RTIP ID# *(required)***:** RIV011233

TCWG Consideration Date: March 26, 2013

Project Description *(clearly describe project)*

The County of Riverside, in cooperation with the California Department of Transportation (Caltrans), the City of Eastvale and the City of Jurupa Valley, proposes to improve the existing freeway interchange at Interstate 15 (I-15) and Limonite Avenue, located within the cities of Eastvale and Jurupa Valley in Riverside County (see Figure 1). Within the project limits, I-15 currently is a six lane, three mixed flow lanes in each direction, accessed controlled freeway. The median of this freeway is unimproved and depressed with Type K barriers north of the proposed new interchange along the northbound outside edge of median shoulder and south of the proposed new interchange along the southbound outside edge of median shoulder.

The project extends along Limonite Avenue from Hamner Avenue to Wineville Avenue. Along I-15, improvements are proposed from approximately 0.60 miles south to 0.60 miles north of the existing Limonite Avenue overcrossing (OC). The Limonite Avenue OC, an east-west roadway, currently provides two traffic lanes in each direction and two left-turn lanes at the ramp intersections. This project proposes replacing the existing Limonite Avenue OC and widening the roadway from four lanes to six lanes.

Three alternatives are under consideration. Alternative 1, the No-Build Alternative, proposes to maintain the existing interchange configuration. Alternative 2, the Enhanced Capacity Diamond Alternative (Type L-1), proposes modifying the existing entrance and exit ramps and replacing the existing Limonite Avenue OC structure. Alternative 3, the Partial Clover Leaf Alternative (Type L-7), proposes replacing the existing OC structure and constructing loop ramps in the southeast and northwest quadrants. See Project Alternatives attachment for depictions of each project alternative.

Type of Project *(use Table 1 on instruction sheet)*

Reconfigure existing interchange

County	**Narrative Location/Route & Postmiles:** Interstate 15/Limonite Avenue Interchange Improvements (PM47.6/48.9) **Caltrans Projects – EA#** 0E150K
Riverside	

Lead Agency: Riverside County Transportation Department (RCTD)

Contact Person	**Phone#**	**Fax#**	**Email**
Keith Cooper	213-312-1752	213-312-1799	Keith.Cooper@icfi.com

Hot Spot Pollutant of Concern *(check one or both)* **PM2.5** ✓ **PM10** ✓

Federal Action for which Project-Level PM Conformity is Needed *(check appropriate box)*

✓ **Categorical Exclusion (NEPA)**	**EA or Draft EIS**	**FONSI or Final EIS**	**PS&E or Construction**	**Other**

Scheduled Date of Federal Action: 2013

NEPA Assignment – Project Type *(check appropriate box)*

Exempt	**Section 326 –Categorical Exemption**	✓ **Section 327 – Non-Categorical Exemption**

Current Programming Dates *(as appropriate)*

	PE/Environmental	ENG	ROW	CON
Start	1/1/2009	11/14/2012	7/12/2013	8/20/2014
End	12/5/2013	1/27/2015	7/29/2014	5/3/2016

Project Purpose and Need (Summary): *(attach additional sheets as necessary)*

Purpose

The purpose of the project is to:

- Address increased travel associated with existing and planned development located in Eastvale and Jurupa Valley; and
- Relieve congestion and improve traffic flow on the regional transportation system.

Need

The project is needed to alleviate traffic congestion associated with planned area development. Based on the most recent update of the Riverside County General Plan, the Cities of Eastvale and Jurupa Valley will add numerous residences and businesses in the coming years, resulting in substantial traffic and requiring a number of transportation and circulation improvements, including improvements to the I-15/Limonite Avenue Interchange. Operation of the I-15/Limonite Avenue Interchange ramps is currently approaching a deficient condition and will continue to degrade as development occurs in the area unless improvements are made to the transportation system.

Surrounding Land Use/Traffic Generators *(especially effect on diesel traffic)*

As shown in Project Alternatives attachment, regional commercial uses are located immediately northwest and southeast of the I-15/Limonite Avenue interchange. With the exception of the I-15/Limonite Avenue's northeast quadrant (this is vacant land), residential uses area located throughout the immediate project vicinity. No uses are present that would attract of substantial quantity of diesel truck traffic.

Opening Year: Build and No Build LOS, AADT, % and # trucks, truck AADT of proposed facility

Table 1 summarizes the projection of opening-year (2015) total and truck AADT on the study area I-15 mainline segments under build and no-building conditions. Total ADT and truck ADT were obtained from the project traffic report prepared by Dokken Engineering and approved by Caltrans District 8 (Dokken Engineering, October 2011).

Table 1. Opening-Year (2015) AADT and Truck AADT

I-15 Mainline Segment	2015 No Build Alternative		2015 Build Alternatives		Project Effect (Percent increase over No Build)	
	Total AADT	Truck AADT*	Total AADT	Truck AADT*	Total AADT	Truck AADT
North of Limonite Avenue	163,900	16,390	163,900	16,390	0.0%	0.0%
South of Limonite Avenue	157,400	15,740	157,400	15,740	0.0%	0.0%

*Truck percentage estimated to be 10% AADT volumes.
Adapted from Dokken Engineering, October 2011.

AADT on both I-15 mainline segments within the project limits would exceed the FHWA and EPA guidance criterion of 125,000 for all vehicles and 10,000 truck AADT (8% of 125,000 AADT), for a roadway project considered to be a potential project of air quality concern (POAQC). The proposed project would have no effect on I-15 mainline traffic volumes under the build alternatives when compared to no-build. Rather, the project would provide improved LOS conditions at the Limonite Avenue interchange under the build alternatives when compared to no-build as shown in attachment (LOS Forecast Summary).

RTP Horizon Year / Design Year: Build and No Build LOS, AADT, % and # trucks, truck AADT of proposed facility

Table 2 summarizes the projection of horizon-year (2035) total and truck AADT on the study area I-15 mainline segments under build and no-building conditions. Total ADT and truck ADT were obtained from the project traffic report prepared by Dokken Engineering and approved by Caltrans District 8 (Dokken Engineering, October 2011).

Table 2. Horizon-Year (2035) AADT and Truck AADT

I-15 Mainline Segment	2035 No Build Alternative		2035 Build Alternatives		Project Effect (Percent increase over No Build)	
	Total AADT	Truck AADT*	Total AADT	Truck AADT*	Total AADT	Truck AADT
North of Limonite Avenue	228,500	22,850	228,500	22,850	0.0%	0.0%
South of Limonite Avenue	219,400	21,940	219,400	21,940	0.0%	0.0%

*Truck percentage estimated to be 10% AADT volumes.
Adapted from Dokken Engineering, October 2011.

