along similar routes).

In addition to the airport-related rubber-tired ridership estimates, a bus or shuttle also has the potential to "capture" ridership at intermediate stops along the route. To estimate this ridership, the regional travel demand forecasting model was utilized to estimate total trip generation at each stop and, similar to the airport methodology described above, a 0.5% mode capture was assumed at each location.

6.2 Ridership Results

6.2.1 Airport Related Ridership

The ridership methodologies described above were incorporated to develop ridership estimates for each of the alternatives. Since the passenger activity level (in MAP) at the airport will affect ridership of the rail extension, ridership estimates were created for the existing Ontario Airport use (4.3 MAP), 5.0 future MAP, and in 5.0 MAP increases up-to 30 MAP. **Table 6.1** summarizes the daily ridership forecasts for each project alternative.

In addition to daily ridership, peak hour directional ridership was also estimated by utilizing the peak hour characteristics from the regional travel demand model. Specifically, the regional model was used to estimate the percentage of airport trip generation that would occur in each peak hour, which was then applied to the daily DRM forecasts described above. **Table 6.2** and **Table 6.3** summarize the peak hour boardings and alightings.

Table 6.1: Airport Daily Ridership Estimates

Alternative	Existing MAP (4.3)	5 MAP	10 MAP	15 MAP	20 MAP	25 MAP	30 MAP
Ridership Estimates							
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway)	185	264	815	1,367	1,919	2,471	3,023
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway)	185	264	815	1,367	1,919	2,471	3,023
A-7: Rancho Cucamonga to Ontario via Rail Spur	185	264	815	1,367	1,919	2,471	3,023
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle	118	136	274	411	548	685	822
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail)	290	369	921	1,472	2,024	2,576	3,128
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel	827	906	1,458	2,010	2,562	3,113	3,665
MAP Daily Mode Share Estimates							
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway)	2%	2%	3%	3%	4%	4%	4%
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway)	2%	2%	3%	3%	4%	4%	4%
A-7: Rancho Cucamonga to Ontario via Rail Spur	2%	2%	3%	3%	4%	4%	4%
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle	1%	1%	1%	1%	1%	1%	1%
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail)	2%	3%	3%	4%	4%	4%	4%
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel	7%	7%	5%	5%	5%	5%	4%

Table 6.2: Airport AM Peak Hour Boardings and Alightings

Ridership Estimates by Alignment		Existing MAP (4.3)	5 MAP	10 MAP	15 MAP	20 MAP	25 MAP	30 MAP
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway)	Alighting	7	10	31	52	73	94	116
	Boarding	4	6	17	29	41	53	65
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway)	Alighting	7	10	31	52	73	94	116
	Boarding	4	6	17	29	41	53	65
A-7: Rancho Cucamonga to Ontario via Rail Spur	Alighting	7	10	31	52	73	94	116
	Boarding	4	6	17	29	41	53	65
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle	Alighting	5	5	10	16	21	26	31
	Boarding	3	3	6	9	12	15	18
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail)	Alighting	11	14	35	56	77	98	120
	Boarding	6	14	20	32	43	55	67
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel	Alighting	32	35	56	77	98	119	140
	Boarding	18	19	31	43	55	67	79

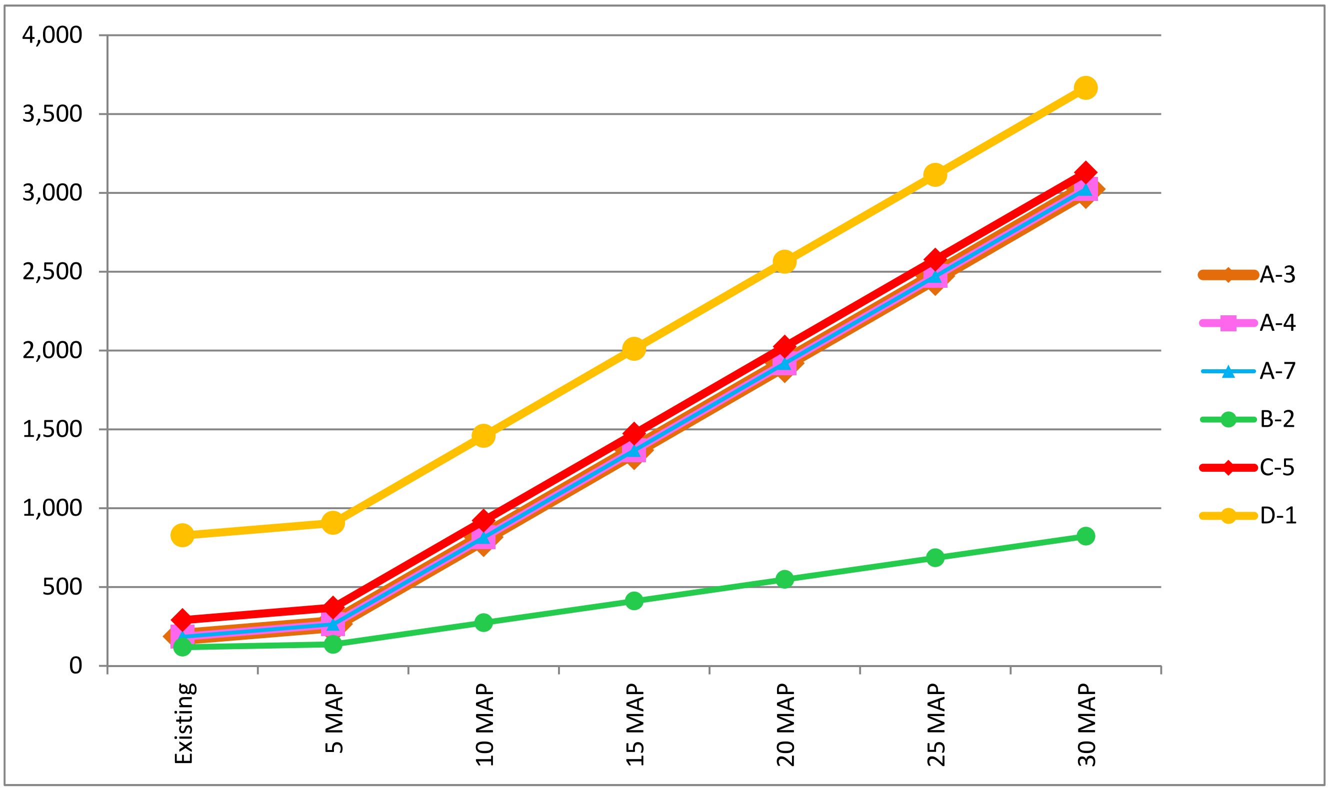
Table 6.3: Airport PM Peak Hour Boardings and Alightings

Ridership Estimates by Alignment		Existing MAP (4.3)	5 MAP	10 MAP	15 MAP	20 MAP	25 MAP	30 MAP
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway)	Alighting	10	14	43	72	101	130	159
	Boarding	11	16	49	82	115	148	181
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway)	Alighting	10	14	43	72	101	130	159
	Boarding	11	16	49	82	115	148	181
A-7: Rancho Cucamonga to Ontario via Rail Spur	Alighting	10	14	43	72	101	130	159
	Boarding	11	16	49	82	115	148	181
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle	Alighting	6	7	14	22	29	36	43
	Boarding	7	8	16	25	33	41	49
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail)	Alighting	15	19	48	77	106	135	164
	Boarding	17	22	55	88	121	154	187
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel	Alighting	43	48	76	105	134	163	192
	Boarding	49	54	87	120	153	186	219

The airport related ridership data indicate that, with the existing airport activity level, Alternative D-1 shows the highest ridership potential to the airport given the higher existing ridership on the Gold Line and higher service frequency to the airport. Alternative D-1 is expected to generate 827 daily boardings/alightings at the airport today. However, as MAP at the airport increases, the other rail alternatives "converge" toward expected ridership of Alternative D-1 where all of the rail alignment alternatives are expected to generate between 3,000 and 3,700 riders per day under a 30 MAP scenario at Ontario Airport, as shown in **Figure 6.1**.

The bus ridership, assuming a 1% mode share capture, would generate roughly 120 riders per day currently, and would grow to approximately 820 riders per day under a 30 MAP scenario.

Figure 6.1: Airport Ridership in Relation to ONT Air Passenger Demand



Source: HDR 2014

6.2.2 Intermediate Station Ridership

Table 6.4 summarizes the intermediate station area ridership that was estimated using either a DRM model (for rail connections) or mode share estimates (for the rubber-tired alternative). Peak hour ridership estimates were developed by reviewing trip generation estimates from the regional travel demand forecasting model to identify the percent of trips, and directionality of those trips, relative to the daily estimated ridership. As shown in the Table, Alternatives A-4 and A-7 have the greatest potential to capture intermediate ridership along the route.

Table 6.4: Intermediate Station Ridership Estimates

Alternative	Daily Station Ridership	Peak Hour Ridership			
		AM Alightings	AM Boardings	PM Alightings	PM Boardings
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway) **Stop 1:** Hermosa Ave north of I-10	152	5	8	8	6
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway) **Stop 2:** South of I-10 at Future Multi Modal Center	241	17	4	6	16
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway) **Stop 1:** Deer Creek north of Inland Empire Blvd	154	7	3	5	8
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway) **Stop 2:** South of I-10 at Future Multi Modal Center	337	13	6	11	17
A-7: Rancho Cucamonga to Ontario via Rail Spur **Stop 1:** Deer Creek north of Inland Empire Blvd	154	7	3	5	8
A-7: Rancho Cucamonga to Ontario via Rail Spur **Stop 2:** South of I-10 at Future Multi Modal Center	337	13	6	11	17
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle **Stop 1:** Inland Empire Blvd east of Haven Ave	204	9	4	7	11
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle **Stop 2:** Inland Empire Blvd at Archibald Ave	82	4	2	3	5
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle **Stop 3:** Archibald Ave south of I-10 at Future Multi Modal Center	144	10	3	4	10
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail) **Stop 1:** Ontario Center at Concourse St	391	17	7	13	22
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel **Stop 1:** Cucamonga Canyon Channel at Inland Empire Blvd	154	7	3	5	8
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel **Stop 2:** South of I-10 at Future Multi Modal Center	252	10	4	8	13

6.2.3 Total Ridership Estimates

Table 6.5 summarizes the total daily ridership estimates, accounting for both the airport-related ridership and intermediate station ridership. To convert daily ridership to annual ridership, a conversion factor was applied that was derived from comparing daily and annual ridership along the existing Gold Line route. This conversion factor was applied to the daily ridership estimates in **Table 6.5**, and **Table 6.6** summarizes the total annual estimated ridership.

Table 6.5: Total Daily Ridership Estimates

Alternative	Existing MAP (4.3)	5 MAP	10 MAP	15 MAP	20 MAP	25 MAP	30 MAP
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway)	578	657	1,208	1,760	2,312	2,864	3,416
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway)	676	755	1,306	1,858	2,410	2,962	3,514
A-7: Upland to Ontario via Rail Spur	676	755	1,306	1,858	2,410	2,962	3,514
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle	548	566	704	841	978	1,115	1,252
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail)	681	760	1,312	1,863	2,415	2,967	3,519
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel	1,233	1,312	1,864	2,416	2,968	3,519	4,071

Table 6.6: Total Annual Ridership Estimates

Alternative	Existing MAP (4.3)	5 MAP	10 MAP	15 MAP	20 MAP	25 MAP	30 MAP
A-3: Rancho Cucamonga to Ontario via Hermosa/Turner (Fixed Guideway)	183,230	208,270	382,940	557,920	732,900	907,890	1,082,870
A-4: Rancho Cucamonga to Ontario via Deer Creek (Fixed Guideway)	214,290	239,340	414,000	588,990	763,970	938,950	1,113,940
A-7: Upland to Ontario via Rail Spur	214,290	239,340	414,000	588,990	763,970	938,950	1,113,940
B-2: Rancho Cucamonga to Ontario via Bus or Shuttle	173,720	179,420	223,170	266,600	310,030	353,460	396,880
C-5: Redlands to Ontario via Cleveland Avenue/Ontario Center (DMU/Commuter Rail)	215,880	240,920	415,900	590,570	765,560	940,540	1,115,520
D-1: Gold Line Extension from Montclair to Ontario via Cucamonga Canyon Channel	390,950	415,970	590,880	765,792	940,702	1,115,613	1,290,523

As shown in **Table 6.6**, if implemented today, Alternative D-1 would have the highest ridership potential with approximately 311,000 annual passengers. Alternative B-2 would attract the fewest riders with 173,720 annual passengers. However, as activity increases to 30 MAP at the airport, all of the rail alternatives would be projected to attract similar annual ridership (between 1.08 and 1.21 million passengers), while Alternative B-2 would attract the fewest with approximately 397,000 passengers.

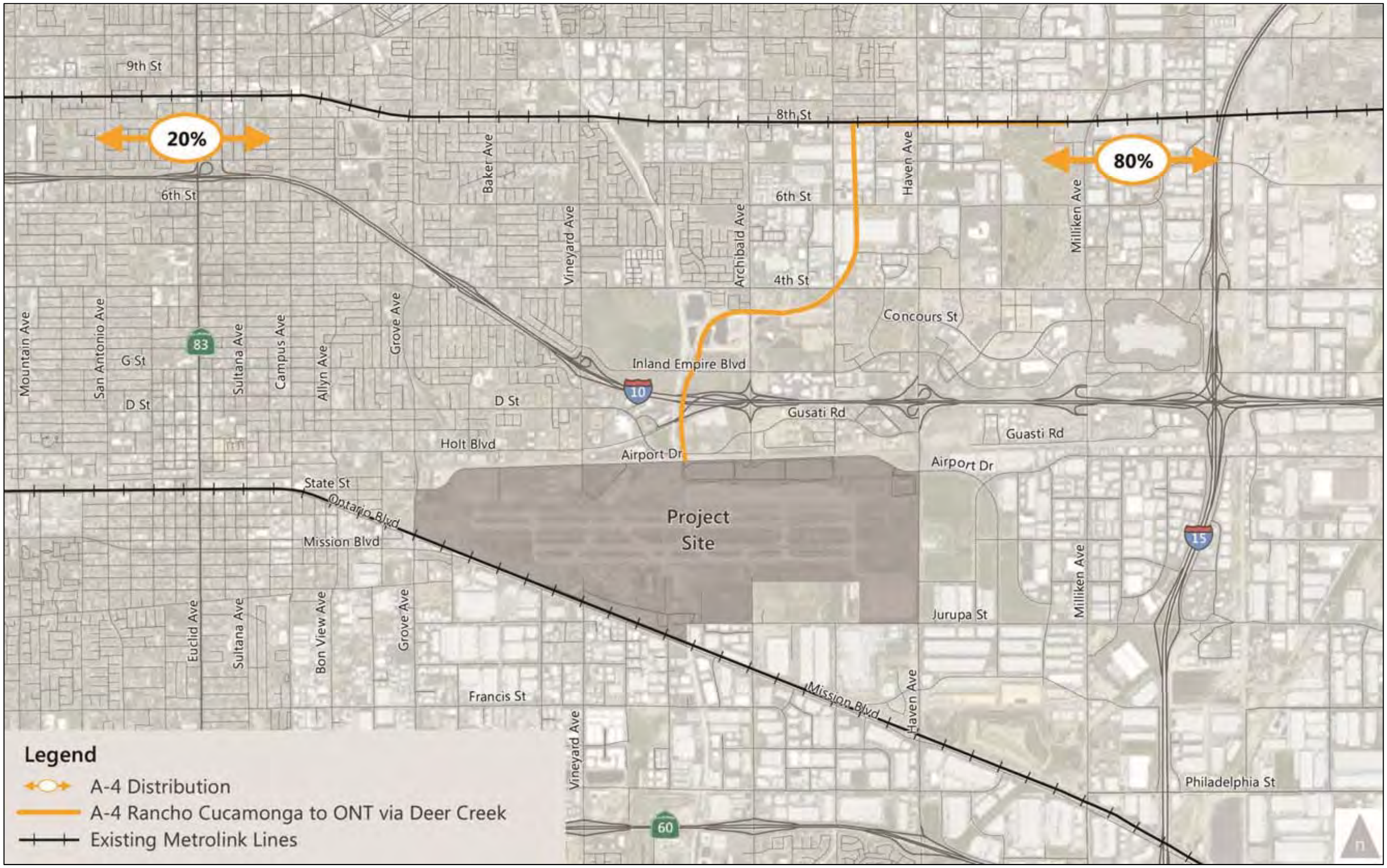
6.2.4 Ridership Split by Direction

The following figures (**Figure 6.2** – **Figure 6.7**) illustrate the distribution of riders coming from the east or the west of the airport and using each alternative. For Gold Line, the distribution is 100% to/from the west of the airport given the alignment of the route. For trips along the Metrolink system, Airsage data was utilized and the percentage of trips that currently come from or goes to zip codes along the routes.

