Casa Grande Mountain Ranch Development
Casa Grande, AZ

Traffic Impact Analysis

Prepared for:

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Prepared by:

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December 14, 2006

LEE ENGINEERING

Project No. 911.01

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INTRODUCTION AND STUDY SUMMARY

This study analyzes the potential traffic impacts of a proposed mixed-use development to be located on land straddling Interstate 8 to the west of the I-8/I-10 interchange in Casa Grande, Arizona. The purpose of this study is to prepare a traffic impact analysis that satisfies the requirements, standards, and expectations of the City of Casa Grande and the Arizona Department of Transportation. The traffic study will determine the need for roadway improvements, identify operational deficiencies, and recommend appropriate treatments, if required, in order to ensure that efficient and safe traffic operations are maintained on the adjacent road network. Given the nature of the development and its anticipated development schedule, three horizon years (2008, 2012, and 2016) will be analyzed corresponding with buildout stages for the site.

The proposed site is estimated to generate about 79,000 daily trips when at full buildout sometime between 2016 and 2020. About 8,500 of these trips (in + out) are projected to occur in the AM peak hour, while the PM peak hour trip generation is estimated at about the same. For the purposes of the study, an equivalent estimate of about 10% of these totals would represent trips between parcels on-site and thus would have limited impact potential. Consideration of general area growth and other nearby developments generates the need for specific study area intersection improvements discussed in the body of the report. The site will rely on these improvements in addition to site-specific needs that were determined from comparing projected traffic conditions with and without the site-generated traffic demands. Examples for the first phase of development include the need for a traffic signal at the main access to the northern site area and expanding the eastbound approach at the Arica Road/Sunland Gin Road intersection. Although the assessment of the two other horizon years is based on less certain circumstances, it appears that the proposed Henness Road/I-8 interchange will be needed to support the introduction of the site's Phase 2 land uses/intensities.

SITE DESCRIPTION - PROPOSED DEVELOPMENT

The vicinity map for the proposed site is shown in Figure 1. The proposed site is composed of northern and southern sections, each having parcels slated to develop within each of the three phases. The southern portion of the site is generally bounded by I-8 on the north, Arica Road (or its alignment) on the south, Lamb/Cox Road on the east, and mountainous terrain on the west. The northern portion of the site is bounded by I-8 on the south, I-10 on the east, Jimmie Kerr Boulevard (SR 84) on the north, and the Henness Road alignment (generally) on the west. The current uses on-site either are vacant land or a small campground. Figure 2 shows the layout of the site and the proposed development phasing.

The southern portion of the site is 768 acres and is planned to contain single family and multi-family residential areas, an elementary school site, commercial/retail parcels, office/business buildings, and a resort hotel/conference center. The northern portion of the site will provide business park/flex industrial land uses and a corporate headquarters situated on a total of about 456 acres. After three phases of development, the combined sections of the site will likely provide 2,613 dwelling units and approximately 4.1 million square feet of commercial/retail/office space. Phase 1 will likely entail development of 875 dwelling units and about 1.34 million square feet of business park/office space (with about 85% of that space planned for the northern section of the site). Phase 2 is planned to introduce an additional 1,169 dwelling units (combination of single family homes, townhomes, and apartments), about 75,000 square feet of retail building space, about 1.2 million square feet of office space (about 91% in the northern section), and an elementary school site (southern portion).

Not to scale

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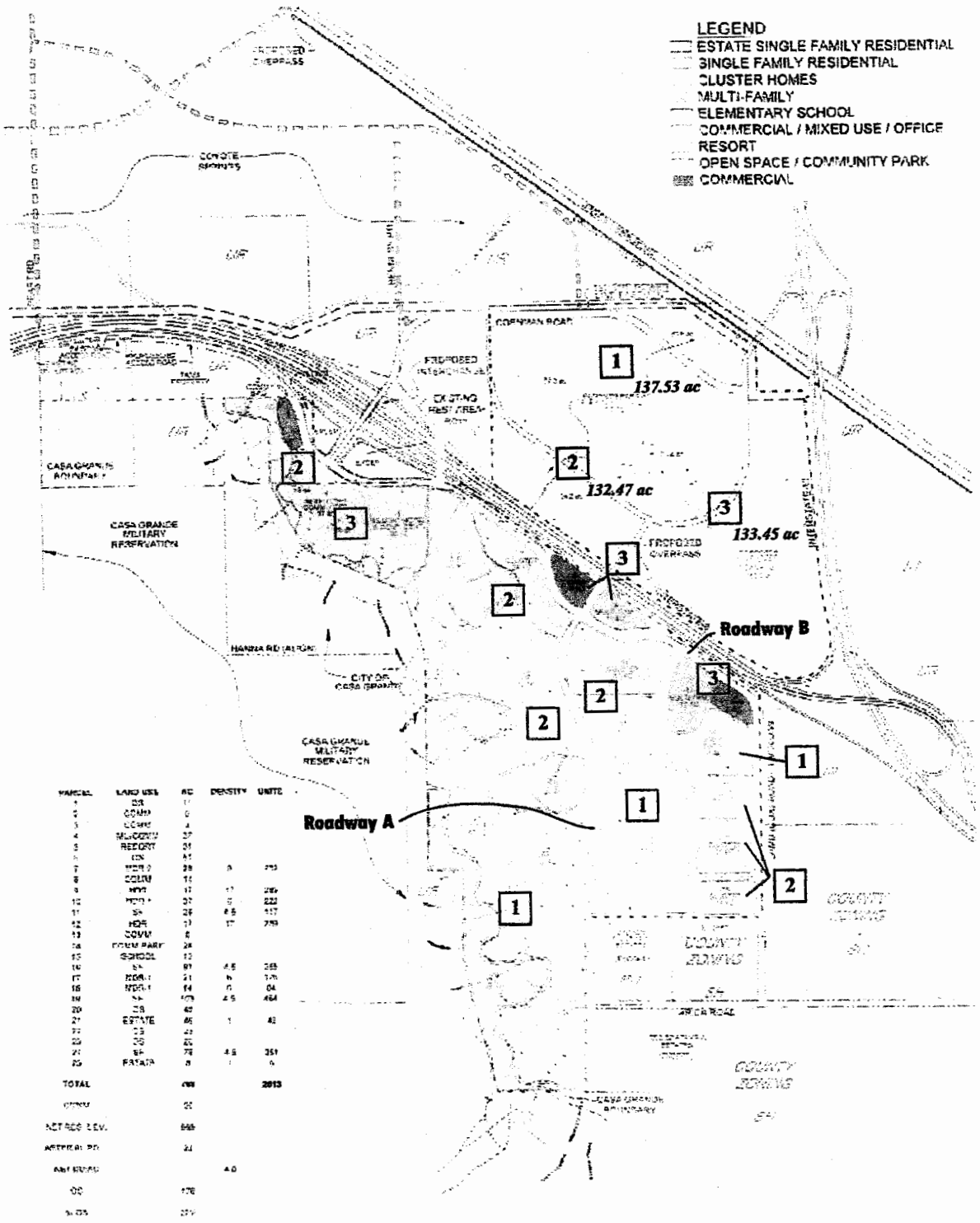
Vicinity Map **Figure 1**



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[X] Development Phase (1, 2, or 3)

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Site Layout & Phasing

Figure 2

Phase 3 rounds out the development plans with the south section to provide 578 apartment units, 182,000 square feet of retail development, a mixed-use office/commercial parcel with about 200,000 square feet of building space, and a resort hotel/conference center. The Phase 3 component for the north section of the site consists of a corporate headquarters/campus with approximately 1.1 million square feet of office space.

Access to and from the site will be facilitated by existing roadways and on-site roadway construction during Phase 1. Arica Road, the I-10/Sunland Gin Road interchange, and the I-10/Jimmie Kerr Boulevard interchange will bear most of the site traffic associated with Phase 1. Although, there will be a connection to/from Peart Road and its underpass of I-8 to the west/northwest of the site. For Phase 2 and beyond, site traffic will also be able to rely on a proposed Henness Road interchange at I-8 and other roadway construction/upgrades/improvements to be conducted in the future by other developments, the City, the County, and/or the State. Specific access arrangements for individual parcels is not detailed at this time, so this study will focus on primary access routes leading to and from the bounds of the site.