AADT on both I-15 mainline segments within the project limits would exceed the FHWA and EPA guidance criterion of 125,000 for all vehicles and 10,000 truck AADT (8% of 125,000 AADT), for a roadway project considered to be a potential project of air quality concern (POAQC). The proposed project would have no effect on I-15 mainline traffic volumes under the build alternatives when compared to no-build. Rather, the project would provide improved LOS conditions at the Limonite Avenue interchange under the build alternatives when compared to no-build as shown in attachment (LOS Forecast Summary).

Opening Year: If facility is an interchange(s) or intersection(s), Build and No Build cross-street AADT, % and # trucks, truck AADT

Table 3 summarizes the projections of opening-year (2015) total and truck AADT on the cross street Limonite Avenue segments under build and no-building conditions. Total ADT and truck ADT were derived from the peak-hour traffic volume predictions presented in the project traffic report prepared by Dokken Engineering and approved by Caltrans District 8 (Dokken Engineering, October 2011).

Table 3. Cross Street Opening-Year (2015) AADT and Truck AADT

Limonite Avenue Segment	2015 No Build Alternative		2015 Build Alternatives		Project Effect (Percent increase over No Build)	
	Total AADT	Truck AADT	Total AADT	Truck AADT	Total AADT	Truck AADT
West of Interstate 15	31,365	3,137	31,365	3,137	0.0%	0.0%
East of Interstate 15	25,800	2,580	25,800	2,580	0.0%	0.0%

Note: AADT volumes estimated to be 5 times combined AM and PM peak-hour volumes. Truck percentage estimated to be 10% AADT volumes.
Adapted from Dokken Engineering, October 2011.

AADT on both Limonite Avenue cross street segments would not exceed the FHWA and EPA guidance criterion of 125,000 for all vehicles and 10,000 truck AADT (8% of 125,000 AADT), for a roadway project considered to be a potential project of air quality concern (POAQC). The proposed project would have no effect on Limonite Avenue traffic volumes under the build alternatives when compared to no-build. Rather, the project would provide improved LOS conditions at the Limonite Avenue interchange under the build alternatives when compared to no-build as shown in attachment (LOS Forecast Summary).

RTP Horizon Year / Design Year: If facility is an interchange (s) or intersection(s), Build and No Build cross-street AADT, % and # trucks, truck AADT

Table 4 summarizes the projections of horizon-year (2035) total and truck AADT on the cross street Limonite Avenue segments under build and no-building conditions. Total ADT and truck ADT were derived from the peak-hour traffic volume predictions presented in the project traffic report prepared by Dokken Engineering and approved by Caltrans District 8 (Dokken Engineering, October 2011).

Table 4. Cross Street Horizon-Year (2035) AADT and Truck AADT

Limonite Avenue Segment	2035 No Build Alternative		2035 Build Alternatives		Project Effect (Percent increase over No Build)	
	Total AADT	Truck AADT	Total AADT	Truck AADT	Total AADT	Truck AADT
West of Interstate 15	63,015	6,302	63,015	6,302	0.0%	0.0%
East of Interstate 15	53,225	5,323	53,225	5,323	0.0%	0.0%

Note: AADT volumes estimated to be 5 times combined AM and PM peak-hour volumes. Truck percentage estimated to be 10% AADT volumes.
Adapted from Dokken Engineering, October 2011.

AADT on both Limonite Avenue cross street segments would not exceed the FHWA and EPA guidance criterion of 125,000 for all vehicles and 10,000 truck AADT (8% of 125,000 AADT), for a roadway project considered to be a potential project of air quality concern (POAQC). The proposed project would have no effect on Limonite Avenue traffic volumes under the build alternatives when compared to no-build. Rather, the project would provide improved LOS conditions at the Limonite Avenue interchange under the build alternatives when compared to no-build as shown in attachment (LOS Forecast Summary).

Describe potential traffic redistribution effects of congestion relief *(impact on other facilities)*

The proposed I-15/Limonite Avenue Project is not expected to result in any traffic diversion to adjacent interchanges, nor any other change in local travel patterns. The project would have no effect on I-15 mainline or Limonite Avenue traffic volumes. (Dokken, October 2011).

Comments/Explanation/Details *(attach additional sheets as necessary)*

The proposed project is not a project of air quality concern because the project does not meet the following criteria (underlined text indicates answers to 40 CFR 93.123(b)(1) criteria for Projects of Air Quality Concern:

(i) New or expanded highway projects that have a significant number of or significant increase in diesel vehicles.

Truck traffic volumes along the I-15 and Limonite Avenue project limits are not expected to change at opening year 2015 or horizon year 2035, under the build alternatives, when compared to no-build.

(ii) Projects affecting intersections that are at Level-of-Service D, E, or F with a significant number of diesel vehicles, or those that will change to Level-of-Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project.

Attachment LOS Forecast Summary indicates that several ramp junctions would operate at LOS D, E, or F under future no-build conditions. The project is not expected to cause a deterioration of these levels. Rather, as shown in the attachment, the project would improve LOS for some ramp junctions. Overall, by improving traffic flow and reducing conditions, the project would be expected to reduce localized PM concentrations at surrounding land uses.

(iii) New bus and rail terminals and transfer points than have a significant number of diesel vehicles congregating at a single location.

The project does not include new bus or rail terminals and transfer points.

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location.

The project does not include expanded bus or rail terminals and transfer points.

(v) Projects in or affecting locations, areas, or categories of sites which are identified in the PM10 or PM2.5 applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

The project site is not in or affecting an area or location identified in any PM10 or PM2.5 implementation plan. The immediate project area is not considered to be a site of violation or possible violation.

Based on the information provided above, the proposed project is not expected to introduce significant amounts of diesel truck traffic or negatively affect intersections with a significant number of diesel vehicles. Therefore, the project is not considered to be a POAQC based on the definition contained in 40 CFR 93.123(b)(1). The proposed project would also not be considered a project of air quality concern with respect to PM10 or PM2.5 emissions as defined by 40 CFR 93.123(b) (1). Therefore, a PM10/PM2.5 hot-spot evaluation is not required.

Reference:

Dokken Engineering. 2011. Traffic Operations Analysis I-15/Limonite Avenue Interchange. October.