Figure 6.2: Alternative A-3 - Directional Distribution of Ridership

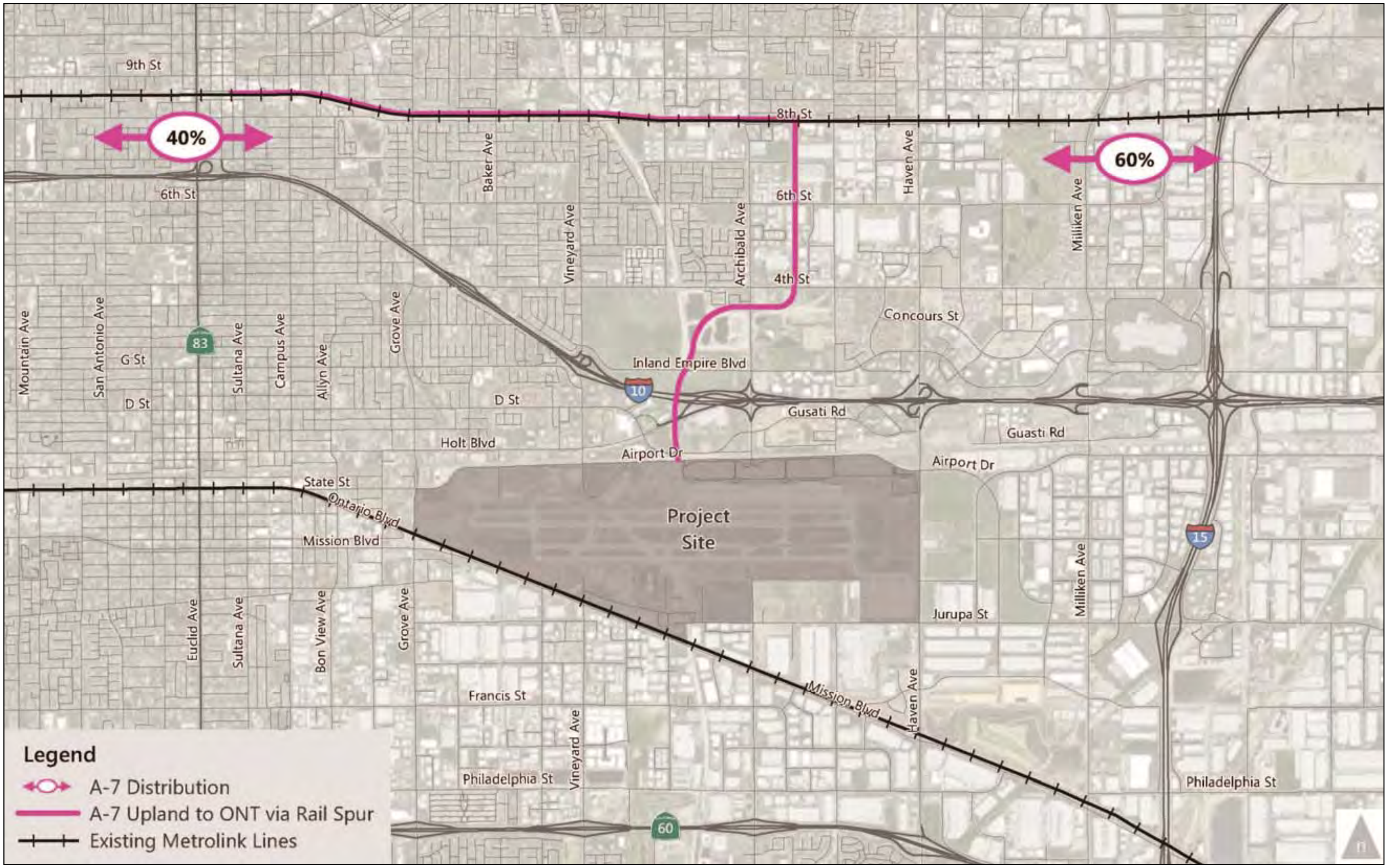
Source: HDR, 2014

Figure 6.3: Alternative A-4 - Directional Distribution of Ridership



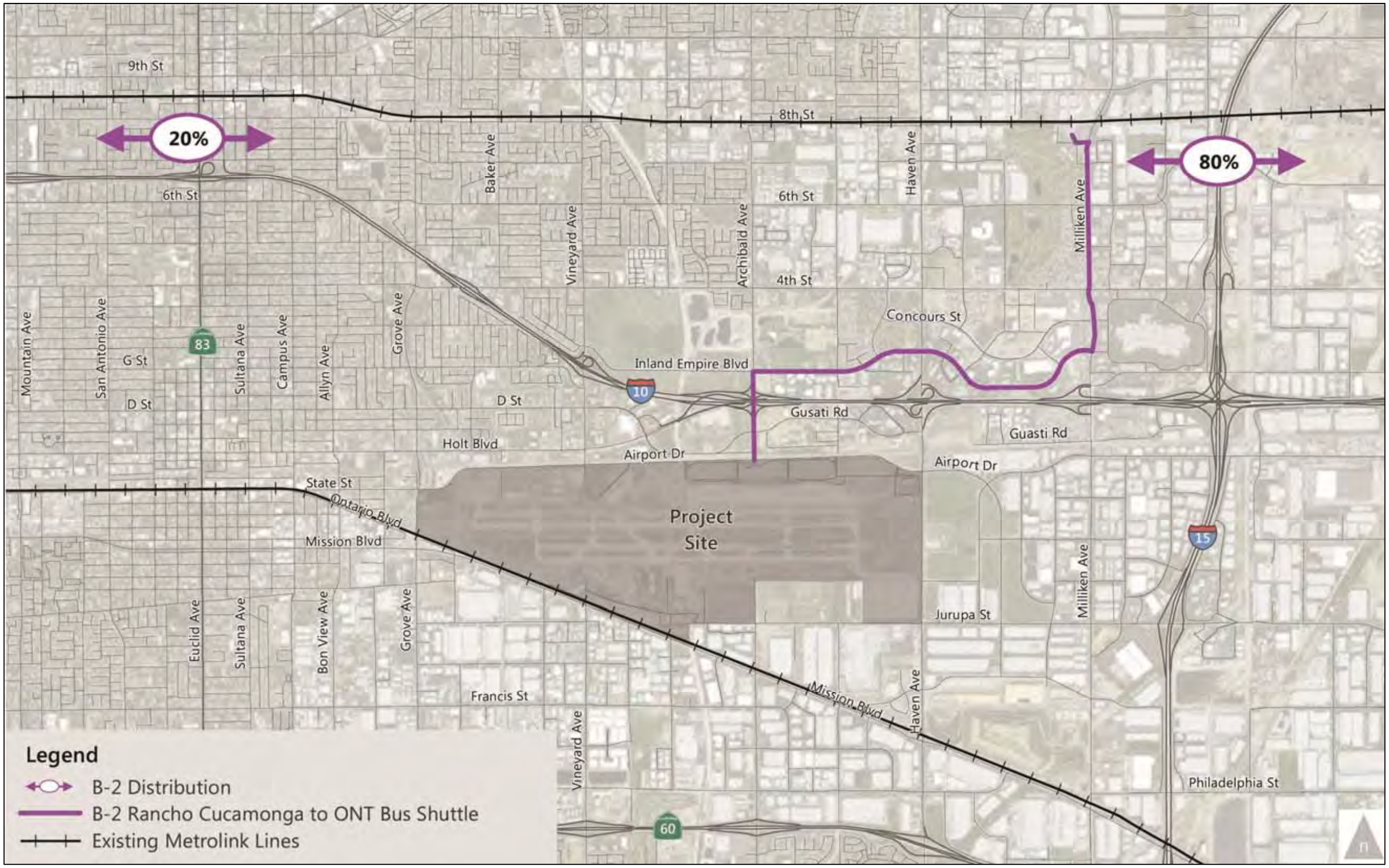
Source: HDR, 2014

Figure 6.4: Alternative A-7 - Directional Distribution of Ridership



Source: HDR, 2014

Figure 6.5: Alternative B-2 - Directional Distribution of Ridership



Source: HDR, 2014

Figure 6.6: Alternative C-5 - Directional Distribution of Ridership

Source: HDR, 2014

Figure 6.7: Alternative D-1 - Directional Distribution of Ridership

Source: HDR, 2014

This resulted in an approximately 80%/20% split favoring the San Bernardino area versus those coming from the Los Angeles area. The following are the directional split (east/west) of ridership for each alignment:

- A-3: 80% / 20%
- A-4: 80% / 20%
- A-7: 60% / 40%
- B-5: 80% / 20%
- C-5: 80% / 20%
- D-1: 5% / 95%

In the future, ONT is expected to serve a greater proportion of passengers from the west and south, as it becomes an attractive alternative to other airports in the region which reach capacity levels and become increasingly difficult to access due to regional highway congestion. These shifts would likely result in more ONT trips to/from the west, but the use of a rail system for airport access would still depend primarily on the accessibility and convenience of the regional rail service, so the Gold Line extension would still be the alternative most used by ONT travelers west of the airport while the other alternatives would predominantly be used by travelers east of the airport.

6.2.5 Grade Separation Assessment

Metro criteria for grade separation for LRT systems were utilized to determine if a rail crossing warranted grade separation or not. The Metro Grade Crossing Policy for LRT (included in **Appendix D**) is derived from the 1993 Institute of Transportation Engineers (ITE) published Grade Separation Guidelines ("Light Rail Transit Grade Separation Guidelines," ITE Journal, Volume 63, Issue 1, January 1993, p. 38-40), but has more stringent criteria than that outlined in ITE. The ITE version identifies two thresholds where at-grade is feasible, and the volumes allowed under the ITE thresholds are larger than the Metro criteria.

In addition, this study researched other grade separation policies nationwide to determine if any other practice could be adopted for this study. Following is a brief discussion on each:

- The American Public Transportation Association (APTA) has a Recommended Practice for Rail Transit System Highway Rail Grade Crossing Safety Assessment, last revised in 2008. It recommends what should be considered in a diagnostic review of a crossing location, but it does not give any specific parameters that could be used to differentiate a crossing that should be grade separated from one that would be acceptable at-grade.
- The American Railway Engineering and Maintenance-of-Way Association (AREMA) has design specifications for grade separations, but does not provide guidelines on criteria for determining if a crossing should or should not be grade separated.
- The California Public Utilities Commission (CPUC) has a formula for creating a priority list for grade separations to be funded at $15M each year out of the state budget. The formula is based on Average Daily Traffic (ADT), number of trains, accident history, blocking delay, speed limit of roadway, speed of trains, geometrics, number of passenger trains, and presence of bus routes, school buses, normal hazardous material deliveries, and community impact. The CPUC methodology is data-intensive and would need to be an extensive data collection program to generate a priority index number that could be compared against recent priority lists to see where these would rank in the statewide list. However, even if this data were collected and a priority index developed, it would not provide an appropriate

comparison since the CPUC Grade Separation Program is not eligible for lines that are exclusively for rail transit.

Table 6.7 presents a detailed analysis of each crossing in order to determine whether existing and future traffic (derived from SANBAG's San Bernardino County Transportation Analysis Model (SBTAM) and General Plan Buildout traffic volumes from City of Ontario and Rancho Cucamonga's General Plan traffic forecasts) warrant grade separation. **Figure 6.8** illustrates crossings that meet the LA Metro criteria for either "possible" or "required" grade separation**.**

The locations that meet the LA Metro criteria for either "possible" or "required" grade separation are:

- Existing
  - Achibald Avenue – possible
- Year 2035
  - Achibald Avenue – possible
  - Fourth Street – possible
  - Guasti Road – possible
  - **Holt Boulevard at I-10 Ramps – required**
  - Inland Empire Boulevard - possible

Grade separations for all these locations were incorporated into the design of the alternative rail alignments. It should be noted that, during review of the engineering concepts, the City of Rancho Cucamonga has indicated that a condition of approval for implementation of the project would likely be the requirement for grade separations at all arterial crossings in order to eliminate negative delay impacts and potential vehicle/rail conflicts with at-grade crossings. For purposes of the alternatives analysis, the locations of grade separations were determined using the process described above.

6.3 Design Assumptions for Rail Alternatives

Design criteria for the project are based on Metrolink Standards. A minimum design speed of 30 mph is used. The maximum degree of curve used is 10 degrees (573' radius) so that the horizontal alignments may accommodate any of the potential vehicle types. Due to the anticipated train length, platform lengths of 280' are assumed. Per Metrolink standards, all platforms are located on horizontal and vertical tangents. Maximum grade though any platform is 1%. A maximum grade of 3% is used for all tracks. 15' track center spacing is used wherever possible to minimize right-of-way impacts and structure costs; wider spacing is used through proposed curves and at station locations. Cost for all structures outside of the Metrolink right-of-way is based on DMU vehicle loading. Grade separation locations are based on the assessment presented in **Section 6.3**.