EXISTING CONDITIONS

Study Area

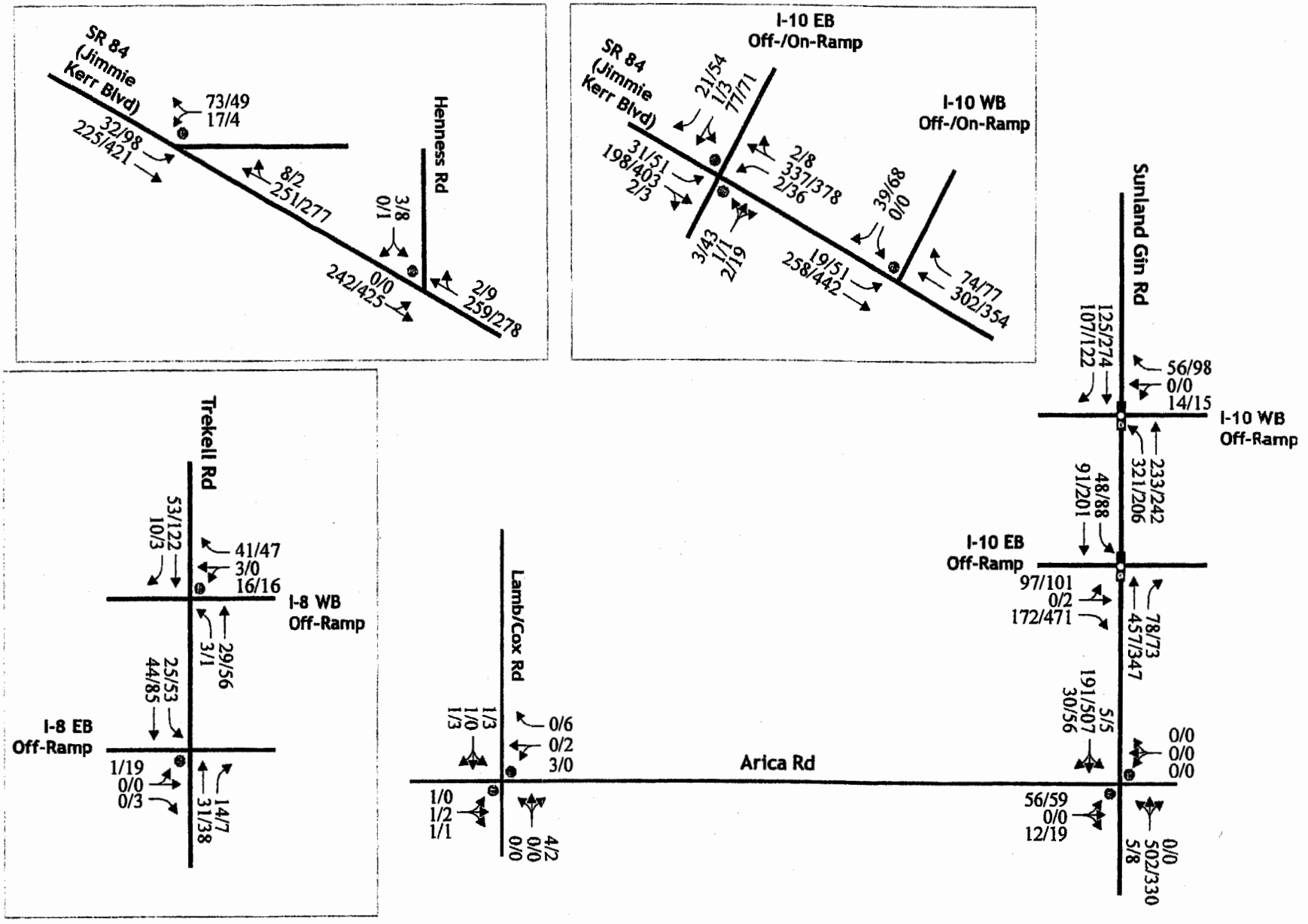
The proposed development is located a few miles south/southeast of the city center for Casa Grande, and is within a mostly rural area adjacent to the two interstate highways in the region. There is some commercial land uses at the Sunland Gin Road interchange with I-10, which cater mostly to motorists on the interstate. Based on the estimated trip generation for the site (see details later in report), the study area is determined to include intersections along Jimmie Kerr Boulevard, Sunland Gin Road, and Arica Road.

Roadway/Intersection Characteristics

Most roadways, other than state/federal routes, in the study are rural in nature with only two total lanes and higher-end speed limits. Arica Road is a wide roadway that could probably sustain four lanes of traffic if demands dictated. The Sunland Gin interchange with I-10 has signalized ramp termini in a "bloated" diamond configuration, allowing the signals to be spaced at about one-quarter mile along Sunland Gin Road. The I-10 interchange with Jimmie Kerr Boulevard is one-sided in that unsignalized on- and off-ramps for each direction are oriented on the north side of Jimmie Kerr Boulevard and on both sides of I-10. Figure 3 shows the existing intersection controls and configurations along with the existing traffic volumes (described below).

Existing Traffic Volumes

Representation of current traffic conditions for the study area was based on intersection turning movement count data collected in late October/November of this year. The resulting peak hour volumes specific to each intersection where data was collected are displayed in Figure 3. The collection effort was conducted at a time before the overall access plan for the site was known, so some of the intersection data presented in Figure 3 will only be for reference purposes as the intersections are not included in subsequent analyses. The intersection of Peart Road and Jimmie Kerr Boulevard was not collected, but its peak hour volume demands were estimated based on data from other nearby intersections where data was collected. Due to the approximation, analysis of this intersection is reserved for introduction when considering the future background conditions.



Not to scale

2006 Existing Traffic Conditions

Figure 3

Capacity Analysis of Existing Conditions

For the estimated existing AM and PM peak hour conditions, the intersections shown in Figure 3 were analyzed based on the methodologies presented in the *Highway Capacity Manual 2000* and evaluated using the *Synchro (v.6)* software package. To provide an indication of intersection performance, signalized and unsignalized intersections are typically reported in terms of levels of service (LOS). Signalized intersection analysis is based on approach control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay for all movements. Unsignalized stop-controlled intersection analysis is based on the minor street approach or critical movement, whichever is applicable. The capacity criteria for signalized and unsignalized intersection analysis are presented in Table 1.

Table 1. Level of Service Criteria for Signalized/Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)	
LOS	Signalized	Unsignalized
A	≤ 10.0	≤ 10.0
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0
F	> 80.0	> 50.0

Source: Exhibit 16-2/17-2, *Highway Capacity Manual 2000*, Transportation Research Board.

Additional performance measures such as volume to capacity (v/c) ratios and queue lengths also provide an indication of operations. For example, at two-way stop controlled intersections, main street traffic volumes may impose longer average delays for a small number of side-street vehicles, thus creating vehicle delays which correspond to a poor level of service. Motorists and agencies will typically accept longer delays (LOS or E or F) if gaps in the traffic stream are anticipated within reasonable time frames, and the side street traffic volumes do not warrant a traffic signal. As a general guide, gap acceptance thresholds for the longer delay values can be defined when the v/c ratios are under 0.80, which corresponds to 80 percent capacity usage for that movement.

Results of the capacity analysis for the collected AM and PM peak hour traffic conditions are shown below in Table 2. For the peak hour traffic conditions in 2006, the area intersections are operating acceptably. Those intersections with lower levels of service have associated v/c ratios well within the acceptable range of less than 0.80 with minimal accompanying queues.

Table 2. Intersection Capacity Analysis Summary - 2006 Existing Conditions

Intersection	Overall LOS (AM/PM)	V/C Ratio if LOS D or Lower (AM/PM)	95th%ile Queue [feet] if LOS D or Lower (AM/PM)
Arica at Lamb/Cox	C / A		
Arica at Sunland Gin	C / D	– / 0.36	– / < 50
I-10 EB Off-Ramp at Sunland Gin	A / A		
I-10 WB Off-Ramp at Sunland Gin	A / A		
I-10 EB On-/Off-Ramp at Jimmie Kerr	C / E	– / 0.39	– / < 50
I-1 WB On-/Off-Ramp at Jimmie Kerr	B / B		
Hennes at Jimmie Kerr	B / C		
Selma Hwy at Jimmie Kerr	B / B		
I-8 EB Off-Ramp at Trekell	A / B		
I-8 WB Off-Ramp at Trekell	A / A		

FUTURE TRAFFIC CONDITIONS

Development of Background Traffic Projections

Background traffic growth is typically estimated by using the existing traffic volumes as a base and elevating them to analysis year levels by applying an estimated average annual growth rate typically defined through historical traffic volume trends. Average annual daily traffic volume data from I-10 in the area of Sunland Gin Road was referenced for 2002 through 2004 (the most recent years available through ADOT). The data indicates an average yearly growth rate of about 3%. Since there is an anticipated influx of development in the area of the site, a 5% average annual growth rate was assumed for each year through 2016 (opening year of the last phase of site development).

In addition, the projected traffic from other adjacent developments were incorporated into the volume projections for each of the three analysis years. The Coyote Springs mixed-use development and residential developments off of Arica Road near the site will likely develop in advance or concurrently with the proposed site. Therefore, estimates of their traffic demands were factored into the background traffic projections according to the following assumptions:

Coyote Springs

- Estimated to have about 7,950 dwelling units (of varying types) by its full buildout
- Estimated to have about 440, 000 square feet of retail space at full buildout
- Assumed 15% of total trips generated to be "internalized" as trips between on-site parcels/land uses
- Assumed to be at 25% of full buildout by 2008, at 50% by 2012, and at full buildout by 2016
- Because of the relevant study area intersections and multiple access means for the site, 75% of corresponding traffic per analysis year was assumed to have destinations/origins to the north/northwest, and in general about 33% of the site's traffic would likely use the Peart Road/Jimmie Kerr Boulevard intersection

Arica Road Residential Developments

- Potential for 750 single family dwelling units to be functional by opening of Phase 3 at proposed site
- 250 dwelling units per analysis year assumed to be occupied
- 10% reduction for trips interacting with subject site that will be made in later analysis years

Figure 4 shows the projected 2008 background traffic conditions assuming intersection controls and configurations as they are today. Subsequent background condition projections are based on the changes in volumes as discussed above and the results of the preceding horizon year analysis. Any improvements needed to provide acceptable traffic operations were assumed to be in place prior to analyzing the following horizon year. Figures 5 and 6 show the resulting 2012 and 2016 background conditions.