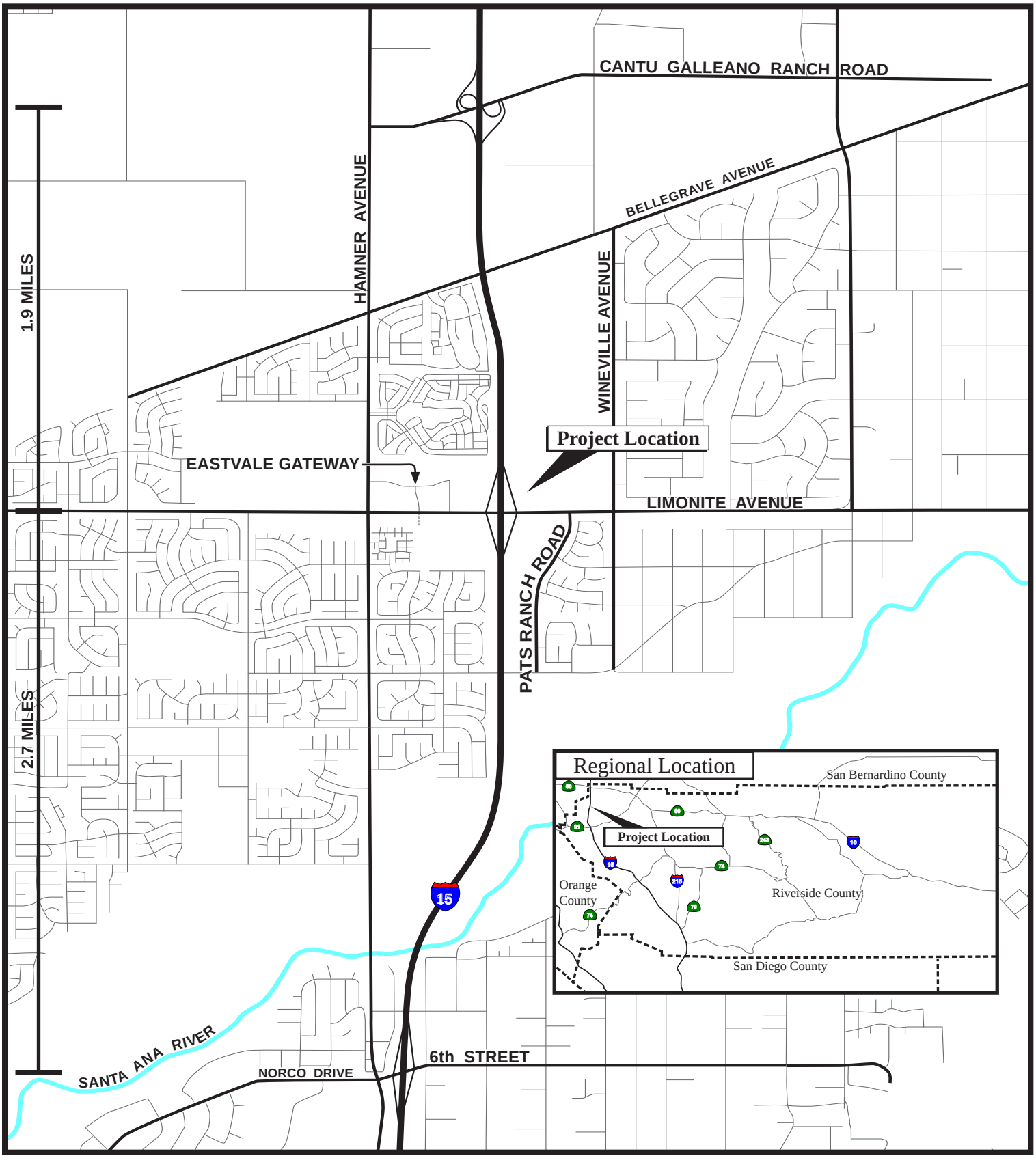


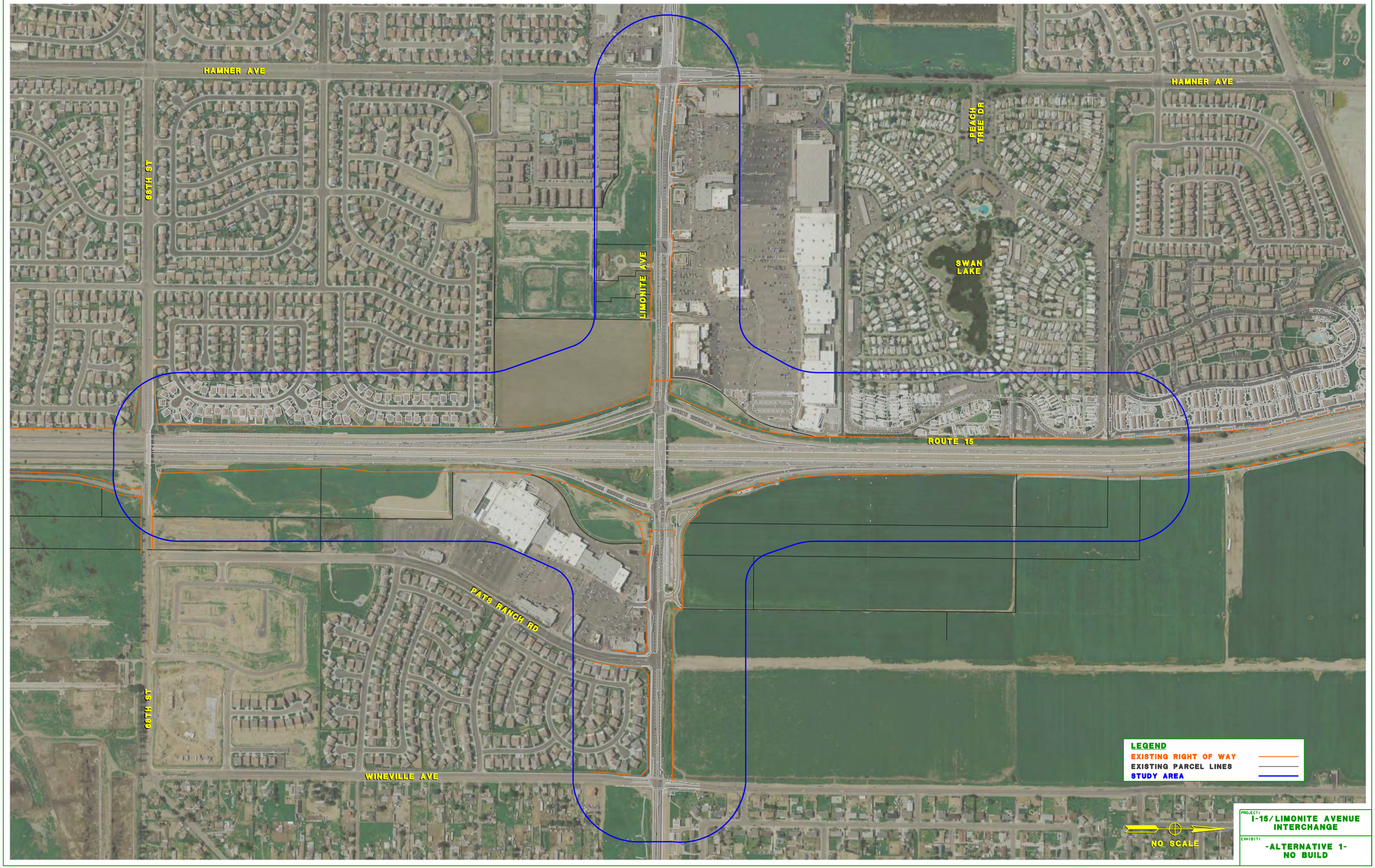
FIGURE 1