Table 6.7: Grade Crossings Analysis based on LA Metro's Grade Crossing Policy

Crossing	Between	And	Exist Lanes	City	Daily Volume	Year	PH/Lane	Exist A/B/C	2008 SBTAM	2035 SBTAM	Model Growth/ Year	# of Years	2035 Daily Forecast	2035 PH/Lane Forecast	Future A/B/C	Notes	Buildout ADT	Buildout PH/Lane	Buildout A/B/C
Alternative A-3 (Hermosa/Turner Alignment)																			
E 8th Street	Archibald Avenue	Haven Avenue	2	RC	3,555	2007	178	A	1,292	2,251	35.5	28	4,550	227	A		9,000	450	A
E 6th Street	Archibald Avenue	Haven Avenue	3	RC	9,637	2005	321	A	7,991	10,446	90.9	30	12,365	412	A		10,000	333	A
5th Street	Lucas Ranch	Hermosa Avenue	2	RC			0	A							A	not modeled		0	A
E 4th Street	Archibald Avenue	Haven Avenue	4	Ontario/RC	14,519	2008	363	A	10,228	12,922	99.8	27	17,213	430	A		35,800	895	B
E Jaguar Way	Hermosa Avenue	Corvette	4	Ontario			0	A							A	not modeled		0	A
Inland Empire Boulevard	Archibald Avenue	Haven Avenue	4	Ontario	11,342	2009	284	A	8,399	11,754	124.3	26	14,573	364	A		29,000	725	B
E Guasti Road	Archibald Avenue	Haven Avenue	4	Ontario	7,437	2009	186	A	8,266	12,739		26	7,437	186	A		42,000	1,050	B
Alternative A-4 (Deer Creek Alignment)																			
E 8th Street	Hermosa Avenue	Haven Avenue	2	RC	1,338	2007	67	A	1,292	2,251	35.5	28	2,333	117	A		9,000	450	A
E 6th Street	Hermosa Avenue	Haven Avenue	4	RC	8,827	2005	221	A	7,478	10,072	96.1	30	11,709	293	A		10,000	250	A
E 4th Street/Hermosa	Archibald Avenue	Haven Avenue	4	Ontario/RC	14,519	2008	363	A	10,228	12,922	99.8	27	17,213	430	A		35,800	895	B
Hermosa/4th Street	Inland Empire Boulevard	6th Street	3	Ontario/RC	9,766	2006	326	A	12,689	13,252	20.9	29	10,371	346	A		14,000	467	A
Archibald	4th Street	Inland Empire Boulevard	4	Ontario	30,668	2009	767	B	24,941	23,842	*18.5*	26	31,148	779	B	negative growth in model, estimated growth by applying average north/south growth of surrounding segments	39,000	975	B
Inland Empire Boulevard	Vineyard Avenue	Archibald Avenue	4	Ontario	2,539	2009	63	A	1,436	4,014	95.5	26	5,022	126	A		31,800	795	B
E Holt Boulevard	***Guasti Road/ E Convention Center Way***	***I-10***	***4***	***Ontario***	***18,672***	***2011***	***467***	***A***	***32,819***	***43,392***	***391.6***	***24***	***28,070***	***702***	***A***		***71,000***	***1,775***	***C***
Alternative A-7 (Rail Spur Alignment)																			
E 8th Street	Archibald Avenue	Hermosa Avenue	2	RC	3,555	2007	178	A	1,112	1,927	30.2	28	4,400	220	A		6,000	300	A
E 6th Street	Archibald Avenue	Hermosa Avenue	2	RC	9,637	2005	482	A	7,991	10,446	90.9	30	12,365	618	A		7,000	350	A
E 4th Street	Archibald Avenue	Hermosa Avenue	4	Ontario/RC	14,519	2008	363	A	10,228	12,922	99.8	27	17,213	430	A		35,800	895	B
Archibald Avenue	4th Street	Inland Empire Boulevard	4	Ontario	30,668	2009	767	B	24,941	23,842	*18.5*	26	31,148	779	B	negative growth in model, estimated growth by applying average north/south growth of surrounding segments	39,000	975	B
Inland Empire Boulevard	Vineyard Avenue	Archibald Avenue	4	Ontario	2,539	2009	63	A	1,436	4,014	95.5	26	5,022	126	A		31,800	795	B
E Holt Boulevard	***Guasti Road/ E Convention Center Way***	***I-10***	***4***	***Ontario***	***18,672***	***2011***	***467***	***A***	***32,819***	***43,392***	***391.6***	***24***	***28,070***	***702***	***A***		***71,000***	***1,775***	***C***
Alternative C-5 (Cleveland Alignment)																			
7th Street	Haven Avenue	Cleveland Avenue	2	RC	2,915	2002	146	A			*167.8*	33	8,452	423	A	not modeled, estimated growth by applying average east/west growth of surrounding segments		0	A
E 6th Street	Haven Avenue	Milliken Avenue	4	RC	9,390	2005	235	A	6,230	9,671	127.4	30	13,213	330	A		13,000	325	A
Bentley Street	Haven Avenue	Cleveland Avenue	2	RC			0	A							A	not modeled		0	A
E 4th Street	Haven Avenue	Milliken Avenue	7	Ontario/RC	19,282	2008	275	A	17,789	26,622	327.1	27	28,115	402	A		32,700	467	A
Ontario Center	Concours Street	Concours Street	2	Ontario			0	A							A	not modeled		0	A
Concours Street	Haven Avenue	Milliken Avenue	6	Ontario	3,779	2011	63	A	6,412	16,684	380.4	24	12,910	215	A		29,000	483	A
Inland Empire Boulevard	Haven Avenue	Milliken Avenue	6	Ontario	13,433	2009	224	A	6,165	4,790	*167.8*	26	17,795	297	A	negative growth in model, estimated growth by applying average east/west growth of surrounding segments	22,900	382	A
E Guasti Road	Archibald Avenue	Haven Avenue	4	Ontario	7,437	2009	186	A	8,266	12,739	165.7	26	11,744	294	A		42,000	1,050	B

Table 6.7: Grade Crossings Analysis based on LA Metro's Grade Crossing Policy (continued)

Crossing	Between	And	Exist Lanes	City	Daily Volume	Year	PH/Lane	Exist A/B/C	2008 SBTAM	2035 SBTAM	Model Growth/ Year	# of Years	2035 Daily Forecast	2035 PH/Lane Forecast	Future A/B/C	Notes	Buildout ADT	Buildout PH/Lane	Buildout A/B/C
Alternative D-1 (Cucamonga Creek Alignment)																			
E 8th Street	Vineyard Avenue	Hellman	2	Ontario/RC	5,879	2011	294	A	1,896	3,801	70.6	24	7,572	379	A		6,000	300	A
E 6th Street	Vineyard Avenue	Hellman Avenue	2	Ontario/RC	7,357	2009	368	A	8,593	11,860	121.0	26	10,503	525	A		12,000	600	A
Hellman Avenue	E 5th Street	E 6th Street	2	Ontario/RC	6,098	2006	305	A	2,082	2,516	16.1	29	6,564	328	A		11,000	550	A
E 4th Street	Hellman Avenue	Archibald Avenue	4	Ontario/RC	12,641	2008	316	A	11,570	22,446	402.8	27	23,517	588	A		35,700	893	B
Inland Empire Boulevard	Vineyard Avenue	Archibald Avenue	4	Ontario	2,539	2009	63	A	1,436	4,014	95.5	26	5,022	126	A		31,800	795	B
E Holt Boulevard	***Guasti Road/ E Convention Center Way***	***I-10***	***4***	***Ontario***	***18,672***	***2011***	***467***	***A***	***32,819***	***43,392***	***391.6***	***24***	***28,070***	***702***	***A***		***71,000***	***1,775***	***C***

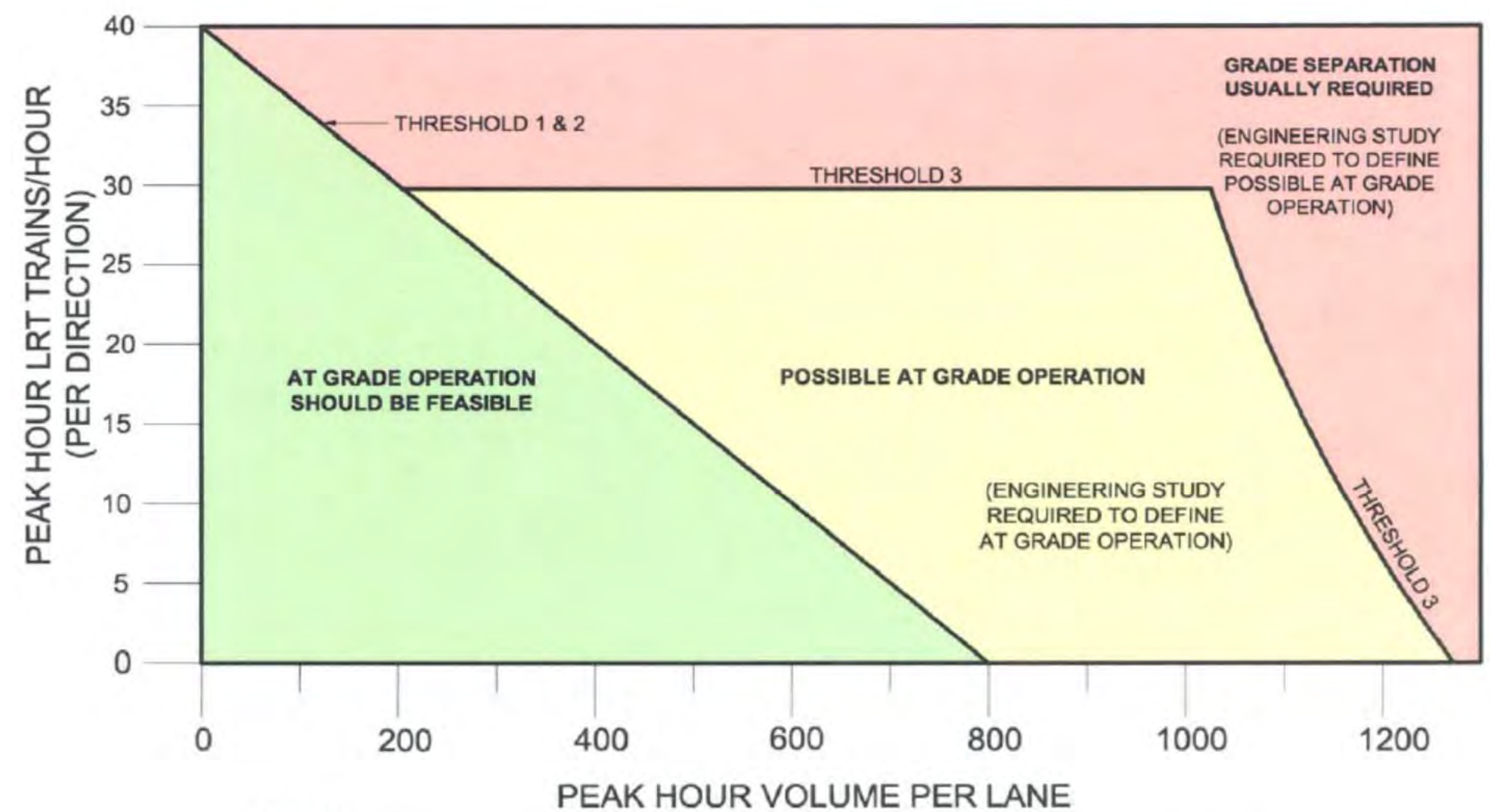
Notes: Traffic Counts obtained from the City of Rancho Cucamonga and City of Ontario websites:
http://www.ci.ontario.ca.us/ftp/traffic/trafficcounts.htm
http://www.cityofrc.us/civica/filebank/blobdload.asp?BlobID=4058

Based on LA Metro Grade Crossing Policy for Light Rail Transit--Figure 3 Nomograph (attached below)
A - Less than 720 PH Volume/Lane, At Grade Operation Should be Feasible
B - Between 720 and 1220 PH Volume/Lane, At-grade Operation May be Possible
C - Over 1220 PH Volume/Lane, Grade Separation Is Usually Required

10% Assumed percent of volume in peak hour

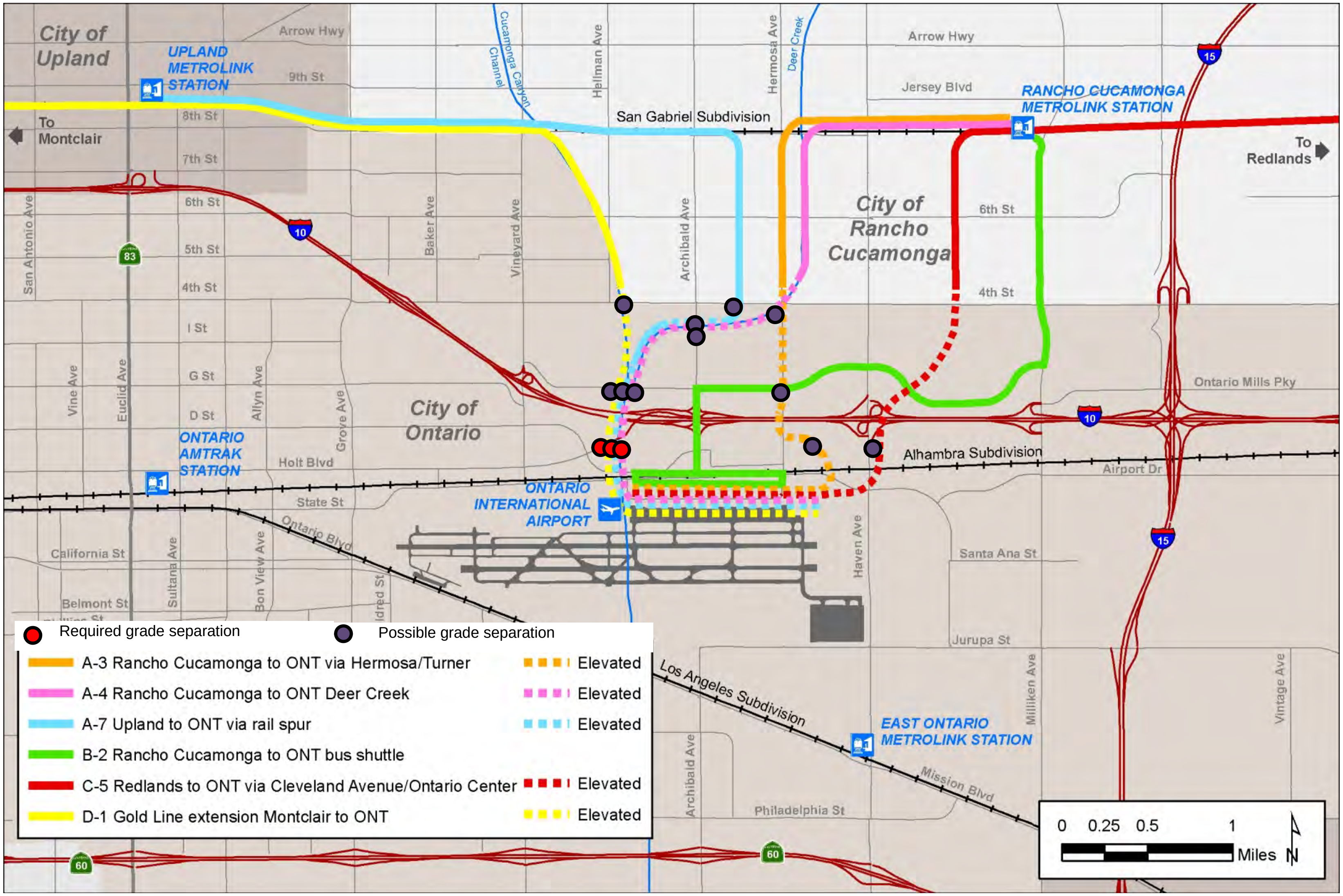
Assuming 15 minute headway, or 4 trains per hour per direction.
Build-Out from Ontario and Rancho Cucamonga General Plans

Bold blue italic font indicate where grade separation is required
Blue font indicate locations where crossings could possibly be grade separated
Volume indicated under "Buildout ADT" denotes which jurisdictional General Plan was used (corresponding Jurisdiction under "City" is also indicated in red



NOTES:
- ROADWAY VOLUME IS PEAK HOUR, HIGHEST PER LANE FLOW RATE
- ADAPTED FROM INSTITUTE OF TRANSPORTATION ENGINEERS INFORMATIONAL REPORT, LIGHT RAIL TRANSIT GRADE SEPARATION GUIDELINES, 1992, THRESHOLD 1 AND THRESHOLD 2 COMBINED.