Background Conditions Capacity Analyses

The capacity analysis results for the three background conditions are presented in Table 3. The capacity analysis results are based on the configurations/controls assumed at the outset of the horizon year analysis. Results after considering mitigation are not exclusively presented, but are integrated in the sequential analysis of the projected conditions. A summary of the roadway improvements needed per analysis year follows:

Roadway Improvements Due to 2008 Background Conditions

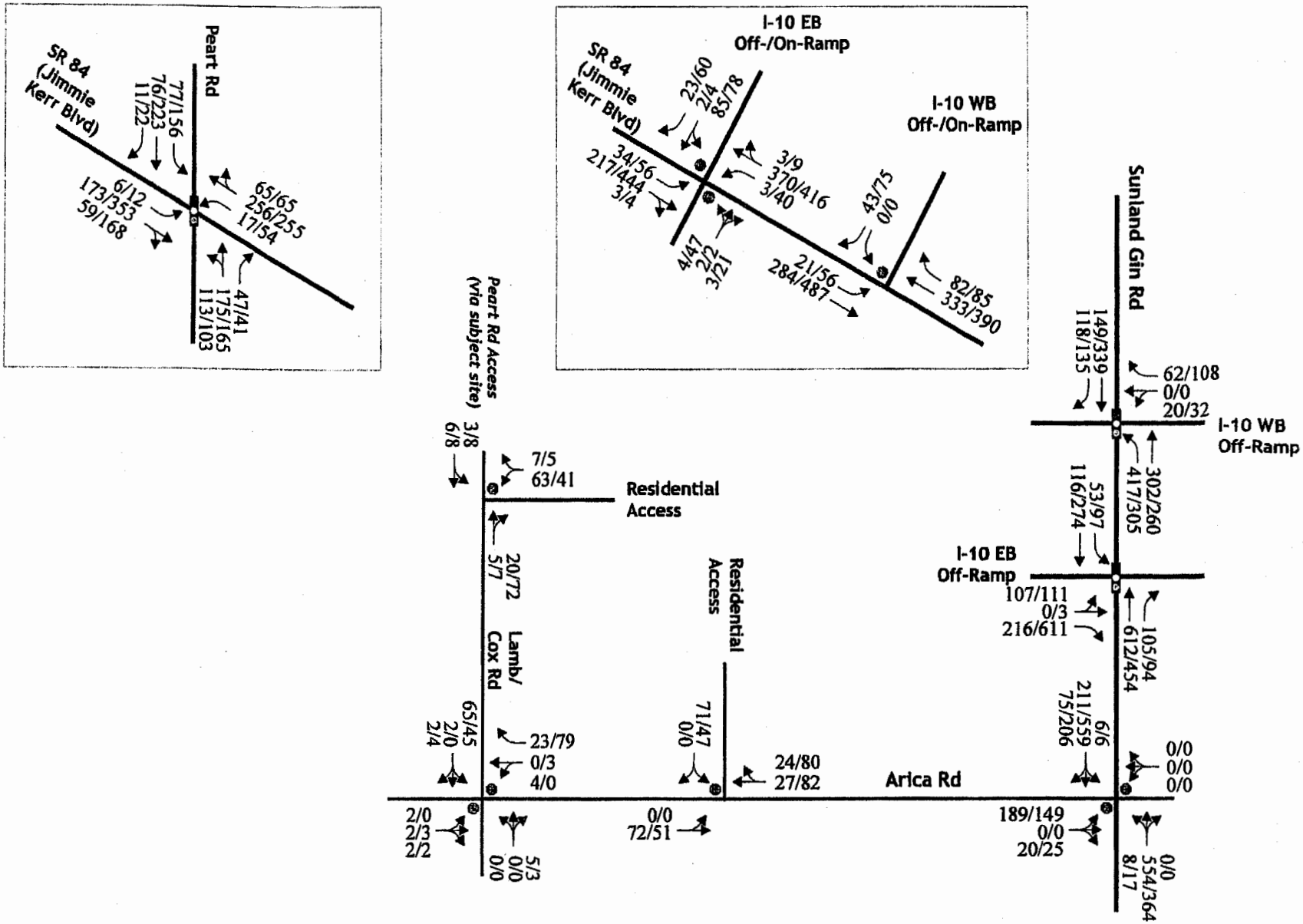
- Intersection of Arica Road and Sunland Gin Road should be signalized (after confirming meeting of MUTCD warrants with actual future volumes) along with introducing an eastbound right turn lane, a northbound left turn lane, and southbound left and right turn lanes.

Roadway Improvements Due to 2012 Background Conditions

- A second right turn lane should be added to the I-10 eastbound off-ramp at Sunland Gin Road.
- The intersection of Jimmie Kerr Boulevard with the I-10 eastbound on-/off-ramps should be signalized (after confirming meeting of MUTCD warrants with actual future volumes).
- A northbound left turn lane and eastbound right turn lane should be introduced at the intersection of Peart Road and Jimmie Kerr Boulevard.

Roadway Improvements Due to 2016 Background Conditions

- One additional through lane in each direction on Sunland Gin Road is likely required to support the projected traffic volumes.
- Introduction of protected/permitted left turn phasing for the northbound to westbound left turn at the I-10 westbound off-ramp at Sunland Gin Road is needed.
- Protected/permitted left turn phasing for the northbound, southbound, and westbound approaches is needed at the Peart Road/Jimmie Kerr Boulevard intersection. Also, an additional through lane on all approaches is dictated by the projected traffic demands.



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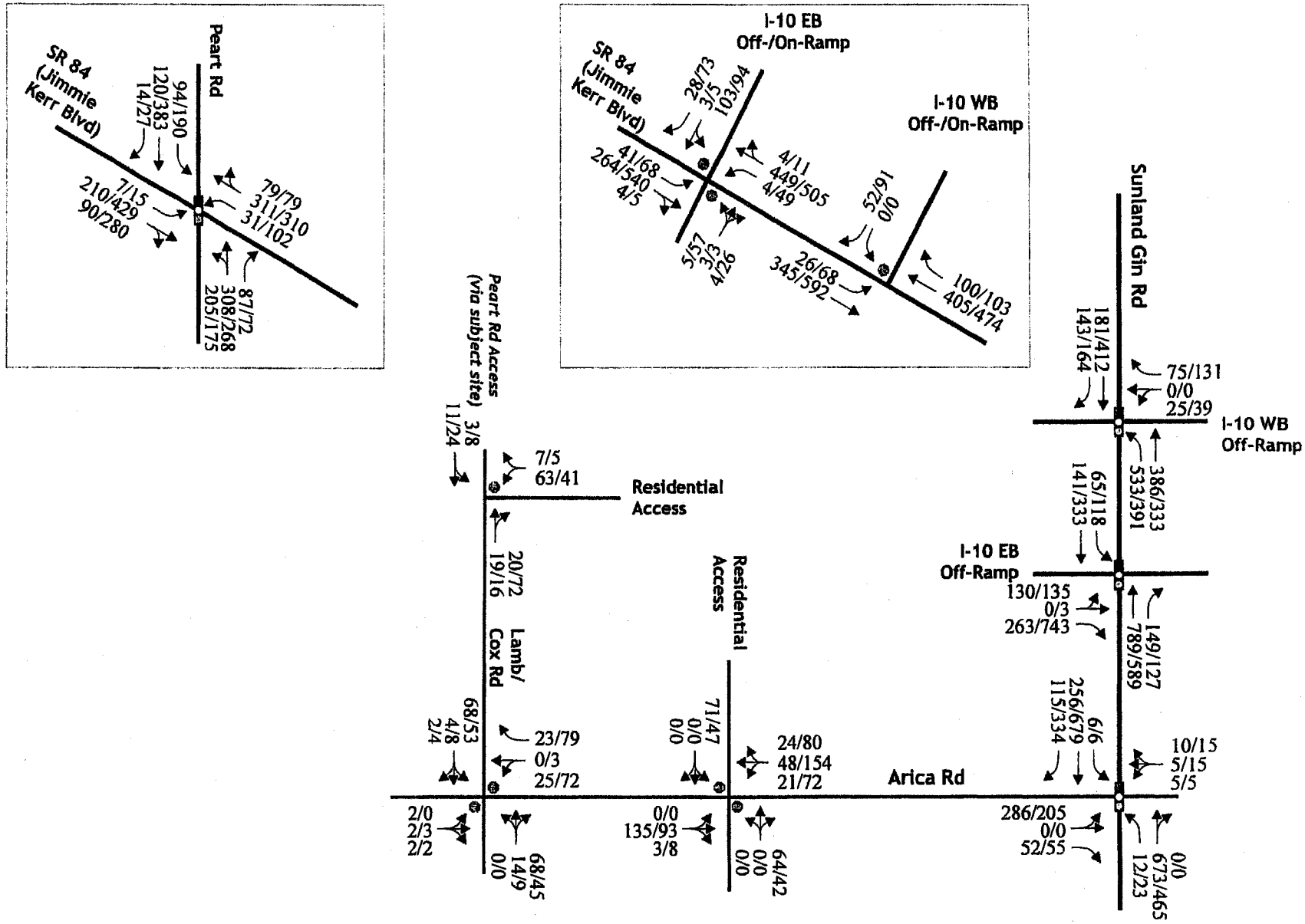
2008 Background Traffic Conditions