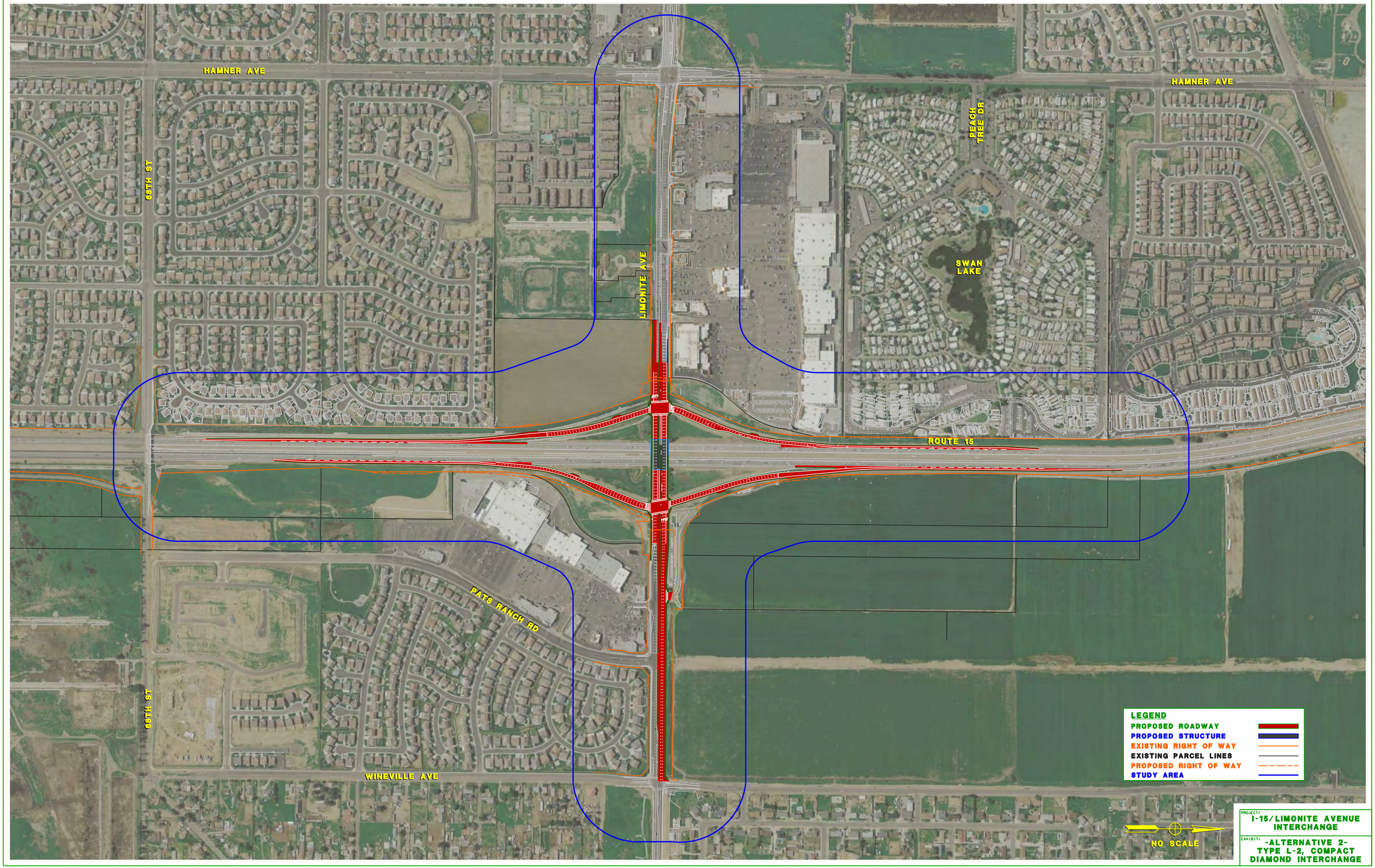
I-15/Limonite Avenue Interchange
Traffic Impact Analysis
Project Location