Figure 6.8: Potential Arterial Grade Separation Locations



Source: HDR, 2014

Special design considerations for each of the five rail alternatives are listed below.

6.3.1 Alternative A-3

It is assumed that DMUs will run on this alignment. This alternative begins at the existing Rancho Cucamonga Metrolink station. Platform extensions will be required at the station to accommodate the new spur track leading into the station. A parallel track has been added south of the existing Metrolink mainlines to minimize impact on existing Metrolink operations and to allow for use of non-FRA-compliant DMUs. In order to preserve access to the existing industrial spurs to the south, a crossover from Main Track 2 to the new track will be required along with the relocation of the existing turnouts where these spurs tie into the mainline. At Haven Avenue, the existing Metrolink bridge will need to be widened to accommodate the new track. Just west of Haven Avenue, several hundred feet of rail spur will need to be reconstructed to tie into the new track. This will require modification of the existing at-grade crossing at 8th Street. At Deer Creek, the existing Metrolink bridge will need to be widened to accommodate the new track. As the track diverges from the Metrolink right-of-way a new, significantly skewed at-grade crossing will be created at 8th Street. The track superelevation will require some re-profiling of 8th Street. Significant right-of-way acquisition is required though this curve heading south away from the Metrolink tracks.

These impacts may be reduced significantly if DMU design criteria is used (minimum curve radius 250'). The track will run at-grade down the center of Hermosa Avenue, separated from the adjacent traffic lanes by a raised curb and fence. Hermosa Avenue will be reduced from two lanes in each direction to a single lane in each direction. It is assumed that all private driveways and minor streets will become right-in/right-out access only where the track runs at-grade. This may require driveway modifications for some of the adjacent properties. At-grade crossing improvements will be required at 8th Street and Hermosa Avenue. A large 8'x8' RCB storm drain runs parallel with and under the proposed tracks down about 4,800 feet of Hermosa Avenue. This and other utilities in the vicinity will need to be removed and replaced due to the increased loading from the rail and to allow for future maintenance of the facilities. At-grade crossing improvements will be required at 6th Street and Hermosa Avenue. The proposed track is elevated over 4th Street to prevent an at-grade crossing. Due to track geometry requirements and various other sensitive crossings, the track remains elevated until its terminus at Ontario Airport. An elevated station is proposed between 4th Street and Inland Empire Boulevard. After crossing over Interstate 10, a second elevated station is proposed along Guasti Road to serve the commercial facilities in the area. A major aerial fiber optic line just south of the UPRR tracks is impacted and will need to be relocated. Two stations and a universal crossover are proposed along Terminal Way at the airport. Track geometry has been designed to accommodate a third station directly in front of future terminal 5 on the east side of the airport.

6.3.2 Alternative A-4

It is assumed that DMUs will run on this alignment. Like Alternative A-3, this alternative begins at the existing Rancho Cucamonga Metrolink station. From Rancho Cucamonga Station to Center Avenue, this alternative traces the A-3 alternative and has the same impacts. Just west of Center Avenue, a new, skewed at-grade crossing will be created at 8th Street. The track superelevation will require some re-profiling of 8th Street. Significant right-of-way acquisition is required though the curve heading south away from the Metrolink tracks. These impacts may be reduced significantly if DMU design criteria is used (minimum curve radius 250'). In order to preserve maintenance road width along Deer Creek, a single track runs along each side of the channel. This requires a bridge to be constructed over the channel several hundred feet south of 8th Street. A new at-grade crossing will be created at 6th Street. The 80'+ track spacing is not preferred, but safety improvements can be implemented to maintain a safe crossing (see **Appendix E**). The proposed track is elevated over 4th Street to prevent an at-grade crossing. The skewed crossing over 4th Street and Hermosa Avenue results in long bridge span lengths. Due to track geometry requirements and various other sensitive crossings, the track remains elevated until its terminus at Ontario Airport. Following the overhead crossing of 4th Street, the right-of-way along Deer Creek becomes wider and both tracks are able to run along a single side of the channel. This transition will again require a bridge across Deer Creek. Camping activities occur annually along the south side of Dear Creek, west of Archibald Avenue. Physical separation of the campers from the tracks is achieved because the tracks are elevated through this area. An elevated station is proposed just north of Inland Empire Boulevard. Another elevated station is proposed just north of Guasti Road to serve the future intermodal transit center. Two stations and a universal crossover are proposed along Terminal Way at the airport. In order to accommodate a third station directly in front of future terminal 5 on the east side of the airport, the track and structure would need to be extended at a future date.

6.3.3 Alternative A-7

It is assumed that DMUs will run on this alignment. This alternative begins at the existing Upland Metrolink station. An additional platform and improvements will be required at Upland Station to accommodate the new spur track leading into the station. As with Alternatives A-3 and A-4, a parallel track has been added south of the existing Metrolink mainlines to minimize impact on existing Metrolink operations and to allow for use of non-FRA-compliant DMUs. The new track is connected to the existing main tracks via a crossover just east of Upland Station. The existing at-grade crossing at Campus Avenue will need to be modified to accommodate the additional track. An existing rail bridge will need to be widened at approximately station 39+50. The existing grade crossing at Grove Avenue will need to be modified to accommodate the additional track. An existing rail bridge will need to be widened at approximately station 73+00. An existing rail bridge will need to be widened at approximately station 105+50. The existing grade crossing at Vineyard Avenue will need to be modified and the existing rail bridge over Cucamonga Canyon Channel will need to be widened to accommodate the additional track. In addition, an existing rail bridge will need to be widened just west of Hellman Avenue, the existing grade crossing at Vineyard Avenue will need to be modified , and the existing grade crossing at Archibald Avenue will need to be modified to accommodate the additional track. An additional turnout will be added to form a crossover between the new track and the existing main track just west of the existing industrial rail spur on which much of this alignment runs. Portions of the existing spur alignment will need to be realigned to comply with Metrolink geometry standards. These impacts may be avoidable if DMU criteria are used instead. Track shifts and additional/replacement turnouts are used to maintain all current industrial services along this line. Due to the through movements to the airport, some storage capacity of existing rail freight cars just north of 4th Street will be lost. In order to maintain connections to the existing industrial rail services and avoid an at-grade crossing at 4th Street, 4th Street will need to be elevated over the tracks as they cross 4th Street. This will cause significant impacts, represented in the cost estimate as a lump sum based on similar road-over-rail grade separations recently completed in the Inland Empire. South of 4th Street the tracks cross Deer Creek, after which point the alignment and impacts are the same as Alternative A-4.

6.3.4 Alternative C-5

It is assumed that DMUs will run on this alignment. This alternative provides service from Redlands to Ontario Airport and assumes extensive track improvements within the Metrolink right-of-way from Redlands to west of Rancho Cucamonga Station where the alignment heads south to the airport. The cost of these improvements is reflected in the capital cost estimate for this alternative. As the alignment diverges from the existing Metrolink tracks, it passes through an existing golf course for about 1,000 feet. The alignment continues at-grade to the south, and a new at-grade crossing is required at 7th Street. A single track runs down the center of Cleveland

Avenue at-grade, separated from the adjacent traffic lanes by a raised curb and fence similar to the Hermosa Avenue alternative. A new at-grade crossing will be created at 6th Street. South of 6th Street the alignment leaves Cleveland Avenue to run at-grade along the east side of the street. Once out of the roadway, a second, parallel track is added. In order to run elevated over proposed improvements immediately south of 4th Street, the proposed track is elevated over 4th Street, preventing an at-grade crossing. Due to track geometry requirements and various other sensitive crossings, the track remains elevated until its terminus at Ontario Airport. An elevated station is proposed in the Citizens Business Bank Arena parking lot. A major aerial fiber optic line just south of the UPRR tracks is impacted and will need to be relocated. Two stations and a universal crossover are proposed along Terminal Way at the airport. Track geometry has been designed to accommodate a third station directly in front of future terminal 5 on the east side of the airport. During the review process, the City of Rancho Cucamonga expressed concerns regarding environmental impacts that this alignment will cause by its proximity to the City's proposed redevelopment on the current golf course site east of Cleveland Avenue.

6.3.5 Alternative D-1

It is assumed that DMUs will run on this alignment. (As noted in **Section 5.1.6**, DMU technology is assumed for the purpose of providing a more direct comparison of costs between alternatives. Costs for LRT are also documented in the cost analysis.) This alternative provides service from Montclair to Ontario Airport and assumes a third track within the Metrolink right-of-way from Montclair station to Cucamonga Creek where the alignment heads south to the airport. The cost of the improvements within the Metrolink right-of-way is reflected in the capital cost estimate for this alternative. This route uses the Cucamonga Canyon Channel right-of-way for a large portion of its length between the Metrolink right-of-way and the airport. In order to preserve maintenance road width, as requested by the flood control district, a single track runs along each side of the channel until about halfway between 4th Street and Inland Empire Boulevard. A new rail bridge is required to cross the channel just north of 8th Street. New skewed at-grade crossings are created at 8th Street about 200’ apart. This geometry is undesirable from a safety and road profile perspective, but is necessary to preserve maintenance road width while complying with Metrolink geometric design criteria. If DMU or LRT allowable curves are used, the curvature and skew through the crossing may be eliminated, but the undesirable track spacing remains. Just south of Olive Court the proposed tracks cross a 152” MWD line. Protection measures of some sort will likely be required to guard this major line from the impacts of the new rail loading. A new at-grade crossing will be created at 6th Street and Hellman Avenue. Both will have the same spacing issues as 8th Street. In addition, this crossing is skewed significantly due to the geometric relationship between Hellman Avenue and Rancho Cucamonga Channel. The proposed track is elevated over 4th Street to prevent an at-grade crossing here. Due to track geometry requirements and various other sensitive crossings, the track remains elevated until its terminus at Ontario Airport. Just north of Inland Empire Boulevard, this alterative begins to match the Alternative A-4 alignment, after which point the alignment and impacts are the same as Alternative A-4.

6.4 Major Utility Considerations for each Alternative

For any design and construction project, relocation of utilities comprises a substantial portion of the construction cost. Hence, for each alternative, except Alternative B-2, careful consideration was made to avoid utilities along each alignment as much as possible. Following is the list of potential utility conflicts for each alternative:

- A-3:
  - There is an 8’x8’ Reinforced Concrete Box (RCB) storm drain that runs down Hermosa Avenue, parallel with and near the proposed alignment. Additional encasement or other protection may be required for a long stretch to support the rail loading.
  - Just south of the UPRR tracks the alignment crosses a 120-strand/96-strand overhead Verizon/Time-Warner fiber optic line. Since the alignment is elevated here, this will be impacted.

- A-4:
  - At 6th Street the tracks cross a 114” Reinforced Concrete Pipe (RCP) storm drain that drains into the creek.
  - Just south of the UPRR tracks the alignment crosses a 120-strand/96-strand overhead Verizon/Time-Warner fiber optic line. Since the alignment is elevated here, this will be impacted.

- A-7:
  - Based on Sempra utilities as-builts, a 36” high pressure gas line crosses A-7 around Station 126+50.
  - At Hellman Avenue there is an 120” Reinforced Concrete Pipe Storm Drain (RCP SD) that cross under the tracks (Approximately at Station 140+00).
  - At Archibald Avenue there is a 78” RCP SD under the tracks (Approximately at Station 166+50)
  - At 4th Street a 48” RCP SD and other existing utilities will need to be encased due to new rail loading, or relocated if an underpass grade separation is selected.
  - Overhead 96 strand Verizon/ Time-Warner fiber optic line are located along 4th Street.
  - Just south of the UPRR tracks the alignment crosses a 120-strand/96-strand overhead Verizon/Time-Warner fiber optic line. Since the alignment is elevated here, this will be impacted.

- C-5:
  - There are several storm drain lines ranging from 66” to 76” that drain into the channel. These may have minimal cover and may be difficult to relocate.
  - Just south of the UPRR tracks the alignment crosses a 120-strand/96-strand overhead Verizon/Time-Warner fiber optic line. Since the alignment is elevated here, this will be impacted.

- D-1:
  - A 36” high pressure gas line runs along 8th Street and crosses the channel via the existing bridge. This likely means it has minimal cover where track crossings are proposed. The line was indicated on City of Ontario storm drain plans, but direct information from Southern California Gas Company was not obtained.
  - A 152” MWD water line crosses under the channel. This is deep enough that the alignment will not likely impact it, but the size of the line merits special consideration during design.
  - There are several storm drain lines ranging from 36” to 66” that drain into the channel. These may have minimal cover and may be difficult to relocate.

Chapter 7 - Evaluation of Alternatives

7.1 Evaluation Criteria and Methodologies

Similar to the screening criteria that were used to screen the initial list of 32 alternatives, the criteria and methodologies for evaluating the six alternatives were derived from the objectives defined in the Purpose and Need statement. **Table 7.1** presents proposed evaluation criteria, evaluation factors, the basis or method for evaluation, and reference to the Purpose and Need objective addressed, while **Table 7.2** shows the trip origin/destination locations to be evaluated in the service availability and travel time analyses, as well as the time of day in the travel time analysis.