Figure 4



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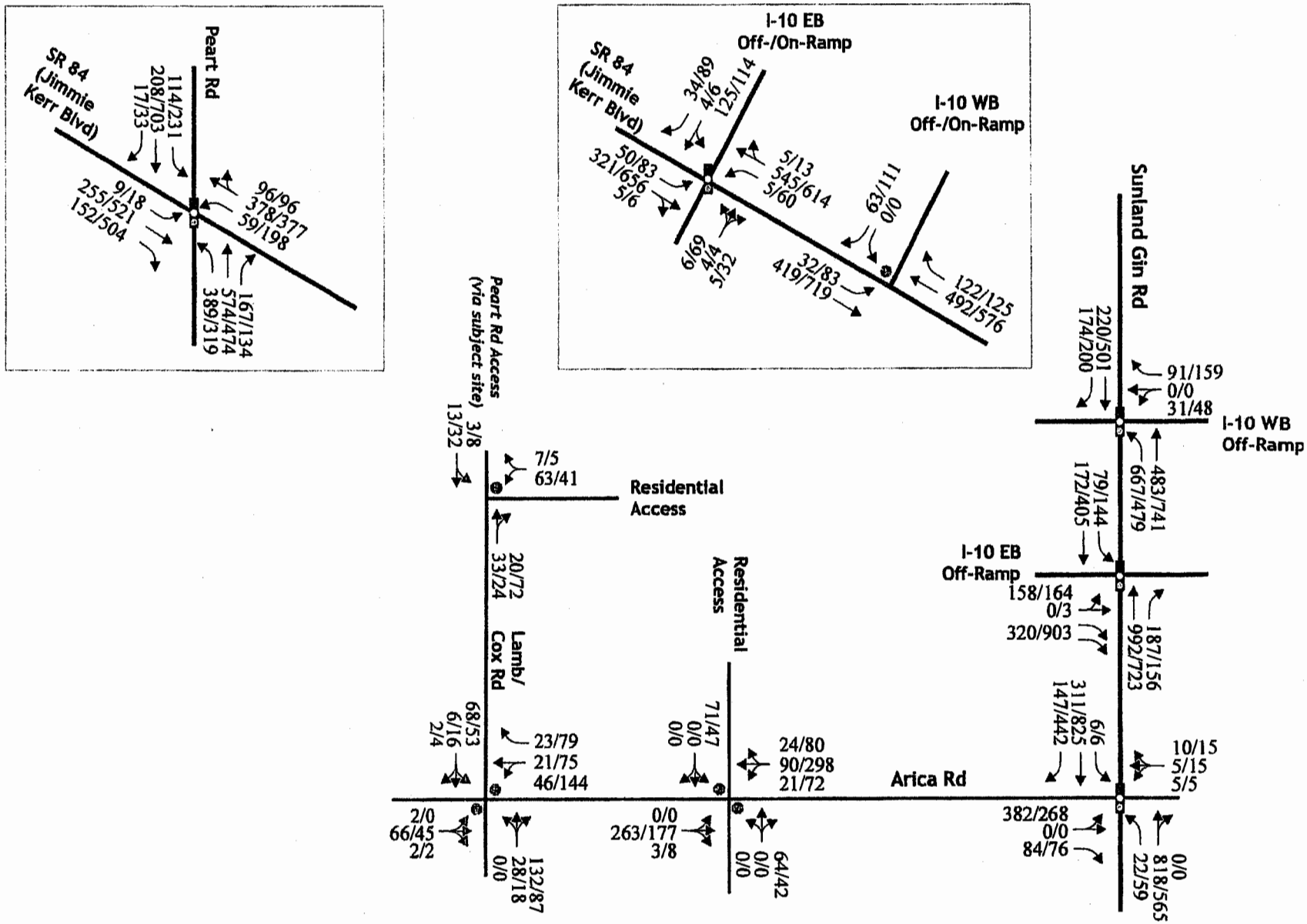
2012 Background Traffic Conditions

Figure 5



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2016 Background Traffic Conditions

Figure 6

Table 3. Intersection Capacity Analysis Results - Projected Background Traffic Conditions

		2008 Traffic Conditions								2012 Traffic Conditions								2016 Traffic Conditions							
		Level of Service (LOS)		Average Delay (sec/veh)		V/C Ratio (if stop control and LOS D or lower)		95th-%ile Queue (ft)		Level of Service (LOS)		Average Delay (sec/veh)		V/C Ratio (if stop control and LOS D or lower)		95th-%ile Queue (ft)		Level of Service (LOS)		Average Delay (sec/veh)		V/C Ratio (if stop control and LOS D or lower)		95th-%ile Queue (ft)	
	Intersection - Movement	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
INTERSECTIONS PRESENT IN BACKGROUND CONDITIONS	Lamb/Cox at Arica																								
	EB Approach	A	A	9.4	9.2	-	-	< 25	< 25	A	A	9.8	9.6	-	-	< 25	< 25	B	B	12.4	11.2	-	-	< 25	< 25
	WB Through/Left	A	A	8.6	8.7	-	-	< 25	< 25	A	A	9.5	9.5	-	-	< 25	< 25	B	B	11.4	12.4	-	-	< 25	< 25
	WB Right	A	A	8.6	8.7	-	-	< 25	< 25	A	A	9.5	9.5	-	-	< 25	< 25	B	B	11.4	12.4	-	-	< 25	< 25
	NB Approach	A	A	~ 0	~ 0	-	-	< 25	< 25	A	A	~ 0	~ 0	-	-	< 25	< 25	A	A	~ 0	~ 0	-	-	< 25	< 25
	SB Approach	A	A	6.9	6.7	-	-	< 25	< 25	A	A	6.9	6.1	-	-	< 25	< 25	A	A	7.0	5.6	-	-	< 25	< 25
	Arica at Sunland Gin									***C***	***B***	***23.5***	***12.0***					***D***	***B***	***43.4***	***17.4***				
	EB Approach/Left	F	F	78.3	176.4	0.91	1.16	196	253	D	D	54.3	49.3	-	-	275	168	E	D	76.9	54.0	-	-	494	244
	NB Through	A	A	0.2	0.7	-	-	< 25	< 25	C	A	21.5	8.9	-	-	509	207	D	B	52.1	11.1	-	-	875	233
	SB Through	A	A	0.3	0.2	-	-	< 25	< 25	A	A	9.3	8.6	-	-	123	238	B	B	13.3	19.2	-	-	207	430
	SB Right	A	A	0.3	0.2	-	-	< 25	< 25	A	A	2.5	1.0	-	-	< 25	< 25	A	A	2.4	2.3	-	-	33	29
	I-10 EB Off-Ramp at Sunland Gin	***B***	***C***	***10.3***	***20.0***					***B***	***D***	***11.7***	***48.6***					***C***	***B***	***22.6***	***16.0***				
	EB Left/Through	C	B	28.5	13.3	-	-	73	54	D	B	45.0	14.9	-	-	120	83	F	C	87.2	32.4	-	-	243	125
	EB Right	A	C	9.5	28.6	-	-	46	288	B	E	11.7	60.7	-	-	68	548	A	B	8.7	19.1	-	-	45	178
	NB Through	B	B	10.4	18.9	-	-	282	306	B	D	10.1	51.7	-	-	299	528	C	B	25.3	13.4	-	-	295	460
	NB Right	A	A	1.5	3.5	-	-	< 25	< 25	A	A	0.7	3.1	-	-	< 25	< 25	A	A	0.3	0.6	-	-	< 25	< 25
	I-10 WB Off-Ramp at Sunland Gin	***A***	***A***	***3.5***	***4.5***					***A***	***A***	***5.4***	***7.1***					***A***	***B***	***9.1***	***15.7***				
	WB Left/Through	C	C	25.3	25.7	-	-	< 25	32	D	D	36.7	37.6	-	-	36	48	E	E	55.5	66.9	-	-	54	83
	WB Right	B	B	12.2	11.8	-	-	29	37	B	B	15.9	15.1	-	-	39	49	C	C	20.4	20.5	-	-	51	72
	NB Left	A	A	3.7	5.2	-	-	52	41	A	B	7.4	12.7	-	-	397	54	B	D	15.5	42.5	-	-	612	236
	NB Through	A	A	1.7	0.8	-	-	38	< 25	A	A	1.7	0.8	-	-	44	< 25	A	A	1.5	6.3	-	-	59	337
	I-10 WB On-/Off-Ramp at Jimmie Kerr																								
	EB Left	A	A	8.4	8.8	-	-	< 25	< 25	A	A	8.7	9.2	-	-	< 25	< 25	A	A	9.1	9.9	-	-	< 25	< 25
	SB Right	B	B	10.6	11.7	-	-	< 25	< 25	B	B	11.4	13.0	-	-	< 25	< 25	B	C	12.4	15.1	-	-	< 25	25
	I-10 EB On-/Off-Ramp at Jimmie Kerr																	***A***	***B***	***8.8***	***10.6***				
	EB Left	A	A	8.3	8.6	-	-	< 25	< 25	A	A	8.6	9.0	-	-	< 25	< 25	A	A	6.3	8.4	-	-	< 25	40
	WB Left	A	A	7.8	8.8	-	-	< 25	< 25	A	A	7.9	9.2	-	-	< 25	< 25	A	A	5.0	8.3	-	-	< 25	30
	NB Approach	B	F	14.4	53.9	-	0.53	< 25	65	C	F	16.9	202.7	-	1.08	< 25	162	B	B	11.1	16.2	-	-	< 25	61
	SB Left/Through	C	F	20.2	73.6	-	0.67	28	93	D	F	30.0	291.1	0.44	1.31	53	208	C	C	20.4	23.3	-	-	78	84
	Peart at Jimmie Kerr	***B***	***B***	***10.5***	***13.3***					***B***	***D***	***18.0***	***50.3***					***B***	***F***	***19.0***	***123.5***				
	EB Through/Right	A	B	8.9	11.4	-	-	87	236	B	F	17.0	82.7	-	-	155	515	A	C	3.9	29.2	-	-	32	317
	WB Left	A	B	8.5	10.5	-	-	< 25	35	B	F	15.2	92.7	-	-	26	127	B	F	14.8	420.2	-	-	41	205
	NB Left/Through	B	B	13.8	19.5	-	-	121	148	C	E	21.0	69.1	-	-	261	357	C	F	29.5	882.4	-	-	275	335
	SB Left	B	C	10.5	22.6	-	-	39	101	B	C	12.4	31.3	-	-	50	164	C	D	25.7	41.7	-	-	103	204
	SB Through	A	B	8.0	13.8	-	-	34	112	A	B	7.5	13.8	-	-	45	170	A	C	9.4	25.9	-	-	81	444