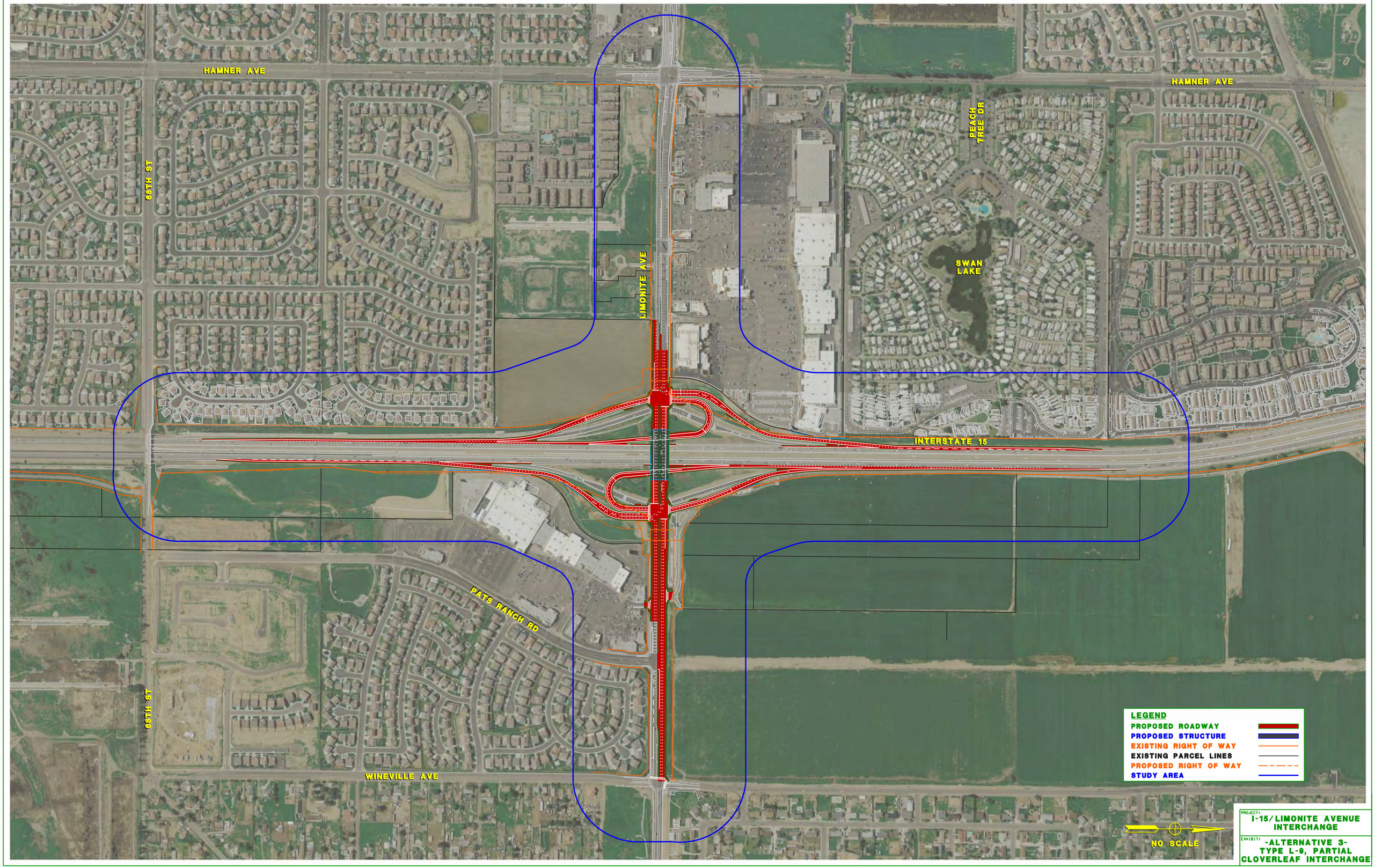
0 .25 .5
Miles

SOURCE: YAHOO MAPS

File Name: Limonite - Operations Report_All Figures_current


HAMNER AVE
HAMNER AVE
68TH ST
LIMONITE AVE
REACH TREE DR
SWAN LAKE
ROUTE 15
PATS RANCH RD
68TH ST
WINEVILLE AVE
LEGEND
EXISTING RIGHT OF WAY
EXISTING PARCEL LINES
STUDY AREA
NO SCALE
PROJECT:
I-15/LIMONITE AVENUE INTERCHANGE
EXHIBIT:
-ALTERNATIVE 1-
NO BUILD


HAMNER AVE
HAMNER AVE
68TH ST
68TH ST
LIMONITE AVE
REACH TREE DR
SWAN LAKE
ROUTE 15
PATS RANCH RD
WINEVILLE AVE
LEGEND
PROPOSED ROADWAY
PROPOSED STRUCTURE
EXISTING RIGHT OF WAY
EXISTING PARCEL LINES
PROPOSED RIGHT OF WAY
STUDY AREA
NO SCALE
PROJECT:
I-15/LIMONITE AVENUE INTERCHANGE
EXHIBIT:
-ALTERNATIVE 2-
TYPE L-2, COMPACT DIAMOND INTERCHANGE


HAMNER AVE
HAMNER AVE
68TH ST
68TH ST
LIMONITE AVE
REACH TREE DR
SWAN LAKE
INTERSTATE 15
PATS RANCH RD
WINEVILLE AVE
LEGEND
PROPOSED ROADWAY
PROPOSED STRUCTURE
EXISTING RIGHT OF WAY
EXISTING PARCEL LINES
PROPOSED RIGHT OF WAY
STUDY AREA
NO SCALE
PROJECT:
I-15/LIMONITE AVENUE INTERCHANGE
EXHIBIT:
-ALTERNATIVE 3-
TYPE L-9, PARTIAL CLOVERLEAF INTERCHANGE

08-Riv-15
PM 47.8/49.1
08804-0800020201
(0E150K)

TRAFFIC OPERATIONS ANALYSIS

I-15/LIMONITE AVENUE INTERCHANGE

RIVERSIDE COUNTY, CALIFORNIA

Prepared by:
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DOKKEN
ENGINEERING
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October 2011

Dokken Job Number: 1680

7.2.2 Year 2015 Mainline Analysis

Tables 22 and 23 shows the results of freeway mainline level-of-service calculations for forecast Year 2015 conditions on the freeway segments north and south of Limonite Avenue, outside of the sphere-of-influence of the freeway ramps.

Table 22 – Year 2015 Freeway Mainline Level-of-Service Analysis (Alternatives 1 and 2)

No.	Segment	Lanes			AM Peak Hour			PM Peak Hour		
		Mixed	HOV	Mixed-flow Capacity	Mixed Flow Volume	Density (pc/km/ln)	LOS	Mixed Flow Volume	Density (pc/km/ln)	LOS
	I-15 Northbound									
1	South of 6th Street Off-Ramp	3	0	7,050	6,375	26.6	E	6,779	-	F
2	6th Street Off-Ramp to 6th Street On-Ramp	3	0	7,050	5,664	20.3	D	5,834	21.5	D
3	6th Street On-Ramp to Limonite Avenue Off-Ramp	3	0	7,050	6,428	27.2	E	6,776	-	F
4	Limonite Avenue Off-Ramp to Limonite Avenue On-Ramp	3	0	7,050	5,667	20.4	D	5,427	18.9	D
5	Limonite Avenue On-Ramp to Cantu Galleano Off-Ramp	3	0	7,050	6,645	-	F	6,096	23.7	E
6	Cantu Galleano Off-Ramp to Cantu Galleano Loop On-Ramp	3	0	7,050	6,433	27.3	E	5,877	21.8	D
7	North of Cantu Galleano Loop On-Ramp	3	0	7,050	6,931	-	F	6,356	26.4	E
	I-15 Southbound									
8	North of Cantu Galleano Off-Ramp	3	0	7,050	6,028	23.1	E	6,028	23.1	E
9	Cantu Galleano Off-Ramp to Cantu Calleano Loop On-Ramp	3	0	7,050	5,588	19.9	D	5,504	19.4	D
10	Cantu Galleano Loop On-Ramp to Slip On-Ramp	4	0	9,400	5,633	13.9	C	5,659	14.0	C
11	Cantu Galleano Slip On-Ramp to Limonite Avenue Off-Ramp	3	0	7,050	5,714	20.7	D	5,790	21.2	D
12	Limonite Avenue Off-Ramp to Limonite Avenue On-Ramp	3	0	7,050	5,049	17.1	D	4,745	15.8	C
13	Limonite Avenue Slip On-Ramp to 6th Street Off-Ramp	3	0	7,050	6,100	23.7	E	5,762	21.0	D
14	6th Street Off-Ramp to 6th Street On-Ramp	3	0	7,050	5,440	19.0	D	4,930	16.5	D
15	South of 6th Street On-Ramp	3	0	7,050	6,300	25.7	E	5,764	21.0	D

Notes:
All volumes are Passenger Car Equivalents (PCE)
Level-of-Service (LOS) criteria are provided in the Highway Capacity Manual, and are based on density.
expressed in terms of passenger cars per kilometer per lane (pc/km/ln).
Per HCM Exhibit 23-2, the capacity of a mixed flow land is 2,350 PCE per hour, assuming a free flow speed of 110 kph.