Table 7.1: Evaluation Criteria, Factors and Methods

Evaluation Criteria	Evaluation Factors	Basis/Method	P&N Objectives
System Capacity	Hourly number of seats by direction	Seating capacity of the transit alternative's vehicles; service operating plan	#5
Costs	Estimated Capital Costs (2014 dollars), by major element	Quantities based on conceptual design; typical unit cost factors based on recent projects	#7
	Estimated annual operations and maintenance (O&M) cost (2014 dollars)	Vehicle-hours of operation based on service plan; O&M	
Ridership	Estimated average daily ridership	Ridership forecasts based on buildout of Ontario Airport (30 MAP) and regional demographic forecasts for 2035 (based on forecasting methodology developed by Fehr & Peers)	#6
	Estimated total annual ridership		#6
	Estimated daily boarding and alightings by station		#10
	Estimated peak hour, peak direction volume on weekdays		#5
Cost-effectiveness	Annualized cost (capital + O&M) per trip (cost-effectiveness criteria used for FTA New Starts analysis)	Quantities based on conceptual design; typical unit cost factors based on recent projects	#7
Travel Times	Auto and transit travel time between selected locations* and ONT at selected times*	Auto travel times – estimated from SBTAM Year 2035 congested forecast	#2
		Transit travel times – based on current Metrolink and Gold Line schedules, plus proposed service	
	Walk time to/from ONT terminal	Walk time to ONT Terminal #4 from nearest station/stop	#1
	Number of transfers required to travel between selected locations* and ONT	Number of mode transfers based on trip origin, destination and service plan	#3

Table 7.1: Evaluation Criteria, Factors and Methods (continued)

Evaluation Criteria	Evaluation Factors	Basis/Method	P&N Objectives
Service Availability	Earliest possible flight departure time from ONT for a traveler coming from selected locations using the transit service alternative on a weekday, a Saturday and a Sunday	Based on service plan. Assume arrival at ONT terminal 90 minutes before flight departure; departure from ONT terminal 30 minutes after flight arrival	#5
	Latest possible flight arrival time into ONT for a traveler going to selected locations using the transit service alternative on a weekday, a Saturday and a Sunday		
Environmental Constraints	Identification of factors and potential impacts that could preclude or delay implementation of the project or involve substantial mitigation	Review of environmental factors databases	#7
Impacts of Existing Regional Rail	Schedule adherence of existing regional rail service if the transit alternative is operational	RCTC rail operations modeling	#8
	Capital improvements needed in order to maintain schedule adherence of regional rail service		
Impacts on Planned Regional Rail	Qualitative assessment of how implementation of the transit alternative could inhibit or enhance construction of California High Speed Rail or the Gold Line extension to Ontario Airport	Review of conceptual design plans for the transit alternative to identify how it could affect construction of CAHSR or Gold Line as they are currently envisioned.	#11

*Selected locations and selected times presented **Table 7.2**

Table 7.2: Selected Trips for Evaluation of Travel Times and Service Availability

Trips to ONT (for departing flights)		
From	**To**	**Time arriving at ONT Terminal**
West Covina, Claremont, Rialto, Redlands	ONT	5:00 AM weekday
West Covina, Claremont, Rialto, Redlands	ONT	8:00 AM weekday
West Covina, Claremont, Rialto, Redlands	ONT	4:00 PM weekday

Trips from ONT (from arriving flights)		
From	**To**	**Time departing ONT Terminal**
ONT	West Covina, Claremont, Rialto, Redlands	8:30 AM weekday
ONT	West Covina, Claremont, Rialto, Redlands	4:30 PM weekday
ONT	West Covina, Claremont, Rialto, Redlands	10:30 PM weekday

Notes:

- City locations were selected so analysis could include representative locations east and west of Ontario Airport in the corridor to be served by regional rail providing access to ONT, with two middle distance locations (10-15 miles) and two longer distance locations (20-25 miles)
- Assume trips traveling to or from Claremont or Rialto are within walking distance of the Metrolink station
- Assume trips traveling to or from West Covina or Redlands drive to the station
- Travel time analysis is for weekday trips only; service availability analysis considers weekdays, Saturdays, and Sundays

7.2 Evaluation of Alternatives

This section presents the results of the alternative evaluation, based on analyzing each of the six alternatives in relation to the criteria identified in **Section 7.1**. The following discussion covers each criterion individually, and a summary table (**Table 7.14**) of the evaluation is presented at the end of the section.

7.2.1 System Capacity

System capacity in transit operations is measured as the maximum number of passengers that can be carried past a single point on a fixed route, in a given period of time. The most common measure of capacity is in terms of passengers per hour. For this analysis, system capacity was determined as weekday seats by direction for peak hour, based on a typical number of seats per vehicle for the technology combined with the number of vehicles in operation during the peak hours of operation. **Table 7.3** presents the results of the system capacity analysis.

Table 7.3: System Capacity

Alternative	Peak Hour Seats by Direction
A-3	368
A-4	368
A-7	368
B-2	120
C-5	552
D-1	532

Based on the findings, alternatives C-5 and D-1 are expected to provide the highest peak hour passenger capacity by direction, while the bus alternative (B-2) would provide the lowest capacity.

7.2.2 Capital, Operation and Maintenance Cost

Capital Cost

Table 7.4 summarizes the key cost inputs and capital cost estimates (expressed in 2014$) for all alternatives. The largest cost items for each alternative, elevated track and stations, are broken out separately for easy comparison between alternatives. The capital costs shown for the bus alternative (B-2) assume that no infrastructure improvements will be required to implement this option. For all alternatives, it is assumed that new maintenance facilities would not be needed. The low end of capital costs for the rail alternatives ranges from $618 million to $854 million, while the high end ranges from $727 million to $1,004 million. The bus alternative (B-2) would be the least expensive as it would only need capital investment in purchasing vehicles, while alternative C-5 is the most expensive option, since it would require double-tracking of the San Gabriel Sub east of Rancho Cucamonga.

The capital cost of each alternative consists of the total cost of all capital improvements associated with each alternative, including new rail lines (for the rail alternatives), utility relocation costs, stations, ROW, vehicles, etc. The capital cost for Alternative C-5 also includes a cost for track improvements to the San Gabriel Subdivision between Rancho Cucamonga and San Bernardino which would be necessary in order to provide the proposed service without negatively impacting Metrolink's existing operations. For all the rail alternatives, an appropriate planning level contingency was assumed in the cost estimate to account for potential needs to relocate or protect utilities and resolve potential conflicts with them (see **Section 6.5**).

A conceptual-level cost estimate was developed based on DMU technology for all rail alternatives. It includes an overall contingency of 33% as developed using the recommendations in *Metrolink Design Procedures Manual Section 5.7*. This value is reflected in the "High" numbers in **Table 7.4**. The "Low" numbers were developed using a less conservative contingency of 20% on construction costs, with "soft costs" (flagging, project management, etc.) calculated as 30% of the sum of the construction costs and the 20% contingency.

Table 7.4: Capital Costs (2014$)

Alternative	Mode/ Technology		Rail Cost to Nearest Metrolink Station: Elevated Track* (million)	Rail Cost to Nearest Metrolink Station: Stations* (million)	Rail Cost to Nearest Metrolink Station: Utilities/ Signals/ Other Costs* ** (million)	Rail Cost West to Montclair or East to Redlands (million)	Contingency for Utility Relocation and Conflict Resolution (million)	Vehicle Cost (million)	Total Capital Cost (million) ***
A-3	Rail (DMU)	Low	$278	$193	$111		$24	$36	$618
		High	$329	$230	$132		$27		$727
	Rail (LRT)	Low	$277	$193	$151		$23	$23	$644
		High	$329	$229	$179		$27		$760
A-4	Rail (DMU)	Low	$315	$193	$116		$10	$36	$659
		High	$374	$230	$136		$11		$776
	Rail (LRT)	Low	$155	$153	$151		$12	$23	$481
		High	$184	$181	$179		$14		$567
A-7	Rail (DMU)	Low	$212	$193	$185		$12	$36	$626
		High	$251	$230	$218		$13		$735
	Rail (LRT)	Low	$191	$193	$233		$10	$23	$641
		High	$227	$229	$276		$12		$755
B-2	Bus	Low	N/A	N/A	N/A	N/A	N/A	$4	$2
		High	N/A	N/A	N/A	N/A			$4
C-5	Rail (DMU)	Low	$319	$140	$84	$261	$14.5	$50	$854
		High	$378	$167	$99	$310	$16.0		$1004
D-1	Rail (DMU)	Low	$234	$187	$80	$48	$14	$58	$606
		High	$278	$222	$94	$57	$15		$709
	Rail (LRT)	Low	$226	$153	$170	$92	$12	$37	$678
		High	$268	$181	$202	$109	$14		$797

Notes:
*includes contingency for utilities
** includes at-grade track costs
*** Total Capital Cost includes cost of Vehicles

A cost sensitivity analysis was conducted to examine capital cost implications should four of the five rail alternatives (A-3, A-4, A-7 and D-1) be developed with LRT technology. (This type of cost sensitivity analysis was not performed for Alternative C-5 since it needs to use a technology that can operate on the Metrolink tracks and has been assumed to be an extension of the Redlands Rail service, which is being developed with DMU technology.) Conversion of DMU to LRT would entail different design standard but will need electrical substations and overhead catenary wires for power supply, both impacting bottom-line costs. Following are the capital cost (inclusive of vehicle cost) differences:

- A-3: Capital cost would be $33 million more with LRT
- A-4: Capital cost would be $209 million less with LRT
- A-7: Capital cost would be $20 million more with LRT
- D-1: Capital cost would be $36 million more with LRT

The cost saving by implementing LRT technology for A-4 is attributed to lesser ROW takes, the need for constructing fewer structures, and cheaper vehicle costs. Detailed cost estimate worksheets for each rail alignment are presented in **Appendix E**.

Operations and Maintenance Costs

Operations and maintenance (O&M) costs are based on applying a variable cost model approach. A variable cost model approach develops unit costs for each item that contributes to the overall cost for the system. For rail O&M costs, these variables included the cost of maintaining route-miles, maintenance yards or garages, operating the system (vehicle hours and vehicle miles), and vehicles/train-sets needed for peak hour service. For bus O&M costs, these variables included bus-hours, bus-miles, garages, and peak buses. O&M costs assumed DMU technology for all rail alternatives.

Unit costs were obtained from the 2012 National Transit Database (NTD) cost data from various regional and national operators, based on the type of service and are presented in **Appendix F**. For DMU, examples in California, Texas and Oregon were used. For alternative B-2, bus operating costs were based on data from Omnitrans, the Riverside Transit Agency, and Norwalk Transit.

For all alternatives, additional garages or maintenance facilities were excluded from the variable cost calculation. All costs are expressed in both 2012$ and 2014$. **Table 7.5** presents the operating parameters and O&M cost for each alternative. The bus alternative (B-2) would be the least costly to operate and maintain, and the service to Redlands (Alternative C-5) would be the most expensive.

Table 7.5: Operation and Maintenance Costs

Alternative	Mode/ Technology	Vehicle Hours	Vehicle Miles	Total O&M Cost (2012$)		Total O&M Cost (2014$)	
				Cost per Revenue Hour	Total Annual Cost (in million)	Cost per Revenue Hour	Total Annual Cost (in million)
A-3	Rail (DMU)	7,390	109,000	$693	$5.12	$720	$5.32
	LRT			*$249*	*$1.84*	*$258*	*$1.91*
A-4	Rail (DMU)	7,200	113,800	$710	$5.11	$739	$5.32
	LRT			*$258*	*$1.86*	*$268*	*$1.93*
A-7	Rail (DMU)	9,160	161,000	$675	$6.19	$702	$6.43
	LRT			*$255*	*$2.34*	*$265*	*$2.43*
B-2	Bus	8,240	135,100	$121	$1.00	$126	$1.04
C-5	Rail (DMU)	8,070	307,200	$1,053	$8.49	$1,095	$8.83
D-1	Rail (DMU)	7,290	780,400	$1,318	$10.44	$1,371	$10.86
	LRT			*$800*	*$6.33*	*$832*	*$6.59*

Notes:
DMU average unit costs developed based on cost of operations of NCTD Sprinter in San Diego, Capital Metro Red Line in Austin and Tri-Met Westside Express in Portland.
Bus average unit cost developed based on cost of operations of Omnitrans in San Bernardino, Riverside Transit Agency in Riverside, and Norwalk Transit System in Norwalk.
2014$ was calculated by applying Consumer Price Index (CPI) inflation rate to 2012$. CPI was 1.04 as obtained from the Bureau of Labor Statistics

Similar to capital costs, a sensitivity analysis was conducted to examine O&M cost implications, should four of the five rail alternatives (A-3, A-4, A-7 and D-1) be developed with LRT technology. For alternatives A-3, A-4, A-7 operating costs would decrease by approximately 63%, while for D-1, the savings would be about 39%. The estimated differences in O&M cost savings are derived from the assumption that if alternative D-1 were to be developed using LRT technology it would be operated by LA Metro as part of the Gold Line. On the other hand if any of the "A" alternatives was developed with LRT technology, it would not likely be operated by LA Metro, so the LRT O&M cost estimate for the "A" alternatives was based on other LRT systems in California (San Diego Trolley, San Jose/VTA Light Rail, Sacramento Regional Rail).

7.2.3 Ridership

For the rail ridership estimates, a Direct Ridership Model (DRM) was utilized. DRMs incorporate station area characteristics and compare ridership generated at the station level from existing systems to that occurring at the station level for each proposed alternative. For this analysis, three different DRM models were utilized. First, to estimate local ridership from intermediate stations, an LRT DRM model was applied based on an existing DRM ridership model from the Sacramento LRT system. This DRM was utilized to estimate intermediate ridership for light rail and rail/fixed guideway systems. For heavy rail intermediate stations (stations along the Metrolink San Bernardino Line), the existing Bay Area Caltrain Heavy/ Commuter Rail DRM model was applied. Once ridership for light rail and heavy/commuter rail was estimated, the forecast was adjusted to account for ONT's buildout forecast of 30 million annual passengers (MAP).

For the bus alternative, ridership was estimated by applying a mode split model which estimated the percentage of riders that would be captured by that system.

Table 7.6 present ridership estimates for each alternative at buildout with 30 MAP using Ontario Airport.

Table 7.6: Ridership

Ridership Components		Alternatives					
		A-3	A-4	A-7	B-2	C-5	D-1
Buildout 30 MAP							
Daily Airport Ridership		3,023	3,023	3,023	822	3,128	3,665
Intermediate Station Ridership		393	491	491	430	391	406
Total Ridership		**3,416**	**3,514**	**3,514**	**1,252**	**3,519**	**4,071**
Annual ridership		**1,082,870**	**1,113,940**	**1,113,940**	**396,880**	**1,115,520**	**1,290,523**
Transit Mode Share		4%	4%	4%	1%	4%	4%
AM Peak Hour	Alighting	116	116	116	31	120	140
	Boarding	65	65	65	18	67	79
PM Peak Hour	Alighting	159	159	159	43	164	192
	Boarding	181	181	181	49	187	219

All of the rail alternatives are projected to have similar ridership potential (between 1.08 and 1.21 million passengers annually), while alternative B-2 would attract fewer passengers (approximately 400,000 passengers annually). Details of ridership forecast were presented in **Section 6.2**.

7.2.4 Cost-Effectiveness

Cost effectiveness was measured to determine the average cost per passenger for each alternative. The cost component consists of the total annualized capital and O&M costs for each alternative. Capital costs were annualized based on the expected lifetime of the various capital components. This annualized capital cost was added to the annual O&M cost presented earlier, and the total was divided by the annual ridership forecast to derive the cost-effectiveness measure.

As shown in **Table 7.7**, the bus alternative (B-2) is the most cost-effective alternative, while the services to Redlands (Alternative C-5) and Montclair (Alternative D-1) are the least cost-effective alternative. The rail alternatives connecting to nearby stations (Alternatives A-3, A-4 and A-7) have similar cost-effectiveness ratings that are closer to C-5 and D-1 than they are to B-2 because of the capital investment involved.