Site Traffic

The first step in estimating traffic from the proposed development is to calculate trip generation, which is the total vehicle trips to and from the site over a given time period. To project the site's trip generation characteristics, *Trip Generation, Seventh Edition,* published by the Institute of Transportation Engineers (ITE) 2003, was used to calculate average weekday, AM peak hour and PM peak hour number of trips. The various land uses proposed within the site have matching land use categories (or close approximations) within ITE's *Trip Generation.* Due to the mixed-use nature of the site and its physical size, a portion of the total trip generation for the site was considered to stay "on-site" and only travel between site parcels. This portion of the trip generation estimate for the site is referenced as "inter-parcel" trips in Table 4 on the next page. The trip volumes that were used in the capacity analyses are shown as "out-of-area" trips and are intended to represent the portion of the trip generation that generate more impact since they would be utilizing the adjacent roadway network off-site. Since Phase 1 has limited land use types and intensities, no inter-parcel effect was considered.

The next step in estimating site traffic is to distribute the trips associated with each development phase and assign them to the specific site access routes and study area intersections The overall distribution of site traffic was based on the collected intersection volume data, the accessibility providing by the existing roadway network, proximity to Casa Grande/Phoenix/Tucson, and traffic demands from preceding phase-specific site traffic. Figures 7 through 9 show the resulting site traffic volumes at the horizon years representing the opening of the associated phase of development (full phase trip generation potential assumed at opening). The intersection configurations/controls depicted in the figures are based on the results/determinations from the background analyses and represent the mitigated conditions from the preceding analysis year.

Total Traffic Conditions

The three total traffic conditions were determined by adding the site-generated traffic from Figures 7 through 9 to the corresponding background traffic conditions presented in Figures 4 through 6. The projected total traffic conditions, for 2008, 2012, and 2016, on the roadways and at the study intersections are shown in Figures 10 through 12.

Table 4. Trip Generation Estimate

	Phase	1					2												3						
	Parcel No.	14	16	19	21	North Area	2	3	4a	7	10	11	15	17	18	24	25	North Area	4b	5	8	9	12	13	North Area
Description	Land Use	Comm. Park	Residential	Residential	Residential - Estate	Bus./Indust. Park	Commercial	Commercial	Mixed-Use/Comm.	Residential	Residential	Residential	School	Residential	Residential	Residential	Residential - Estate	Office Park	Mixed-Use/Comm.	Resort/Conf. Ctr	Commercial	Residential	Residential	Commercial	Corp. Campus
	ITE Land Use Code	770	210	210	210	770	820	820	750	230	230	210	520	230	230	210	210	750	750	330	820	220	220	820	714
	ITE Land Use Title	Business Park	Single-Family Detached	Single-Family Detached	Single-Family Detached	Business Park	Shopping Center	Shopping Center	Office Park	TH/Condo	TH/Condo	Single-Family Detached	Elem. School [3]	TH/Condo	TH/Condo	Single-Family Detached	Single-Family Detached	Office Park	Office Park	Resort Hotel [2]	Shopping Center	Apartments	Apartments	Shopping Center	Corp. HQ Bldg
	Land Use Variable	1000 GFA	Dwelling Units	Dwelling Units	Dwelling Units	1000 GFA	1000 GLA	1000 GLA	1000 GFA	Dwelling Units	Dwelling Units	Dwelling Units	1000 GFA	Dwelling Units	Dwelling Units	Dwelling Units	Dwelling Units	1000 GFA	1000 GFA	Rooms	1000 GLA	Dwelling Units	Dwelling Units	1000 GLA	1000 GFA
	Variable Amount	198.634	365	484	46	1138.253	49.658	24.829	107.593	252	222	117	98.010	126	84	351	8	1096.375	198.834	500	115.870	289	289	66.211	1104.486
Trip Rates	Weekday	12.76	9.57	9.57	9.57	12.76	42.94	42.94	11.42	5.86	5.86	9.57	14.49	5.86	5.86	9.57	9.57	11.42	11.42	8.17	42.94	6.72	6.72	42.94	7.98
	AM Peak Hour	1.43	0.75	0.75	0.75	1.43	1.03	1.03	1.74	0.44	0.44	0.75	4.69	0.44	0.44	0.75	0.75	1.74	1.74	0.31	1.03	0.51	0.51	1.03	1.49
	PM Peak Hour	1.29	1.01	1.01	1.01	1.29	3.75	3.75	1.5	0.52	0.52	1.01	0	0.52	0.52	1.01	1.01	1.50	1.5	0.42	3.75	0.62	0.62	3.75	1.40
Inbound %	Weekday	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
	AM Peak Hour	84%	25%	25%	25%	84%	61%	61%	89%	17%	17%	25%	54%	17%	17%	25%	25%	89%	89%	72%	61%	20%	20%	61%	93%
	PM Peak Hour	23%	63%	63%	63%	23%	48%	48%	14%	67%	67%	63%	0%	67%	67%	63%	63%	14%	14%	43%	48%	65%	65%	48%	10%
	Percentage of Inter-Parcel Trips [1]	0%	0%	0%	0%	0%	15%	15%	10%	15%	15%	15%	50%	15%	15%	15%	15%	10%	10%	25%	15%	15%	15%	15%	10%
Inter-Parcel Trips	Weekday	0	0	0	0	0	320	160	123	222	195	168	710	111	74	504	11	1,252	227	1,021	746	291	291	426	881
	AM Peak Hour Inbound	0	0	0	0	0	5	3	17	3	3	4	125	2	1	10	1	170	31	28	11	5	5	7	154
	AM Peak Hour Outbound	0	0	0	0	0	3	1	2	14	12	10	105	7	5	30	0	21	4	11	7	18	18	4	11
	PM Peak Hour Inbound	0	0	0	0	0	14	7	3	14	12	12	0	7	5	34	1	24	5	23	32	18	18	18	16
	PM Peak Hour Outbound	0	0	0	0	0	14	7	14	6	6	6	0	3	2	20	1	141	25	30	34	9	9	20	139
Out of Area Trips	Weekday	2,535	3,494	4,441	441	14,525	1,813	907	1,106	1,255	1,106	952	711	628	419	2,856	66	11,269	2,042	3,064	4,230	1,652	1,652	2,418	7,933
	AM Peak Hour Inbound	239	69	87	9	1,368	27	13	150	16	14	18	124	8	6	56	1	1,528	277	84	62	25	25	35	1,377
	AM Peak Hour Outbound	46	205	261	26	260	17	9	19	78	69	56	106	39	25	168	4	189	34	32	40	100	100	23	104
	PM Peak Hour Inbound	59	233	296	30	338	76	38	20	74	66	63	0	37	25	190	5	207	37	68	177	99	99	102	139
	PM Peak Hour Outbound	198	136	173	17	1,131	83	42	125	38	32	38	0	19	12	111	2	1,273	231	89	192	54	54	109	1,253
Total Trips	Weekday	2,535	3,494	4,441	441	14,525	2,133	1,067	1,229	1,477	1,301	1,120	1,421	739	493	3,360	77	12,521	2,269	4,085	4,976	1,943	1,943	2,844	8,814
	AM Peak Hour Inbound	239	69	87	9	1,368	32	16	167	19	17	22	249	10	7	66	2	1,698	308	112	73	30	30	42	1,531
	AM Peak Hour Outbound	46	205	261	26	260	20	10	21	92	81	66	211	46	30	198	4	210	38	43	47	118	118	27	115
	PM Peak Hour Inbound	59	233	296	30	338	90	45	23	88	78	75	0	44	30	224	6	231	42	91	209	117	117	120	155
	PM Peak Hour Outbound	198	136	173	17	1,131	97	49	139	44	38	44	0	22	14	131	3	1,414	256	119	226	63	63	129	1,392