Table 23 – Year 2015 Freeway Mainline Level-of-Service Analysis (Alternative 3)

No.	Segment	Lanes			AM Peak Hour			PM Peak Hour		
		Mixed	HOV	Mixed-flow Capacity	Mixed Flow Volume	Density (pc/km/ln)	LOS	Mixed Flow Volume	Density (pc/km/ln)	LOS
	I-15 Northbound									
1	South of 6th Street Off-Ramp	3	0	7,050	6,375	26.6	E	6,779	-	F
2	6th Street Off-Ramp to 6th Street On-Ramp	3	0	7,050	5,664	20.3	D	5,834	21.5	D
3	6th Street On-Ramp to Limonite Avenue Off-Ramp	3	0	7,050	6,428	27.2	E	6,776	-	F
4	Limonite Avenue Off-Ramp to Limonite Avenue Loop On-Ramp	3	0	7,050	5,667	20.4	D	5,427	18.9	D
5	Limonite Avenue Loop On-Ramp to Limonite Avenue Slip On-Ramp	4	0	9,400	6,320	15.8	C	5,900	14.6	C
6	Limonite Avenue On-Ramp to Cantu Galleano Off-Ramp	3	0	7,050	6,645	-	F	6,096	23.7	E
7	Cantu Galleano Off-Ramp to Cantu Galleano Loop On-Ramp	3	0	7,050	6,433	27.3	E	5,877	21.8	D
8	North of Cantu Galleano Loop On-Ramp	3	0	7,050	6,931	-	F	6,356	26.4	E
	I-15 Southbound									
9	North of Cantu Galleano Off-Ramp	3	0	7,050	6,028	23.1	E	6,028	23.1	E
10	Cantu Galleano Off-Ramp to Cantu Calleano Loop On-Ramp	3	0	7,050	5,588	19.9	D	5,504	19.4	D
11	Cantu Galleano Loop On-Ramp to Slip On-Ramp	4	0	9,400	5,633	13.9	C	5,659	14.0	C
12	Cantu Galleano Slip On-Ramp to Limonite Avenue Off-Ramp	3	0	7,050	5,714	20.7	D	5,790	21.2	D
13	Limonite Avenue Off-Ramp to Limonite Avenue Loop On-Ramp	3	0	7,050	5,049	17.1	D	4,745	15.8	C
14	Limonite Avenue Loop On-Ramp to Limonite Avenue Slip On-Ramp	4	0	9,400	5,662	14.0	C	5,264	13.0	C
15	Limonite Avenue Slip On-Ramp to 6th Street Off-Ramp	3	0	7,050	6,100	23.7	E	5,762	21.0	D
16	6th Street Off-Ramp to 6th Street On-Ramp	3	0	7,050	5,440	19.0	D	4,930	16.5	D
17	South of 6th Street On-Ramp	3	0	7,050	6,300	25.7	E	5,764	21.0	D

Notes:
All volumes are Passenger Car Equivalents (PCE)
Level-of-Service (LOS) criteria are provided in the Highway Capacity Manual, and are based on density.
expressed in terms of passenger cars per kilometer per lane (pc/km/ln).
Per HCM Exhibit 23-2, the capacity of a mixed flow land is 2,350 PCE per hour, assuming a free flow speed of 110 kph.

In the Year 2015 for all Limonite Avenue Project Alternatives, the freeway mainline is forecast to operate at LOS F northbound north of the Limonite Avenue On-Ramp in the AM peak hour and northbound south of 6th Street in the PM peak hour.

7.2.3 Year 2035 Mainline Analysis

Tables 24 and 25 show the results of freeway mainline level-of-service calculations for forecast Year 2035 conditions on the freeway segments north and south of Limonite Avenue, outside of the sphere-of-influence of the freeway ramps.

Table 24 – Year 2035 Freeway Mainline Level-of-Service Analysis (Alternatives 1 and 2)

No.	Segment	Lanes			AM Peak Hour				PM Peak Hour			
						Mixed-Flow Lane Analysis				Mixed-Flow Lane Analysis		
		Mixed	HOV /HOT	Mixed-flow Capacity	HOV /HOT Lane Volume	Mixed Flow Volume	Density (pc/km/ln)	LOS	HOV /HOT Lane Volume	Mixed Flow Volume	Density (pc/km/ln)	LOS
	I-15 Northbound											
1	South of 6th Street Off-Ramp	4	2	9,400	1,360	8,208	24.2	E	1,263	7,561	20.4	D
2	6th Street Off-Ramp to 6th Street On-Ramp	4	2	9,400	1,360	6,865	17.5	D	1,263	5,770	14.3	C
3	6th Street On-Ramp to Limonite Avenue Off-Ramp	4	2	9,400	1,360/ 1,431	8,106	23.5	E	1,263/ 1,421	8,212	24.3	E
4	Limonite Avenue Off-Ramp to Limonite Avenue On-Ramp	4	2	9,400	1,431	6,418	16.1	D	1,421	5,853	14.5	C
5	Limonite Avenue On-Ramp to Cantu Galleano Off-Ramp	4	2	9,400	1,431	7,473	20.0	D	1,421	6,995	18.0	D
6	Cantu Galleano Off-Ramp to Cantu Galleano Loop On-Ramp	4	2	9,400	1,431/ 1,426	7,070	18.3	D	1,421/ 1,232	6,329	15.8	C
7	North of Cantu Galleano Loop On-Ramp	4	2	9,400	1,431	7,952	22.5	E	1,232	7,341	19.4	D
	I-15 Southbound											
8	North of Cantu Galleano Off-Ramp	4	2	9,400	1,003	5,090	12.6	C	943	5,123	12.7	C
9	Cantu Galleano Off-Ramp to Cantu Calleano Loop On-Ramp	4	2	9,400	1,003	4,431	10.9	B	943	4,467	11	C
10	Cantu Galleano Loop On-Ramp to Slip On-Ramp	5	2	11,750	1,003	4,531	9.0	B	943	4,728	9.3	B
11	Cantu Galleano Slip On-Ramp to Limonite Avenue Off-Ramp	4	2	9,400	1,003/ 988	4,692	11.6	C	943/ 998	5,015	12.4	C
12	Limonite Avenue Off-Ramp to Limonite Avenue On-Ramp	4	2	9,400	988	3,441	8.5	B	998	3,604	8.9	B
13	Limonite Avenue Slip On-Ramp to 6th Street Off-Ramp	4	2	9,400	988/ 1,094	5,601	13.8	C	998/ 1,108	5,654	14.0	C
14	6th Street Off-Ramp to 6th Street On-Ramp	4	2	9,400	1,094	4,631	11.4	C	1,108	4,205	10.4	B
15	South of 6th Street On-Ramp	4	2	9,400	1,094	6,331	15.8	C	1,108	6,076	15.1	C

Notes:
All volumes are Passenger Car Equivalents (PCE)
Level-of-Service (LOS) criteria are provided in the Highway Capacity Manual, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).
Per HCM Exhibit 23-2, the capacity of a mixed flow land is 2,350 PCE per hour, assuming a free flow speed of 110 kph.