Table 7.7: Cost Effectiveness

Cost Effective Components	**Assuming DMU**					
	A-3	**A-4**	**A-7**	**B-2**	**C-5**	**D-1**
Capital Cost per year	$ 12,491,986	$13,038,835	$13,034,061	$297,917	$16,826,560	$12,755,783
Operating Cost per year	$ 5,322,408	$5,318,664	$6,434,272	$1,036,776	$8,833,760	$10,858,848
Total Cost per year	$17,814,394	$18,357,499	$19,468,333	$1,334,693	$25,660,320	$23,614,631
Annual Passengers	1,082,870	1,113,940	1,113,940	396,880	1,115,520	1,210,620
Annual cost per passenger	**$16.45**	**$16.48**	**$17.48**	**$3.36**	**$23.00**	**$19.51**

Cost Effective Components	***Assuming LRT***					
	A-3	***A-4***	***A-7***	***B-2***	***C-5***	***D-1***
Capital Cost per year	*$13,494,882*	*$13,494,882*	*$13,494,882*	*$297,917*	*$16,826,560*	*$14,512,633*
Operating Cost per year	*$1,909,960*	*$1,932,320*	*$2,429,856*	*$1,036,776*	*$8,833,760*	*$6,586,528*
Total Cost per year	*$15,404,842*	*$12,848,252*	*$16,547,984*	*$1,334,693*	*$25,660,320*	*$21,099,161*
Annual Passengers	*1,082,870*	*1,113,940*	*1,113,940*	*396,880*	*1,115,520*	*1,210,620*
Annual cost per passenger	***$14.23***	***$11.53***	***$14.86***	***$3.36***	***$23.00***	***$17.43***

7.2.5 Travel Time

Transit travel time was calculated as a combination of travel time to the nearest Metrolink station, transfer/wait time for change of travel modes (e.g. Metrolink train to bus or rail alternative) and walk time to the ONT terminal. This analysis is based on the current planned start and end times of DMU service from Redlands which could be modified based on the ridership demand for this alternative as ONT activity grows in the future. For each alternative, travel time was calculated for four representative locations. The choice of these locations was based on distance from ONT, direction from ONT and whether the rail stations at these locations could be accessed by auto versus walking. Two locations were chosen west of ONT – Claremont and West Covina, and two were chosen east of ONT – Rialto and Redlands. In addition, travel time was calculated for both inbound and outbound directions based on three sets of representative times. The timings chosen were as follows:

Inbound (arriving at ONT):
- 5:00 am
- 8:00 am
- 4:00 pm

Outbound (departing from ONT)
- 8:30 am
- 4:30 pm
- 10:30 pm

Table 7.8 presents the findings of travel time analysis for each alternative. As a comparison for transit travel, a corresponding auto travel is also presented. The key findings are as follows:

- For all alternatives except D-1, there are no available rail connections from West Covina and Claremont to reach ONT by 5:00 am. For all alternatives except D-1, there are no available rail connections from ONT after 10:30 pm going west towards West Covina and Claremont.

Table 7.8: Travel Time

From/To	Inbound/ Outbound	Auto Travel	A-3			A-4			A-7			B-2			C-5			D-1		
			Total Travel Time	Wait/ Transfer Time	# of Transit Transfers	Total Travel Time	Wait/ Transfer Time	# of Transit Transfers	Total Travel Time	Wait/ Transfer Time	# of Transit Transfers	Total Travel Time	Wait/ Transfer Time	# of Transit Transfers	Total Travel Time	Wait/ Transfer Time	# of Transit Transfers	Total Travel Time	Wait/ Transfer Time	# of Transit Transfers
West Covina																				
5:00 am	Inbound	**0:27**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	0:42	0:08	0
8:00 am		**0:33**	1:13	0:11	1	1:11	0:11	1	1:10	0:11	1	1:06	0:11	1	1:29	0:37	1	0:42	0:08	0
4:00 pm		**0:45**	1:10	0:11	1	1:08	0:11	1	1:07	0:11	1	1:04	0:11	1	1:16	0:27	1	0:42	0:08	0
8:30 am	Outbound	**0:40**	2:20	1:23	1	2:20	1:25	1	2:20	1:26	1	2:20	1:29	1	2:20	1:32	1	0:55	0:21	0
4:30 pm		**0:43**	2:00	0:46	1	2:00	0:48	1	2:00	0:49	1	2:00	0:59	1	2:00	0:55	1	0:51	0:17	0
10:30 pm		**0:27**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	0:52	0:18	0
Claremont																				
5:00 am	Inbound	**0:16**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	0:26	0:03	0
8:00 am		**0:19**	0:53	0:06	1	0:51	0:06	1	0:50	0:06	1	0:46	0:06	1	1:09	0:32	1	0:26	0:03	0
4:00 pm		**0:22**	0:49	0:06	1	0:47	0:06	1	0:46	0:06	1	0:43	0:06	1	0:55	0:22	1	0:26	0:03	0
8:30 am	Outbound	**0:20**	2:01	1:18	1	2:01	1:20	1	2:01	1:21	1	2:01	1:24	1	2:01	1:27	1	0:39	0:16	0
4:30 pm		**0:22**	1:36	0:41	1	1:36	0:43	1	1:36	0:44	1	1:36	0:54	1	1:36	0:50	1	0:35	0:12	0
10:30 pm		**0:15**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	0:36	0:13	0
Rialto																				
5:00 am	Inbound	**0:22**	0:46	0:06	1	0:44	0:06	1	0:43	0:06	1	0:54	0:06	1	n/a	n/a	0	n/a	n/a	1
8:00 am		**0:28**	0:47	0:06	1	0:45	0:06	1	0:44	0:06	1	0:55	0:06	1	0:35	0:03	0	0:59	0:23	1
4:00 pm		**0:27**	0:47	0:06	1	0:45	0:06	1	0:44	0:06	1	0:55	0:06	1	0:35	0:03	0	0:54	0:18	1
8:30 am	Outbound	**0:24**	0:50	0:07	1	0:50	0:09	1	0:50	0:10	1	2:02	1:10	1	1:01	0:28	0	2:02	1:23	1
4:30 pm		**0:31**	1:16	0:33	1	1:16	0:35	1	1:16	0:36	1	1:16	0:25	1	1:01	0:28	0	1:16	0:38	1
10:30 pm		**0:22**	1:54	1:11	1	1:54	1:13	1	1:54	1:14	1	1:54	1:10	1	n/a	n/a	0	1:54	1:16	1
Redlands																				
5:00 am	Inbound	**0:31**	1:02	0:11	1	1:00	0:11	1	0:59	0:11	1	1:10	0:11	1	n/a	n/a	0	n/a	n/a	1
8:00 am		**0:41**	1:03	0:11	1	1:01	0:11	1	1:00	0:11	1	1:11	0:11	1	1:05	0:08	0	1:15	0:28	1
4:00 pm		**0:39**	1:03	0:11	1	1:01	0:11	1	1:00	0:11	1	1:11	0:11	1	1:05	0:08	0	1:10	0:23	1
8:30 am	Outbound	**0:34**	1:17	0:12	1	1:17	0:14	1	1:17	0:15	1	2:27	1:15	1	1:34	0:33	0	2:27	1:28	1
4:30 pm		**0:45**	1:42	0:38	1	1:26	0:40	1	1:26	0:41	1	1:42	0:30	1	1:34	0:33	0	1:42	0:43	1
10:30 pm		**0:31**	2:17	1:16	1	2:17	1:18	1	2:17	1:19	1	2:17	1:15	1	n/a	n/a	0	2:17	1:21	1

Notes:
Inbound - TRIPS TO ONTARIO (for departing flights) - time arriving at ONT terminal
Outbound - TRIPS FROM ONTARIO (for arriving flights) - time departing from ONT terminal

- For C-5, there are no available rail connections to get from Redlands to ONT by 5:00 am, or to travel from ONT to Redlands at 10:30 pm.
- The mode transfers required for Alternatives A-3, A-4, and A-7 do not substantially increase total travel times because the rail connection schedule is timed to meet the Metrolink train schedule.
- Outbound trip times (for trips leaving the airport) can be highly variable because arriving travelers are not able to time their trip to coincide with the Metrolink schedule.
- For passengers traveling to/from the east (Redlands and Rialto), C-5 provides the direct (no-transfer) trip to the airport can reduce travel times for some trips, but the lower service frequency can result in longer travel times for others.
- For passengers traveling to/from the west (West Covina and Claremont), D-1 provides the fastest connection to ONT because of the Gold Line's frequent service and the direct (no transfer) connection into the airport.

7.2.6 Service Availability

Service availability was based on assessing the earliest possible flight departure time for a traveler coming from West Covina, Claremont, Rialto or Redlands; and the latest possible flight arrival time into ONT for a traveler going to the same selected four locations using the transit service alternatives on a weekday, a Saturday and Sunday. The analysis assumed that a traveler would arrive at the airport at least 1.5 hours prior to departure and would need half an hour to collect baggage before getting on an outbound transit connection. **Table 7.9** presents the results of the service availability analysis. Based on the analysis, Alternative D-1 provides the best options for passengers traveling to/from ONT from/to areas to the west, while for those traveling to/from east of ONT, Alternatives A-3, A-4 and A-7 provide the best service.

Table 7.9: Service Availability

Origin/ Destination	Day of the week	Alternatives					
		A-3	A-4	A-7	B-2	C-5	D-1
For Inbound Trips							
West Covina	Weekday	9:09 AM	9:07 AM	9:06 AM	9:02 AM	9:25 AM	6:03 AM
	Saturday	9:18 AM	9:16 AM	9:15 AM	9:10 AM	9:25 AM	6:03 AM
	Sunday	12:08 PM	12:06 PM	12:05 PM	11:58 AM	12:25 PM	6:03 AM
Claremont	Weekday	9:09 AM	9:07 AM	9:06 AM	9:02 AM	9:25 AM	6:03 AM
	Saturday	9:18 AM	9:16 AM	9:15 AM	9:10 AM	9:25 AM	6:03 AM
	Sunday	12:08 PM	12:06 PM	12:05 PM	11:58 AM	12:25 PM	6:03 AM
Rialto	Weekday	6:18 AM	6:16 AM	6:15 AM	6:26 AM	7:25 AM	6:35 AM
	Saturday	9:15 AM	9:13 AM	9:12 AM	9:23 AM	7:25 AM	9:25 AM
	Sunday	9:15 AM	9:13 AM	9:12 AM	9:23 AM	7:25 AM	9:25 AM
Redlands	Weekday	6:18 AM	6:16 AM	6:15 AM	6:26 AM	7:25 AM	6:35 AM
	Saturday	9:15 AM	9:13 AM	9:12 AM	9:23 AM	7:25 AM	9:25 AM
	Sunday	9:15 AM	9:13 AM	9:12 AM	9:23 AM	7:25 AM	9:25 AM

Table 7.9: Service Availability (continued)

Origin/ Destination	Day of the week	Alternatives					
		A-3	A-4	A-7	B-2	C-5	D-1
For Outbound Trips							
West Covina	Weekday	8:28 PM	8:30 PM	8:31 PM	8:39 PM	8:28 PM	1:10 AM
	Saturday	8:40 PM	8:42 PM	8:43 PM	8:48 PM	8:28 PM	1:10 AM
	Sunday	5:55 PM	5:57 PM	5:58 PM	6:03 PM	5:28 PM	1:10 AM
Claremont	Weekday	8:28 PM	8:30 PM	8:31 PM	8:39 PM	8:28 PM	1:10 AM
	Saturday	8:40 PM	8:42 PM	8:43 PM	8:48 PM	8:28 PM	1:10 AM
	Sunday	5:55 PM	5:57 PM	5:58 PM	6:03 PM	5:28 PM	1:10 AM
Rialto	Weekday	11:06 PM	11:08 PM	11:09 PM	10:58 PM	9:28 PM	11:03 PM
	Saturday	11:40 PM	11:42 PM	11:43 PM	11:32 PM	9:28 PM	11:30 PM
	Sunday	9:15 PM	9:17 PM	9:18 PM	9:07 PM	9:28 PM	9:05 PM
Redlands	Weekday	11:06 PM	11:08 PM	11:09 PM	10:58 PM	9:28 PM	11:03 PM
	Saturday	11:40 PM	11:42 PM	11:43 PM	11:32 PM	9:28 PM	11:30 PM
	Sunday	9:15 PM	9:17 PM	9:18 PM	9:07 PM	9:28 PM	9:05 PM

Notes:
Inbound - TRIPS TO ONTARIO (for departing flights) - time arriving at ONT terminal
Outbound - TRIPS FROM ONTARIO (for arriving flights) - time departing from ONT terminal
Departing and Arriving flight times calculated based on service plan and the following assumptions:
Inbound passengers will reach airport 90 minutes prior to flight departure;
Outbound passengers will depart airport 30 minutes after flight arrival

7.2.7 Environmental Constraints

For the environmental constraints analysis, a primary and secondary study area was delineated for each alternative alignment, except B-2. The delineation was within the overall project area to evaluate potential direct and indirect impacts to local environmental resources. The primary study area includes a 200-foot corridor that follows each alignment and is based on a 100-foot buffer on each side of the route's centerline. The primary study area was delineated with the intent of identifying resources that could be directly impacted by construction or operation of the project (e.g. property acquisition, etc.). A secondary study area was delineated for an evaluation of potential indirect impacts that could occur beyond the immediate limits of construction and with the different vehicle technologies under consideration (e.g. DMU, LRT, etc.).

The analysis evaluated the six alternatives against the following eight environmental constraints, and the consolidated analyses results are presented in **Table 7.10.** Details of this analysis are presented in **Appendix G:**

- Biological Resources
- Cultural Resources
- Noise / Vibration
- Hazards
- Air pollutants and Greenhouse Gas
- Recreational Resources
- Traffic/Circulation
- Hydrology/Water Quality
- Visual Resources

For the analysis, impacts defined by each environmental criterion are rated as high, moderate and low. The environmental criteria is specific to each resource area, but some by their nature are "subjective" (e.g. aesthetics). The rating systems used for each of the resource areas is described below:

- High Rating: a high probability for agency involvement, likelihood for the requirement of one or more permits, and/or increased mitigation costs
- Moderate Rating: lower probability of species actually occurring within the study area and/or no additional permits required beyond CEQA and NEPA certification
- Low Rating: no special permits or mitigation requirements are anticipated and/or the resource has a low probability to occur on site

Table 7.10: Environmental Constraints

Issues Area	Alternatives						Primary Constraint(s)
	A-3	A-4	A-7	B-2	C-5	D-1	
Biological Resources	M	M	M	L	H[1]	M	Delhi sands flower-loving fly, Water crossings, burrowing owl
Cultural Resources	H	H	H	L	L	H	Overlap with Northtown (RC)[2], Euclid Avenue (U), Citrus Transportation (U), and/or Guasti (Proposed) Historic (O) Districts
Noise/Vibration	H	M	H	L	M	H	Proximity to sensitive receptors; Potential EJ communities
Hazards	M	M	M	L	M	M	Proximity to underground storage tanks (USTs)
Criteria Air Pollutants and Greenhouse Gases	M[3]	M[3]	M[3]	L	M[3]	M	Construction-related emissions
Recreational Resources	H	H	H	L	M	H	Potential for use of 4(f) properties
Traffic/Circulation	L	L	M	L	L	M	Proximity to intersection(s) with poor LOS
Hydrology/Water Quality	M	H	H	L	M	H	Potential for alteration(s) at USACE flood control facilities (33 USC 408)
Visual Resources	H	H	H	L	L	H	Visual changes in historic districts

Notes:

1. Overlap with Recovery Unit for Delhi sand flower loving fly.
2. RC – Rancho Cucamonga, U – Upland, O – Ontario
3. Vehicle technology (e.g. locomotive verses LRT) will affect the net air quality benefit that may be attributable to operations.

(L) – Low; (M) Moderate; (H) High

Anticipated Environmental Clearances

The extension and future operation of transit service to Ontario Airport would have the potential to trigger a variety of federal, state, and local approvals and/or permit requirements depending on the alternative alignment ultimately selected. **Table 7.11** identifies the potential discretionary approvals and permits that may be required for each alternative based on the conceptual engineering completed to date and local environmental constraints. This list of potential approvals and permits should not be considered exhaustive, but rather a preliminary indication of the major regulatory approvals that could be required for the alternative alignments pending additional design engineering. It should be noted that, if the City of Rancho Cucamonga moves forward to implement the proposed redevelopment of the golf course east of Cleveland Avenue, there is potential for negative noise and vibration impacts in that area.