		Phase 1	Phase 2	Phase 3	TOTAL
Inter-Parcel Trips	Weekday	0	3,850	3,883	**7,733**
	AM Peak Hour Inbound	0	344	241	**585**
	AM Peak Hour Outbound	0	210	73	**283**
	PM Peak Hour Inbound	0	133	130	**263**
	PM Peak Hour Outbound	0	220	266	**486**
Out of Area Trips	Weekday	25,436	23,088	22,991	**71,515**
	AM Peak Hour Inbound	1,772	1,961	1,885	**5,618**
	AM Peak Hour Outbound	798	779	433	**2,010**
	PM Peak Hour Inbound	956	801	721	**2,478**
	PM Peak Hour Outbound	1,655	1,775	1,982	**5,412**
Total Trips	Weekday	25,436	26,938	26,874	**79,248**
	AM Peak Hour Inbound	1,772	2,305	2,126	**6,203**
	AM Peak Hour Outbound	798	989	506	**2,293**
	PM Peak Hour Inbound	956	934	851	**2,741**
	PM Peak Hour Outbound	1,655	1,995	2,248	**5,898**

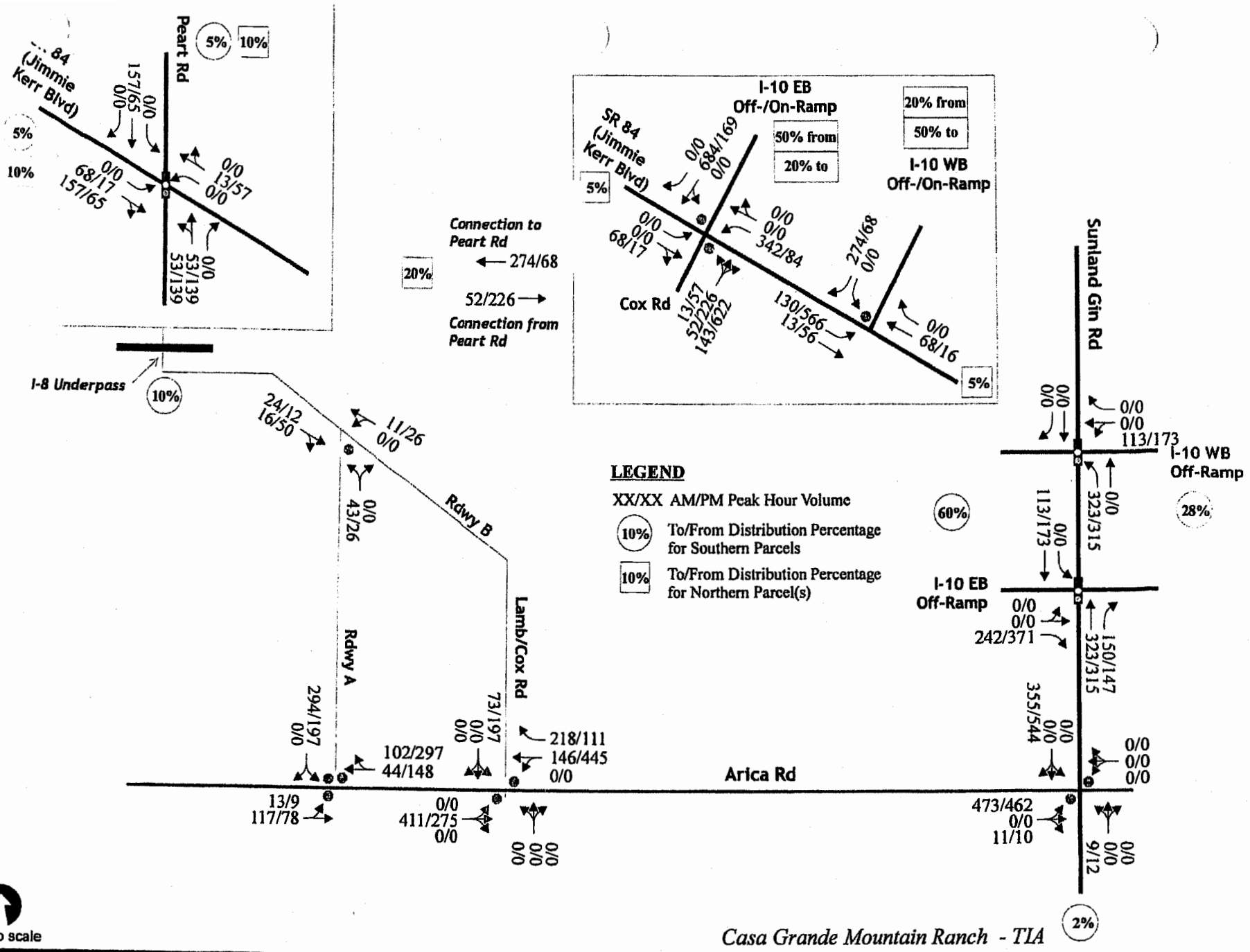
Notes:

1 To account for portion of trip generation representing trips made between parcels associated with the site as a whole

2 Resort Hotel room number characteristic based on average for sites surveyed in ITE Trip Generation. Daily rate not available for Resort Hotel - Hotel daily rate used instead

3 Elementary School building area based on floor area ratio to parcel size (15 acres) of 0.15

Source: Trip Generation Manual, 7th Ed, Institute of Transportation Engineers, 2003.



Casa Grande Mountain Ranch - TIA

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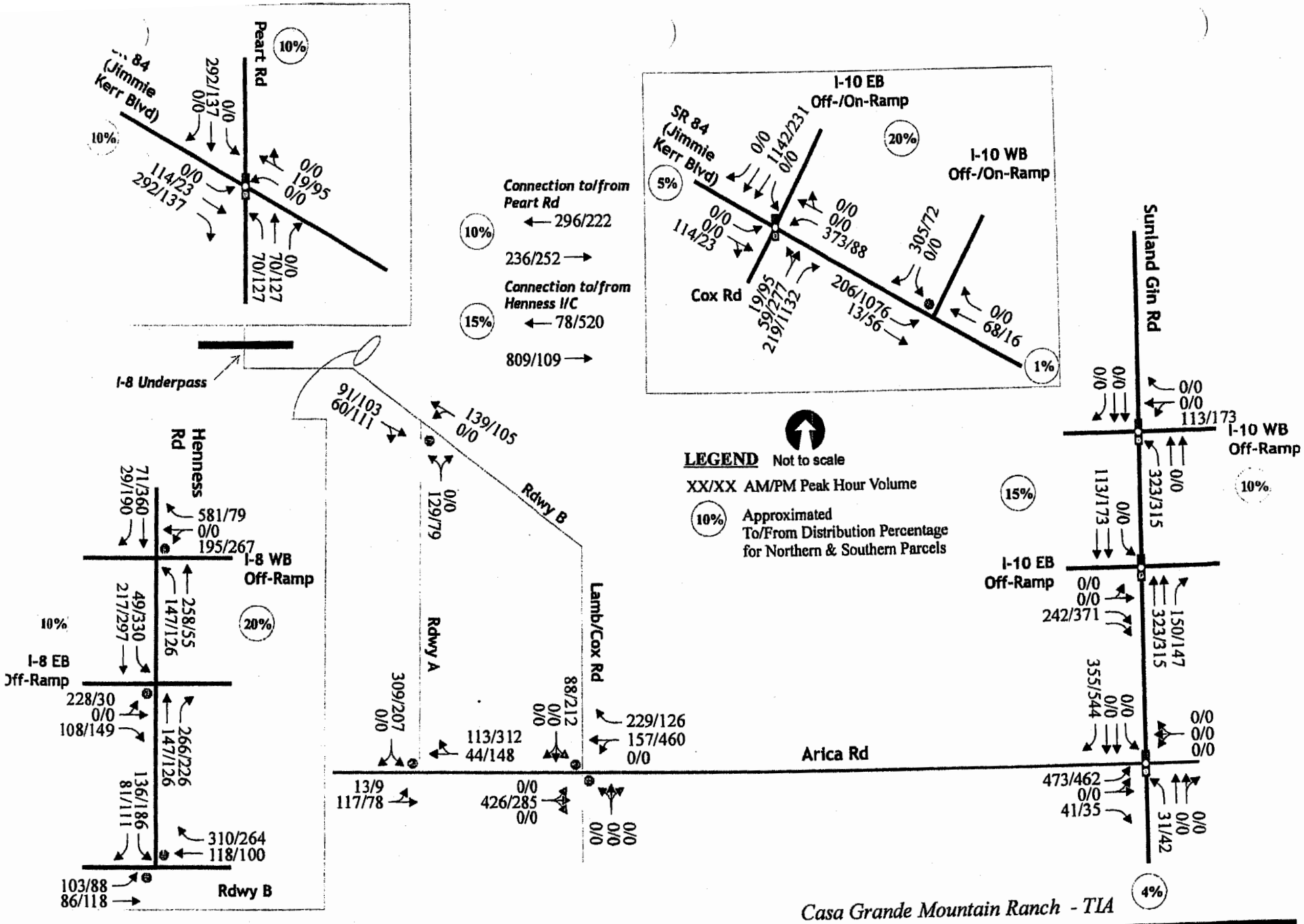
Phase 1 Site Traffic