Table 25 – Year 2035 Freeway Mainline Level-of-Service Analysis (Alternative 3)

No.	Segment	Lanes			AM Peak Hour				PM Peak Hour			
						Mixed-Flow Lane Analysis				Mixed-Flow Lane Analysis		
		Mixed	HOV /HOT	Mixed-flow Capacity	HOV /HOT Lane Volume	Mixed Flow Volume	Density (pc/km/ln)	LOS	HOV /HOT Lane Volume	Mixed Flow Volume	Density (pc/km/ln)	LOS
	I-15 Northbound											
1	South of 6th Street Off-Ramp	4	2	9,400	1,360	8,208	24.2	E	1,263	7,561	20.4	D
2	6th Street Off-Ramp to 6th Street On-Ramp	4	2	9,400	1,360	6,865	17.5	D	1,263	5,770	14.3	C
3	6th Street On-Ramp to Limonite Avenue Off-Ramp	4	2	9,400	1,360/ 1,431	8,106	23.5	E	1,263/ 1,421	8,212	24.3	E
4	Limonite Avenue Off-Ramp to Limonite Avenue Loop On-Ramp	4	2	9,400	1,431	6,418	16.1	D	1,421	5,853	14.5	C
5	Limonite Avenue Loop On-Ramp to Limonite Avenue Slip On-Ramp	5	2	11,750	1,431	6,993	13.8	C	1,421	6,115	12.1	C
6	Limonite Avenue On-Ramp to Cantu Galleano Off-Ramp	4	2	9,400	1,431	7,473	20.0	D	1,421	6,995	18.0	D
7	Cantu Galleano Off-Ramp to Cantu Galleano Loop On-Ramp	4	2	9,400	1,431/ 1,426	7,070	18.3	D	1,421/ 1,232	6,329	15.8	C
8	North of Cantu Galleano Loop On-Ramp	4	2	9,400	1,431	7,952	22.5	E	1,232	7,341	19.4	D
	I-15 Southbound											
9	North of Cantu Galleano Off-Ramp	4	2	9,400	1,003	5,090	12.6	C	943	5,123	12.7	C
10	Cantu Galleano Off-Ramp to Cantu Calleano Loop On-Ramp	4	2	9,400	1,003	4,431	10.9	B	943	4,467	11	C
11	Cantu Galleano Loop On-Ramp to Slip On-Ramp	5	2	11,750	1,003	4,531	9.0	B	943	4,728	9.3	B
12	Cantu Galleano Slip On-Ramp to Limonite Avenue Off-Ramp	4	2	9,400	1,003/ 988	4,692	11.6	C	943/ 998	5,015	12.4	C
13	Limonite Avenue Off-Ramp to Limonite Avenue Loop On-Ramp	4	2	9,400	988	3,441	8.5	B	998	3,604	8.9	B
14	Limonite Avenue Loop On-Ramp to Limonite Avenue Slip On-Ramp	5	2	11,750	988	4,601	9.1	B	998	4,654	9.2	B
15	Limonite Avenue Slip On-Ramp to 6th Street Off-Ramp	4	2	9,400	988/ 1,094	5,601	13.8	C	998/ 1,108	5,654	14.0	C
16	6th Street Off-Ramp to 6th Street On-Ramp	4	2	9,400	1,094	4,631	11.4	C	1,108	4,205	10.4	B
17	South of 6th Street On-Ramp	4	2	9,400	1,094	6,331	15.8	C	1,108	6,076	15.1	C

Notes:
All volumes are Passenger Car Equivalents (PCE)
Level-of-Service (LOS) criteria are provided in the Highway Capacity Manual, and are based on density.
expressed in terms of passenger cars per kilometer per lane (pc/km/ln).
Per HCM Exhibit 23-2, the capacity of a mixed flow land is 2,350 PCE per hour, assuming a free flow speed of 110 kph.

Tables 24 and 25 show that proposed future freeway improvements, planned for implementation after the Year 2019 but before the Year 2035, will provide sufficient mixed-flow capacity to accommodate Year 2035 freeway mainline demand. As shown in Tables 24 and 25, the volume forecasts in the HOV/HOT lanes do not exceed 1,500 vehicles per hour, far below the capacity of two HOV/HOT lanes that would be expected to have a capacity of double that amount. As such, the HOV/HOT lane levels of service are expected to be good and formal analysis to calculate lane densities was not deemed necessary.

Appendix M contains the freeway mainline mixed-flow lane analysis worksheets.

Table 28 – Year 2015 Alternative 1 Ramp Junction Merge/Diverge Calculation Summary

No.	Segment	AM Peak Hour			PM Peak Hour		
		Ramp Volume	Density (pc/mi/ln)	LOS	Ramp Volume	Density (pc/mi/ln)	LOS
	I-15 Northbound						
1	6th Street Off-Ramp	711	34.8	D	945	38.5	F
2	6th Street On-ramp	764	36.1	E	932	38.3	F
3	Limonite Avenue Off-Ramp	761	35.3	D	1,339	38.5	F
4	Limonite Avenue On-Ramp	978	37.8	F	669	34.1	D
5	Cantu Galleano Off-Ramp	440	32.5	D	219	32.5	D
	I-15 Southbound						
6	Cantu Galleano Slip On-Ramp	81	30.5	D	524	36.0	E
7	Limonite Avenue Off-Ramp	665	31.6	D	1,045	32.6	D
8	Limonite Avenue On-Ramp	1,051	35.3	E	1,017	33.5	D
9	6th Street Off-Ramp	660	33.1	D	832	32.1	D
10	6th Street On-ramp	860	35.7	E	834	33.0	D

Notes:
All volumes are in Passenger Car Equivalents (PCE).
Level of Service (LOS) criteria are provided in the *Highway Capacity Manual*, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).

Table 29 – Year 2015 Alternative 2 Ramp Junction Merge/Diverge Calculation Summary

No.	Segment	AM Peak Hour			PM Peak Hour		
		Ramp Volume	Density (pc/mi/ln)	LOS	Ramp Volume	Density (pc/mi/ln)	LOS
	I-15 Northbound						
1	6th Street Off-Ramp	711	34.8	D	945	38.5	F
2	6th Street On-ramp	764	36.1	E	932	38.3	F
3	Limonite Avenue Off-Ramp	761	7.1	A	1,339	12.9	B*
4	Limonite Avenue On-Ramp	978	33.6	D*	669	29.9	D
5	Cantu Galleano Off-Ramp	440	32.5	D	219	32.5	D
	I-15 Southbound						
6	Cantu Galleano Slip On-Ramp	81	30.5	D	524	36.0	E
7	Limonite Avenue Off-Ramp	665	3.3	A	1,045	3.7	A
8	Limonite Avenue On-Ramp	1,051	31	D	1,017	29.1	D
9	6th Street Off-Ramp	660	33.1	D	832	32.1	D
10	6th Street On-ramp	860	35.7	E	834	33.0	D

Notes:
* LOS based on calculated density only.
All volumes are in Passenger Car Equivalents (PCE).
Level of Service (LOS) criteria are provided in the *Highway Capacity Manual*, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).