Table 7.11: Anticipated Environmental Clearances

Environmental Clearance	Timeline (approx.)	Alternatives					
		A-3	A-4	A-7	B-2	C-5	D-1
California Environmental Quality Act	12 to 18 mo.	EIR	EIR	EIR	CE or SE	EIR	EIR
National Environmental Policy Act [1]	12 to 36 mo.	EA or EIS	EA or EIS	EA or EIS	CE	EA or EIS	EA or EIS
Sections 404/401, Clean Water Act	6 to 12 mo.[2]	Likely	Likely	Likely	Unlikely	Likely	Likely
Section 402, Clean Water Act (NPDES GCP)	60 days	Likely	Likely	Likely	Unlikely	Likely	Likely
Section 402, Clean Water Act (NPDES MS4)	N/A	Unknown	Unknown	Unknown	Unlikely	Unknown	Unknown
Section 10, Rivers and Harbors Act (33 U.S.C. §408)	6 to 12 mo.[3]	Unlikely	Likely	Likely	Unlikely	Unlikely	Likely
Section 7, Endangered Species Act	12 to 18 mo.	Likely	Likely	Likely	Unlikely	Likely	Likely
Section 106, National Historic Preservation Act	12 mo.	Likely	Likely	Likely	Unlikely	Likely	Likely
Clean Air Act (Transportation Conformity)	6 to 12 mo.	Likely	Likely	Likely	Likely	Likely	Likely
Section 1601, Streambed Alteration Agreement	6 to 12 mo.	Likely	Likely	Likely	Unlikely	Likely	Likely
Caltrans Encroachment Permit	3 to 6 mo.	Likely	Likely	Likely	Unlikely	Likely	Likely
CPUC (GO-88)	3 to 6 mo.	Likely	Likely	Likely	Unlikely	Likely	Likely
Local Permits and Approvals from Private Entities[4]	3 to 6 mo.	Likely	Likely	Likely	Likely	Likely	Likely

Notes:
1 Contingent on federal agency involvement and project funding sources. Duration reflects the approval time frame for an EA or EIS.
2 Assumed duration for a nationwide permit approval. An individual permit could take up to 24 months to process through USACE.
3 Assumed duration reflects a “Minor” 408 permit process.
4 Local permits including, but not limited to encroachment, grading, tree removal, and building permits. Private entitles are assumed to include the railroads and any private utilities.

Acronyms:

EIR: Environment Impact Report
SE: Statutory Exemption
CE: Categorical Exemption
EA: Environmental Assessment
EI: Environmental Impact Statement
NPDES: National Pollutant Discharge Elimination System
GCP: General Construction Permit
MS4: Municipal Stormwater Permit
N/A: Not Available

7.2.8 Impacts on Existing Regional Rail

This criterion evaluated the operational impacts of each alternative, should they be implemented in the context of current Metrolink schedules. An RTC (Rail Traffic Control) Model of the Metrolink San Bernardino Line was utilized to evaluate Alternative C-5 to determine how its implementation would affect current Metrolink service. Based on the RTC model output, Alternative C-5 could not be operated on the San Gabriel Sub without severely disrupting existing Metrolink service on the San Bernardino Line. Substantial capital improvements, including double-tracking and signal upgrades between Rancho Cucamonga and San Bernardino, would be needed for the rail corridor to have enough capacity for C-5 to operate without disrupting Metrolink schedules. The estimated cost of these improvements is approximately $285 million. Alternatives A-3, A-4, A-7 and B-2 would not interfere with Metrolink services. Finally, Alternative D-1 would have its own track for the portion of its operations in the Metrolink right-of-way, so it would not adversely affect Metrolink operations; also, since D-1 would extend the Gold Line east of Montclair, implementation of D-1 would extend and enhance the regional rail system.

Table 7.12 presents the findings of this evaluation criterion.

Table 7.12: Impacts on Existing Regional Rail

Impacts	Alternatives					
	A-3	A-4	A-7	B-1	C-5	D-1
Schedule adherence of existing regional rail service if the transit alternative is operational.	No change	No change	No change	No change	Substantial effect without capital investment	No change
Capital improvements needed in order to maintain schedule adherence of Metrolink	$0	$0	$0	$0	$285M	$0

7.2.9 Impacts on Planned Regional Transit

This section identifies anticipated impacts on planned regional transit systems if each alternative were implemented. Three potential future regional transit systems are being planned or considered through the ONT area: Bus Rapid Transit (BRT), California High Speed Rail (CaHSR), and the Gold Line extension. None of the alternatives would either conflict with or enhance BRT, so this discussion focuses on High Speed Rail and the Gold Line extension.

The CaHSR alignment is being studied on the Alhambra Subdivision west of ONT, on either the Alhambra or the Los Angeles Subdivision through the ONT area, and on the I-15 Corridor to the south or the San Gabriel Subdivision (which carries the Metrolink San Bernardino Line) to the east once it passes the ONT area[18]. Thus, the infrastructure improvements and rail operations associated with Alternative C-5 could potentially affect CaHSR if in the future the Metrolink ROW east of Rancho Cucamonga is selected for the CaHSR alignment. The other rail alternatives would have little or no effect on CaHSR, with their crossing of the Alhambra Sub being the only potential point of conflict. If an on-airport multimodal transportation hub was developed to accommodate a high-speed rail station, an airport rail connection would need to be incorporated, but the alternative rail alignments being considered do not appear to pose any substantial impediments to that. A coordination meeting with CaHSR Authority staff confirmed these basic findings.

Alternative D-1 would extend the Gold Line to the airport, thereby completing the proposed Gold Line project. No other alternatives would affect the Gold Line extension. Findings of this evaluation criterion are presented in **Table 7.13**.

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[18] California High-Speed Train – Section Refinement Report, Los Angeles to San Diego via Inland Empire Section, HNTB, July 2013

Table 7.13: Impacts on Planned Regional Rail

Impacts	Alternatives					
	A-3	A-4	A-7	B-1	C-5	D-1
Qualitative assessment of how implementation of the transit alternative could inhibit or enhance construction of California High Speed Rail or the Gold Line Extension to Ontario Airport.	Little or no effect	Little or no effect	Little or no effect	No effect	Could inhibit CaHSR being built if Metrolink ROW east of Rancho Cucamonga is selected as preferred alignment for CaHSR	Would complete Gold Line extension to ONT proposed in 2008 feasibility study

7.3 Summary of Alternatives Analysis

Table 7.14 presents an overview of results for each alternative measured against each evaluation criterion.

Table 7.14: Alternatives Evaluation Summary Matrix

Evaluation Criteria	Evaluation Factor	A-3	A-4	A-7	B-2	C-5	D-1
System Capacity	Weekday peak hour number of seats by direction	368	368	368	120	552	532
Costs	Total estimated capital costs (2014 dollars)	$618-727M $33M more with LRT	$663-776M $209M less with LRT	$629-735M $20M more with LRT	$2-4M n/a	$854-1004M n/a	$600-705 $36M more with LRT
	Estimated annual O&M cost (2014dollars)	$5.32M 63% less with LRT	$5.32M 63% less with LRT	$6.43M 63% less with LRT	$1.04M n/a	$8.83 n/a	$10.86M 39% less with LRT
Ridership	Estimated average weekday daily ridership	3,416	3,514	3,514	1,252	3,519	3,819
	Estimated total annual ridership	1.08M	1.11M	1.11M	0.40M	1.12M	1.21M
	Estimated daily boardings and alightings by station	393	391	491	430	391	154
	Estimated peak hour peak direction volume on weekdays	181	181	181	49	187	219
	Directional Split of Airport Riders (% from East / % from West)	80% / 20% (E/W)	80% / 20% (E/W)	60% / 40% (E/W)	80% / 20% (E/W)	80% / 20% (E/W)	5% / 95% (E/W)
Cost Effectiveness	Annualized cost (capital + O&M) per trip	$16.45 $14.23 (LRT)	$16.48 $11.53 (LRT)	$17.48 $14.86 (LRT)	$3.36	$23.00	$19.51 $17.43 (LRT)
Travel Times	Transit travel time between Redlands and ONT at selected times*	1:00 1:11 1:26 2:17	0:59 1:00 1:26 2:17	1:10 1:11 1:42 2:17	1:02 1:03 1:42 2:17	n/a 1:05 1:34 n/a	n/a 1:23 1:42 2:17
	Transit travel time between West Covina and ONT at selected times*	n/a 1:11 2:00 n/a	n/a 1:10 2:00 n/a	n/a 1:06 2:00 n/a	n/a 1:13 2:00 n/a	n/a 1:29 2:00 n/a	0:50 0:50 0:51 0:52
	Walk time to/from ONT terminal	0 min.	0 min.	0 min.	0 min.	0 min.	0 min.
	Number of transfers required to travel between selected locations and ONT	Redlands: 1 West Covina: 1	Redlands: 1 West Covina: 1	Redlands: 1 West Covina: 1	Redlands: 1 West Covina: 1	Redlands: 0 West Covina: 1	Redlands: 1 West Covina: 0
Service Availability	Earliest possible flight departure time from ONT for a traveler coming from selected locations using the transit service alternative on a weekday.	Redlands: 6:16 AM West Covina: 9:07 AM	Redlands: 6:15AM West Covina: 9:06 AM	Redlands: 6:26 AM West Covina: 9:02 AM	Redlands: 6:18 AM West Covina: 9:09AM	Redlands: 7:25 AM West Covina: 9:25 AM	Redlands: 6:35 AM West Covina: 6:03AM
	Latest possible flight arrival time into ONT for a traveler going to selected locations* using the transit service alternative on a weekday.	Redlands: 11:08 PM West Covina: 8:30 PM	Redlands: 11:09 PM West Covina: 8:31 PM	Redlands: 10:58 PM West Covina: 8:39 PM	Redlands: 11:06 PM West Covina: 8:28 PM	Redlands: 9:28 PM West Covina: 8:28 PM	Redlands: 10:45 PM West Covina: 1:10 AM
Environmental Constraints	Identification of factors or potential impacts that could preclude or delay implementation of the project or involve substantial mitigation	Bio: Medium Cultural: High Noise: High Recreation: High	Bio: Medium Cultural: High Noise: Medium Recreation: High	Bio: Medium Cultural: High Noise: High Recreation: High	Bio: Low Cultural: Low Noise: Low Recreation: Low	Bio: High Cultural: Low Noise: Medium Recreation: Medium	Bio: Medium Cultural: High Noise: High Recreation: High
Impacts on Existing Regional Rail	Schedule adherence of existing regional rail service if the transit alternative is operational.	No change	No change	No change	No change	Substantial effect without capital investment	No change
	Capital improvements needed in order to maintain schedule adherence of regional rail service	$0	$0	$0	$0	$285M	$0
Impacts on Planned Regional Rail	Qualitative assessment of how implementation of the transit alternative could inhibit or enhance construction of California High Speed Rail or the Gold Line Extension to Ontario Airport.	Little or no effect	Little or no effect	Little or no effect	No effect	Could inhibit CaHSR being built if Metrolink ROW east of Rancho Cucamonga is selected as preferred alignment for CaHSR	Would complete Gold Line extension to ONT proposed in 2008 feasibility study

*Travel times:
1. Traveling to ONT, arriving at 5:00 AM 2. Traveling to ONT, arriving at 8:00 AM 3. Traveling from ONT, departing ONT at 4:30 PM 4. Traveling from ONT, departing ONT at 10:30 PM
Blue text indicate changes due to LRT option

Chapter 8 - Findings and Recommendations

The six alternatives evaluated in this study were structured to facilitate comparison of various ways to connect the regional rail system to Ontario International Airport. The alternatives included different service areas, different alignments, and different transit technologies. To a great extent these elements are interchangeable, so that a preferred system does not need to be one of the six systems evaluated, but could be comprised of elements from different alternatives.

The following section presents a discussion of the different elements that were studied, with the objective of identifying a system that would best address the project purpose and need in the long-term future. For each service element, the analysis highlights and explains how the "most important" P&N objectives are addressed through the options.

8.1 Evaluation of Systems Elements

8.1.1 Rail vs. Bus

Two basic mode options were considered: rail on new track, and bus shuttle on existing streets. **Table 8.1** highlights the key differences in achieving the Purpose and Need objectives:

Table 8.1: Achieving P&N Objectives – Rail vs. Bus

	Superior for these P&N objectives	**Explanation**
Rail service	2. Shorter travel times 4. Linked with regional rail service 6. Maximize ridership	Shorter travel time due to exclusive ROW for tracks. Potential for no-transfer trip to airport; if transfer required, transfer can be made on convenient adjacent platform. Higher capacity system. Higher forecast ridership.
Bus service	7. Financial feasibility	Capital costs very low since only vehicle acquisition. O&M costs substantially less. More cost-effective.

The passenger convenience and system capacity of a rail system will best serve passenger needs and attract the most riders in the long-term future scenario analyzed in this study. However, with ONT handling about 4 MAP, the current and near-term ridership potential is not sufficient to justify the high costs involved in building and operating a high capacity rail system.

Rail vs. Bus Recommendation

A rail connection should be planned for the airport's future, and a bus service should be developed in the interim until passenger volumes through ONT are sufficient to generate the level of demand that justifies a rail system.

8.1.2 Service Concepts

Regional Service vs. Connecting to Metrolink

Two alternative service concepts were evaluated: (1) Regional service running directly to the airport; and (2) connecting one of the nearby Metrolink stations to the airport. The former includes the Redlands service and the Gold Line extension, the latter includes the rail and bus connections from Rancho Cucamonga or Upland to ONT. Table 8.2 highlights the key differences in achieving the Purpose and Need objectives:

Table 8.2: Achieving P&N Objectives – Regional Service vs. Connecting to Metrolink

	Superior for these P&N objectives	Explanation
Regional Service	3. Minimize transfers	Redlands service eliminates transfers for travelers from east, Gold Line extension for travelers from west.
Connections to Metrolink stations	7. Financial feasibility	Lower annual operating cost. More cost-effective.

In the analysis, travel times are generally comparable when the regional services are compared to Metrolink station connectors. The primary reason for this similarity is the proposed operating schedules for the connector services, which were designed to have a vehicle waiting at the Metrolink station for each scheduled train. If the connector service schedule was not designed to coordinate with the Metrolink train arrivals, connection times would be much less predictable and the service would be far less attractive.

Service to East vs. Service to West

Comparing the benefits of regional service to the east of the airport versus regional service to the west, the travel time benefit corresponds with the direction of the direct regional service – the Redlands service provides faster travel times for those traveling to/from the east, the Gold Line extension for those traveling to/from the west. The service to the west is projected to carry more riders at less capital cost and comparable operating cost; however this is not primarily attributable to the characteristics of the area served. The higher ridership on the Gold Line extension is attributable to its shorter headways and longer hours of service; the lower capital cost on the Gold Line extension is attributable to the Redlands service necessitating substantial improvements to the Metrolink line. **Table 8.3** highlights the key differences in achieving the Purpose and Need objectives:

Table 8.3: Achieving P&N Objectives – Service to East vs. Service to West

	Superior for these P&N objectives	Explanation
Regional Service to east (Redlands service.)	2. Travel time	Shorter travel times for travelers to/from east of airport.
Regional Service to west (Gold Line ext.)	2. Travel time 5. Flight schedule compatibility 6. Maximize ridership 7. Financial feasibility	Shorter travel time for travelers to/from west. Travelers to/from west can make earlier flights. Higher total ridership. Lower capital cost. Lower O&M cost. More cost-effective.