Figure 7



Phases 1 & 2 Site Traffic

Figure 8

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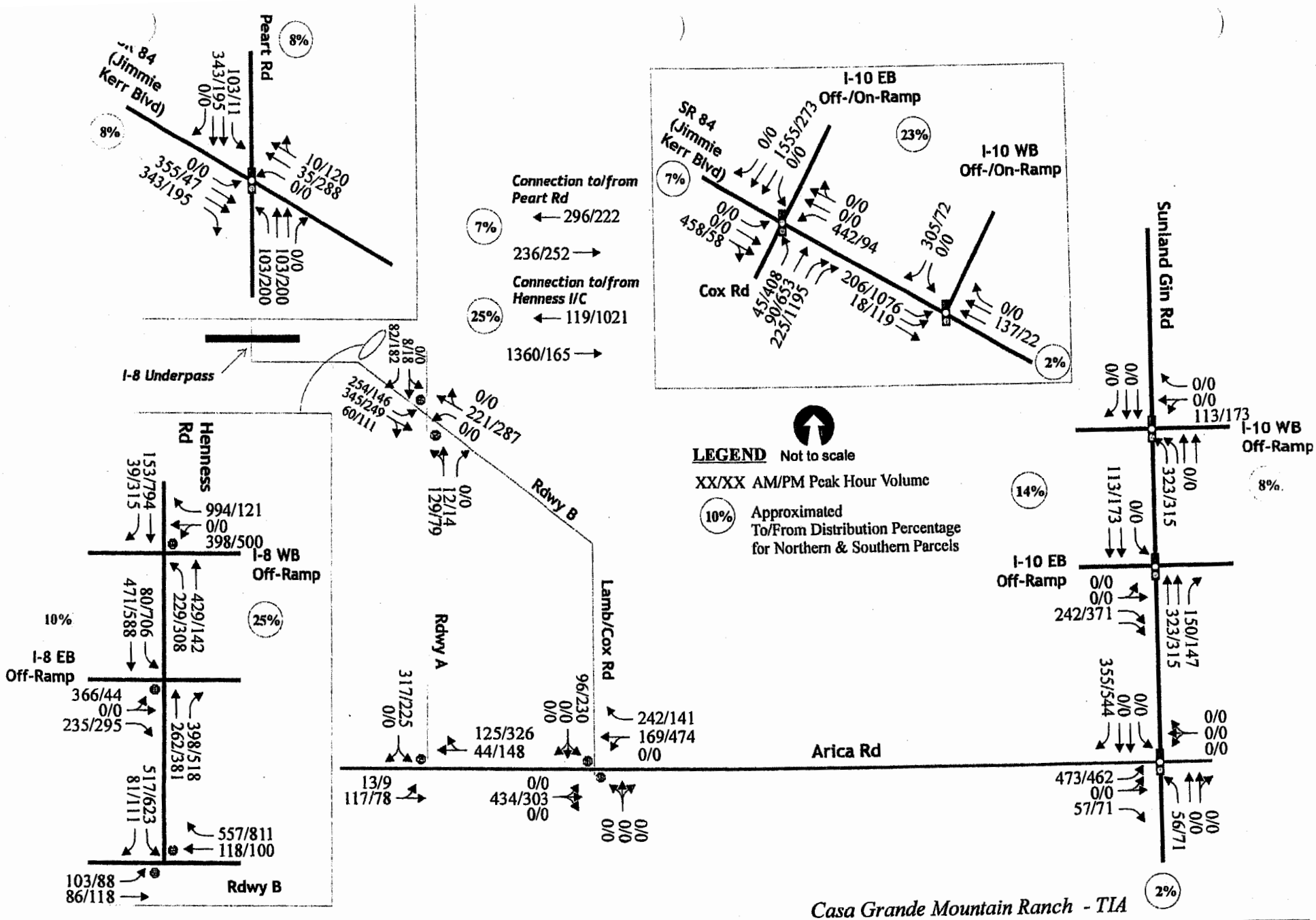

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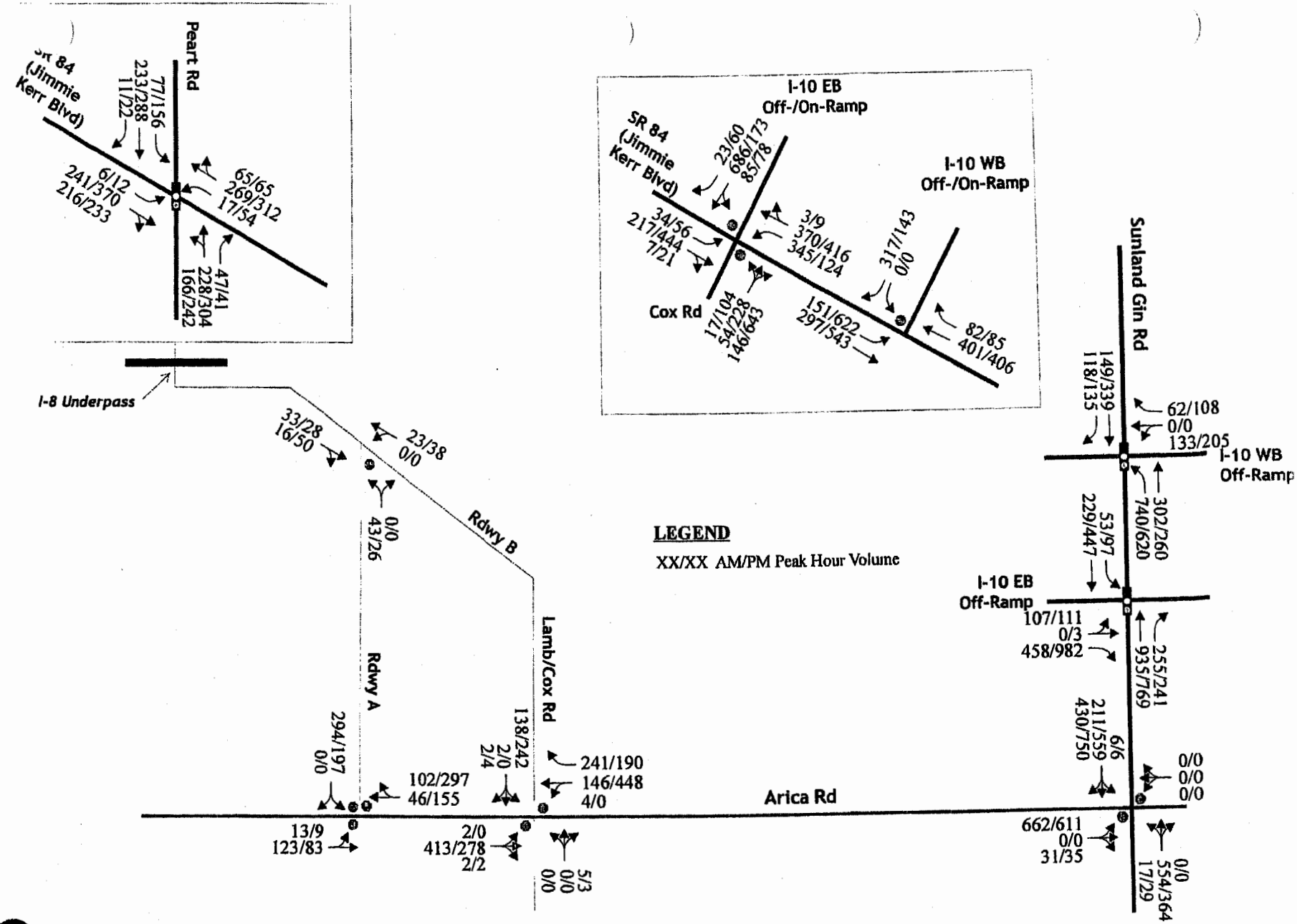
Phases 1 - 3 (Full Buildout) Site Traffic