Table 30 – Year 2015 Alternative 3 Ramp Junction Merge/Diverge Calculation Summary

No.	Segment	AM Peak Hour			PM Peak Hour		
		Ramp Volume	Density (pc/mi/ln)	LOS	Ramp Volume	Density (pc/mi/ln)	LOS
	I-15 Northbound						
1	6th Street Off-Ramp	711	34.8	D	945	38.5	F
2	6th Street On-ramp	764	36.1	E	932	38.3	F
3	Limonite Avenue Off-Ramp	761	7.1	A	1,339	12.8	B*
4	Limonite Avenue On-Ramp	325	20.1	C	196	17.6	B
5	Cantu Galleano Off-Ramp	440	32.5	D	219	32.5	D
	I-15 Southbound						
6	Cantu Galleano Slip On-Ramp	81	30.5	D	524	36.0	E
7	Limonite Avenue Off-Ramp	655	3.3	A	1,045	3.7	A
8	Limonite Avenue On-Ramp	438	18.8	B	498	17.9	B
9	6th Street Off-Ramp	660	33.1	D	832	32.1	D
10	6th Street On-ramp	860	35.7	E	834	33.0	D

Notes:

* LOS based on calculated density only.

All volumes are in Passenger Car Equivalents (PCE).

Level of Service (LOS) criteria are provided in the *Highway Capacity Manual*, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).

For all alternatives, the poor merge/diverge operations in the PM peak northbound in the vicinity of 6th Street is the result of freeway mainline demand approaching or exceeding capacity. The merge/diverge operations at 6th Street and at Cantu Galleano Ranch Road are the same, regardless of which Limonite Avenue Project Alternative is selected.

At the Limonite Avenue interchange, improvements to the off-ramps by adding a second off-ramp lane and a longer deceleration lane results in much improved operations. Both Alternative 2 and 3 increase the acceleration and deceleration lane lengths at the on and off-ramps, thereby improving the merge/diverge operations over the "no build" alternative. Alternative 3 provides two Limonite Avenue on-ramps, thereby dividing the on-ramp traffic, and provides a fourth freeway lane between the loop on-ramp and the slip on-ramp, thereby improving the merge point operations.

7.4.3 Year 2035 Analysis

Tables 31, 32 and 33 show the results of the ramp junction merge/diverge calculation results for each project alternative.

Table 31 – Year 2035 Alternative 1 Ramp Junction Merge/Diverge Calculation Summary

No.	Segment	AM Peak Hour			PM Peak Hour		
		Ramp Volume	Density (pc/mi/ln)	LOS	Ramp Volume	Density (pc/mi/ln)	LOS
	I-15 Northbound						
1	6th Street Off-Ramp	1,343	38.9	E	1,791	38.7	E
2	6th Street On-ramp	1,311	35.1	E	2,442	40.4	E
3	Limonite Avenue Off-Ramp	1,713	40.5	E	2,200	42.8	F
4	Limonite Avenue On-Ramp	1,075	31.5	D	1,561	33.7	D
5	Cantu Galleano Off-Ramp	404	31.0	D	666	30.4	D
	I-15 Southbound						
6	Cantu Galleano Slip On-Ramp	659	23.9	C	287	19.7	B
7	Limonite Avenue Off-Ramp	1,251	24.1	C	1,356	25.8	C
8	Limonite Avenue On-Ramp	2,160	30.3	D	2,050	34.6	D
9	6th Street Off-Ramp	861	25.3	C	1,338	28.0	D
10	6th Street On-ramp	1,700	30.7	D	1,871	30.6	D

Notes:
All volumes are in Passenger Car Equivalents (PCE).
Level of Service (LOS) criteria are provided in the *Highway Capacity Manual*, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).

Table 32 – Year 2035 Alternative 2 Ramp Junction Merge/Diverge Calculation Summary

No.	Segment	AM Peak Hour			PM Peak Hour		
		Ramp Volume	Density (pc/mi/ln)	LOS	Ramp Volume	Density (pc/mi/ln)	LOS
	I-15 Northbound						
1	6th Street Off-Ramp	1,343	38.9	E	1,791	38.7	E
2	6th Street On-ramp	1,311	35.1	E	2,442	40.4	E
3	Limonite Avenue Off-Ramp	1,713	4.3	A	2,200	7.5	A
4	Limonite Avenue On-Ramp	1,075	26.2	C	1,561	28.4	D
5	Cantu Galleano Off-Ramp	404	31.0	D	666	30.4	D
	I-15 Southbound						
6	Cantu Galleano Slip On-Ramp	659	23.9	C	287	19.7	B
7	Limonite Avenue Off-Ramp	1,251	-	A	1,356	-	A
8	Limonite Avenue On-Ramp	2,160	25	C	2,050	29.2	D
9	6th Street Off-Ramp	861	25.3	C	1,338	28.0	D
10	6th Street On-ramp	1,700	30.7	D	1,871	30.6	D

Notes:
All volumes are in Passenger Car Equivalents (PCE).
Level of Service (LOS) criteria are provided in the *Highway Capacity Manual*, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).

Table 33 – Year 2035 Alternative 3 Ramp Junction Merge/Diverge Calculation Summary

No.	Segment	AM Peak Hour			PM Peak Hour		
		Ramp Volume	Density (pc/mi/ln)	LOS	Ramp Volume	Density (pc/mi/ln)	LOS
	I-15 Northbound						
1	6th Street Off-Ramp	1,343	38.9	E	1,791	38.7	E
2	6th Street On-ramp	1,311	35.1	E	2,442	40.4	E
3	Limonite Avenue Off-Ramp	1,713	4.3	A	2,200	-	A
4	Limonite Avenue On-Ramp	475	16.8	B	953	18.8	B
5	Cantu Galleano Off-Ramp	404	31.0	D	666	30.4	D
	I-15 Southbound						
6	Cantu Galleano Slip On-Ramp	659	23.9	C	287	19.7	B
7	Limonite Avenue Off-Ramp	1,251	-	A	1,356	9.5	A
8	Limonite Avenue On-Ramp	1,000	16.2	B	1,050	16.8	B
9	6th Street Off-Ramp	861	25.3	C	1,338	28.0	D
10	6th Street On-ramp	1,700	30.7	D	1,871	30.6	D

Notes:
All volumes are in Passenger Car Equivalents (PCE).
Level of Service (LOS) criteria are provided in the *Highway Capacity Manual*, and are based on density, expressed in terms of passenger cars per kilometer per lane (pc/km/ln).