In terms of serving the corridor population, the Redlands service and the Metrolink connection services would primarily serve riders to and from the area east of the airport in San Bernardino County, while the Gold Line extension would predominantly serve riders to and from the area west of the airport in Los Angeles County.

Connection to Metrolink Station: Rancho Cucamonga vs. Upland

Comparing the rail alternatives that connect to nearby Metrolink stations, the primary difference is in O&M cost, which is about 20% lower for the service to Rancho Cucamonga because of the shorter distance between that Metrolink station and ONT. **Table 8.4** highlights the key differences in achieving the Purpose and Need objectives:

Table 8.4: Achieving P&N Objectives – Rancho Cucamonga vs. Upland

	Superior for these P&N objectives	Explanation
Connection to Rancho Cucamonga	2. Travel time 7. Financial feasibility	Shorter travel times for travelers to/from east of airport. Lower O&M cost
Connection to Upland	2. Travel time	Shorter travel time for travelers to/from west.

Service Concepts Recommendation

A rail connection between ONT and the Rancho Cucamonga Metrolink station would provide a more cost-effective airport connection than a regional service to Redlands, with almost as much convenience for travelers coming to the airport from the east if the service is designed and scheduled to optimize transfer convenience and to minimize transfer wait times. Thus, it is recommended that a regional service from Redlands to ONT be dropped from further consideration. If the Gold Line is extended to Montclair in the future, a further extension to ONT would provide a convenient connection for airport-oriented travelers, with a one-seat ride, greater service frequency, and somewhat longer service hours than a connection from Metrolink for those coming to the airport from the west. A connection to Metrolink would serve primarily a San Bernardino County user base, whereas an extension of the Gold Line would serve predominantly a Los Angeles County user base. It would not be as cost-effective to build both a rail connection and the Gold Line extension, since either one would be able to serve airport-oriented travelers from the east and from the west with no more than one transfer. The viability of the Gold Line extension as an airport connection depends on extension of the Gold Line to Montclair, which is planned but unfunded at the present time.

Since a rail connection to Metrolink will primarily serve users in San Bernardino County, and since the people of San Bernardino County will be expected to shoulder the cost of an airport rail connection, a rail connection between ONT and the Rancho Cucamonga Metrolink station is recommended as the preferred long-term service concept. Development of such a rail connection should not preclude a potential future extension of the Gold Line to ONT, since that service would improve airport access for the user base west of the airport.

8.1.3 Alignment

Alternative Rail Alignments

Five alternative rail alignments were evaluated in the analysis. **Table 8.5** below summarizes the key issues and constraints.

Table 8.5: Key Issues and Constraints of Alignments

Alignment	Key Issues and Constraints
Hermosa Avenue/ Turner Avenue (A-3)	Operates adjacent to traffic on Hermosa and Turner Displaces traffic capacity Intermediate stops don't serve highest activity centers Categories of main environmental constraints: cultural, noise/vibration, recreational, visual.
Deer Creek/ Cucamonga Creek (A-4)	More ROW cost due to displacement than other alignments; cost difference could be mitigated with LRT design standards Categories of main environmental constraints: cultural, recreational, hydrology/ water quality, visual.
Rail Spur/ Cucamonga Creek (A-7)	Would affect freight rail service to adjacent land uses Would require elevation of 4th Street Categories of main environmental constraints: cultural, noise/vibration, recreational, hydrology/water quality, visual.
Cleveland Avenue (C-5)	Affects proposed redevelopment site (existing golf course) in Rancho Cucamonga, a key concern of the City Conflicts with surface parking in private ROW north of 4th Street Only one potential intermediate stop at activity center Categories of main environmental constraints: biological.
Cucamonga Creek (D-1)	Would operate adjacent to (behind) residential land uses Categories of main environmental constraints: cultural, noise/vibration, recreational, hydrology/water quality, visual.

Rail Terminus near Airport Terminals vs. at Intermodal Transportation Center

In this study all alternatives provide service into the airport terminal area, to provide convenient service for airport-oriented passengers. Another possible terminus option, which was assumed for the alternatives evaluated in the 2008 Gold Line Extension feasibility study, would be to provide service to a proposed multimodal transportation terminal located west of Archibald Avenue and north of Guasti Road. Terminating a rail line at the transportation center would save approximately $200-250 million, since the extension into the terminal area would involve elevated structures and stations, but it would be much less convenient for airport-oriented passengers since they would need to transfer to an airport circulator shuttle or walk another 6-10 minutes to reach their terminal.

Alignment Recommendation

To conveniently serve airport-oriented travelers, the planned long-term system should provide a rail connection all the way into the airport terminal area. None of the five alignments has any fatal flaws that would totally preclude its possible use for a rail line; however, the challenges associated with using the two flood control channels (Deer Creek and Cucamonga Creek) appear to be less difficult than some of those associated with the other three routes. The rail spur alignment (A-7) carries active freight rail service to adjacent businesses which would likely conflict with passenger service, and Fourth Street would likely need to be elevated to accommodate this rail line's crossing. The Hermosa Avenue/Turner Avenue alignment (A-3) would use street capacity and present potential conflict issues if operating at-grade. The Cleveland Avenue alignment (C-5) would affect the development proposed for the golf course location and would conflict with private parking and site access in the alignment north of Fourth Street. The Deer Creek alignment (A-4) and the Cucamonga Creek alignment (D-1) are the alignment options with the less challenging constraints. Of these two, the shorter Deer Creek alignment presents the most cost-effective option, so it is recommended that the Deer Creek alignment be carried forward into future planning as the preferred potential alignments for a rail line to connect the San Gabriel Sub with the airport terminal area.

8.1.4 Technology

DMU vs. Light Rail

Development of the system with light rail technology would mean that the design standards would be different as compared to DMU technology, e.g. curve radii could be shorter, providing the possibility of avoiding buildings in some locations. On the other hand, light rail requires additional infrastructure compared to DMU technology, including electrical substations and overhead catenary power lines. So the net effect on capital cost depends on the design issues associated with each alternative alignment. For the Deer Creek alignment the capital cost for LRT would be substantially less than the capital cost for DMU because ROW acquisition costs would be substantially reduced. For the other alignments, the capital cost for LRT would be somewhat higher than for DMU because the change in design standards would not substantially affect ROW acquisition.

In terms of operating cost differences, LRT technology costs less to operate and maintain than DMU technology. O&M cost data from operating DMU and LRT systems in the United States indicate that O&M costs would be substantially (approximately 40-60%) less with LRT than with DMU. This differential is likely due to the relative scarcity of operating DMU systems around the country, which could necessitate more specialized labor and materials for O&M and result in the higher costs.

Technology Recommendation

LRT offers the advantage of lower O&M costs than DMU, and its different design requirements could help avoid ROW impacts, as in the case of Alternative A-4. If the Gold Line extension is eventually selected as the preferred alternative, it should be built with LRT technology and operated as an extension of the Gold Line. Since the Redlands regional service alternative is not being recommended for further consideration (this is the only alternative which would necessarily involve DMU operation, so it could use the Metrolink tracks), technology options for a rail connection to Rancho Cucamonga should remain open for a determination of the most cost-effective system at the time a preferred alternative is selected and designed.

8.1.5 Summary of Recommendations

Key conclusions of the analysis are summarized in terms of system elements and attributes:

- Rail vs. Bus: The passenger convenience and system capacity of a rail system will best serve passenger needs and attract the most riders in the long-term future. However, the current and near-term ridership potential is not sufficient to justify the cost of building and operating a high capacity rail system.
- Regional Service vs. Connecting to Metrolink: If service connections at Metrolink stations are scheduled to coincide with Metrolink train arrivals, an airport connection can be almost as attractive as a regional service with a one-seat ride all the way to the airport. A regional rail service, especially one operating the 29-mile route between Redlands and ONT, would be more costly to build and operate than the five-mile route between the Rancho Cucamonga station and ONT.
- Service to East vs. Service to West: The alternatives connecting to Metrolink would primarily serve riders to and from the east in San Bernardino County, while the Gold Line extension would predominantly serve riders to and from the west in Los Angeles County.

- Metrolink Station Connections: Rancho Cucamonga vs. Upland: The operating cost for a connection to Rancho Cucamonga is less than for a connection to Upland because of the shorter distance.
- Rail Alignments: Four of the five rail connection alignments appear feasible. The Cleveland Avenue alignment should be eliminated from further consideration because of its potential effect on the planned golf course redevelopment project. Deer Creek and Cucamonga Creek are the alignment options with the less challenging constraints, and of these two the shorter Deer Creek alignment presents the most cost-effective option. To conveniently serve airport-oriented passengers, the alignment should extend into the airport terminal area.
- Technology: DMU capital costs are typically lower than LRT capital costs, while LRT operating costs are lower than DMU. The design standards for LRT may offer the potential of reducing right-of-way impacts. Since the ONT passenger volume needs to increase substantially before a rail connection is warranted, the decision on a preferred technology should be deferred so that the most cost-effective option can be determined at the time a final alignment is selected and designed.

The recommendations are summarized as follows:

- A rail connection should be planned for the airport’s future, and a bus shuttle connecting ONT with the Metrolink Rancho Cucamonga station should be developed in the interim until passenger volumes through ONT reach at least 15 MAP.
- A rail connection from the Rancho Cucamonga station should be carried forward as the preferred long-term concept for connecting the regional rail system to ONT.
- The planned long-term system should provide a rail connection all the way into the airport terminal area.
- Deer Creek and Cucamonga Creek should be carried forward into future planning as the preferred potential alignments between the Metrolink right-of-way and the airport terminals.
- A potential future extension of the Gold Line to ONT should not be precluded by development of a connection to Metrolink.
- Technology options for a rail connection to Rancho Cucamonga should remain open for a determination of the most cost-effective system at the time a preferred alternative is selected and designed.
- A regional rail service from Redlands to ONT should be dropped from further consideration.
- The Cleveland Avenue alignment option should be dropped from further consideration.

8.2 Near-Term Improvements and Implementation Phasing

As discussed above, a rail connection into the airport is desirable as the most effective way to serve the airport access needs of travelers using the regional rail system, but under current conditions of ONT passenger volumes and ground access options there wouldn’t be sufficient riders of a rail connection to justify the cost to build and operate a rail system. To improve airport access for regional transit users while ONT passenger volumes are growing to higher levels, a phased improvement plan was developed. It includes:

- Very near-term improvements which would improve transit connectivity into the airport terminal area with relatively minor adjustments to the existing transit system;
- Near-term improvements which would initiate direct shuttle service between the Metrolink San Bernardino Line and the airport terminals;
- Mid-term improvements which would increase service levels of the direct shuttle service to provide riders a quick and easy transfer between their train and the shuttle;

- Long-term implementation of a direct rail connection when airport passenger activity has grown to a level appropriate for investment in a direct rail connection.

8.2.1 Very Near Term

Work with Omnitrans to bring their fixed-route bus service (likely Route 61) into the airport terminal area to serve airport-oriented transit passengers with more convenient pick-up and drop-off. This should be considered as a first step to improve transit convenience for airport-oriented travelers by bringing transit service into the airport terminal area.

8.2.2 Near Term (as soon as practicable)

Implement a shuttle bus service that operates on a route that connects the Rancho Cucamonga Metrolink station to the ONT terminals. The service could be initiated using one or (preferably) two buses, operating during the hours when Metrolink trains serve the Rancho Cucamonga station. To the extent possible, the shuttle service should be scheduled to coincide with train arrivals at the Metrolink station. Omnitrans proposed BRT service (West Valley Connector Rapid Bus[19]) would make this connection but would not likely be scheduled to meet Metrolink train schedules. Parking shuttles or hotel shuttles might initially be used to provide the service.

To help arriving air passengers know when their connecting shuttle to Metrolink will leave the airport, shuttle schedule information should be provided at the airport in ways that are convenient and easy for travelers to access, such as providing real time schedule information via a smart phone app or electronic display at a designated shuttle stop.

8.2.3 Mid Term

As ridership builds on the shuttle service, increase the number of shuttle buses to provide convenient connections with all trains at the Rancho Cucamonga station. The service goal of the fully-operating shuttle bus system should be to minimize airport-oriented passenger transfer time by: (1) having an airport shuttle waiting when each Metrolink train arrives at the Rancho Cucamonga station; and (2) having a shuttle from the airport arrive at the station a few minutes before each train arrives.

8.2.4 Long Term

The key question for the long-term phase is: At what point in the airport's future development would a direct rail connection generate sufficient ridership to be justified? To answer this question, the experience of other airports with rail connections was reviewed In the context of ONT passenger activity levels and projected ridership estimates for a rail connection.

Based on the review of United States airports with rail connections presented in Chapter 2, the minimum airport passenger activity level that should be considered for a direct rail connection that is intended primarily to serve the airport is approximately 10 MAP. The three airports with substantially lower than 10 MAP are not a primary destination on their rail line – Burbank and Providence have stations on a commuter rail line that runs adjacent to the airport and the South Bend Airport is the suburban terminus of a commuter line into Chicago.

[19] http://www.omnitrans.org/about/reports/pdf/WVC-Info.pdf

Oakland Airport's rail connection is somewhat comparable to Ontario's situation, as the airport terminal is a few miles from the nearest station on the regional rail line (BART). For years the AirBART bus shuttle has been operated to carry BART passengers directly between OAK and the nearest BART station. Due to the frequency of BART service, BART's coverage of the urban area, and the convenience of the AirBART connecting service, AirBART has consistently attracted between 7.5-9% of passengers traveling through OAK. A rail connection (automated guideway) connecting BART with OAK is now under construction and almost complete, scheduled to open this fall. The passenger activity level at OAK is currently 10 MAP, down from a high of 14.6 MAP in 2007, so AirBART currently handles approximately 800,000-850,000 passengers annually.

For Ontario Airport, the projected rail connection ridership at 10 MAP would be approximately 3% of the airport passenger volume, including the riders from Ontario Metro Center using the rail connection to access Metrolink. The percentage of airport passengers using a rail link is projected to reach 4% when the airport handles 20 MAP, and the annual ridership at 20 MAP is projected to be comparable to AirBART's current ridership. From these comparisons with other airports, at ONT the ridership potential with 10 MAP does not appear sufficient to justify a rail connection, while the potential with 20 MAP is clearly sufficient to justify a rail connection, so this analysis concludes that airport passenger activity at ONT will need to reach a level of between 15-20 MAP to justify a rail connection.

Appendix A
FAA 2012 Terminal Area Forecast

Appendix B
Existing Omnitrans and Metrolink Schedule

Appendix C
Screening Analysis for each Evaluation Criteria

Appendix D
Metro Grade Crossing Policy for Light Rail Transit

Appendix E
Capital Cost Estimates

Appendix E-1: Alternative A-3

Appendix E-2: Alternative A-4

Appendix E-3: Alternative A-7

Appendix E-4: Alternative C-5

Appendix E-5: Alternative D-1

Appendix F
Operation and Maintenance Cost Estimates

Appendix G
Environmental Constraints

Governments
SANBAG
Working Together

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