Figure 9



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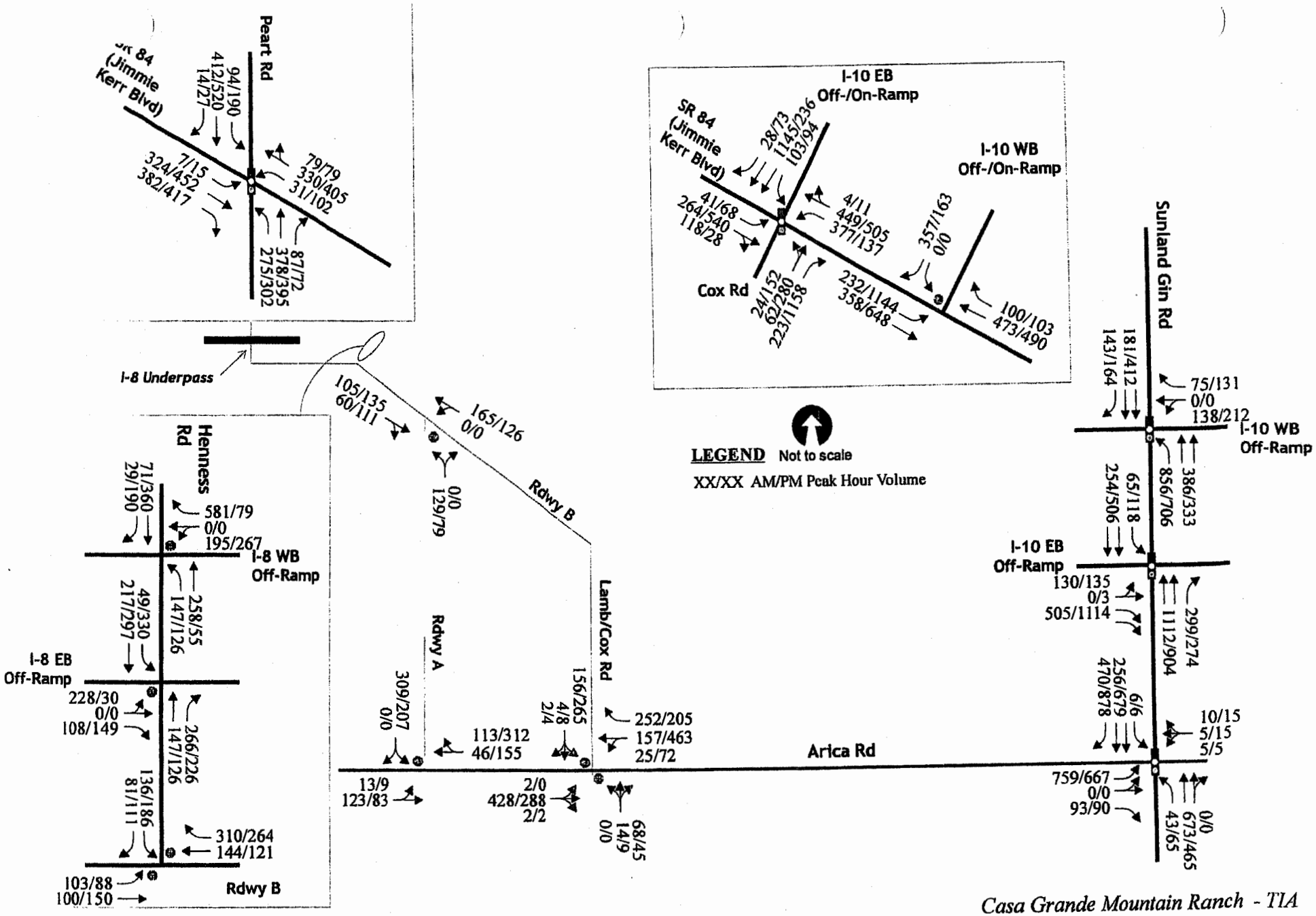
2008 Total Traffic Conditions

Figure 10



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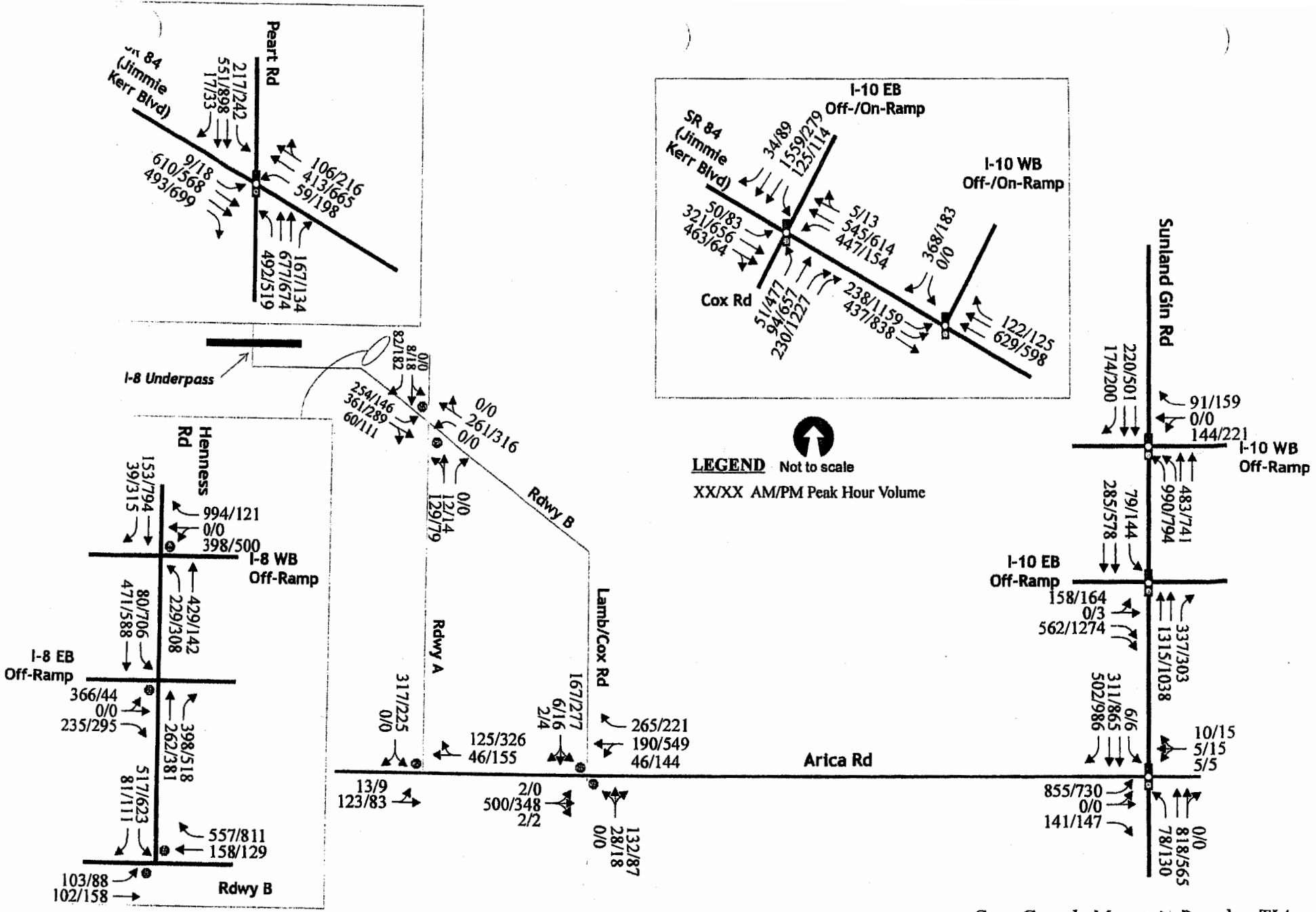
2012 Total Traffic Conditions

Figure 11



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2016 Total Traffic Conditions

Figure 12

Total Conditions Capacity Analyses

Intersection capacity analysis for the previously identified study intersections were conducted in the same manner as the background conditions assessment. The analysis considered the total traffic volumes as depicted in Figures 10 through 12 while assuming the same intersection controls, lane configurations, and number of lanes as the corresponding background conditions. Any mitigation dictated by the background conditions assessment was assumed in place for the corresponding year with total traffic conditions. Table 5 on the following page identifies the capacity analysis summary for the various total traffic conditions. As was the case in the presentation of the background conditions analysis results, the results shown in Table 5 are based on the configurations/controls assumed at the outset of the horizon year analysis (per mitigated background conditions for the corresponding year). If mitigation of the total traffic conditions is needed, the improvements are incorporated into the analysis of the subsequent horizon year. A summary of the roadway improvements needed per analysis year follows:

Roadway Improvements Due to 2008 Total Conditions

- Existing stop control on Arica Road at Lamb/Cox Road to be switched to Lamb/Cox Road approaches.
- Add additional through lanes on Sunland Gin Road in the area of Arica Road and I-10 off-ramp intersections. [same need associated with 2016 background conditions].
- Introduce exclusive left turn lane in addition to shared left/through lane at the eastbound approach of Arica Road to Sunland Gin Road.
- Add eastbound right turn lane on I-10 eastbound off-ramp at Sunland Gin Road [same need associated with 2012 background conditions].
- Introduction of protected/permitted left turn phasing for the northbound to westbound left turn at the I-10 westbound off-ramp at Sunland Gin Road is needed [same need associated with 2016 background conditions].
- The intersection of Jimmie Kerr Boulevard with the I-10 eastbound on-/off-ramps should be signalized (after confirming meeting of MUTCD warrants with actual future volumes) [same need associated with 2012 background conditions].
- A northbound left turn lane and eastbound right turn lane should be introduced at the intersection of Peart Road and Jimmie Kerr Boulevard [same need associated with 2012 background conditions].

Roadway Improvements Due to 2012 Total Conditions

- Add northbound to westbound left turn lane at I-10 westbound off-ramp at Sunland Gin Road (protected only turn phasing as well).
- Signalize (when warranted) I-10 westbound on-/off-ramps at Jimmie Kerr Boulevard, and also provide dual eastbound left turn lanes and one additional westbound through lane on Jimmie Kerr Boulevard.
- Protected/permitted left turn phasing will be needed for the westbound approach of Jimmie Kerr Boulevard at I-10 eastbound on-/off-ramps intersection. Also left and right turn lanes on the northbound approach will be needed in conjunction with one additional through lane in each direction on Jimmie Kerr Boulevard.
- Protected/permitted left turn phasing for the northbound, southbound, and westbound approaches is needed at the Peart Road/Jimmie Kerr Boulevard intersection. Also, an additional through lane on all approaches is dictated by the projected traffic demands [same need associated with 2016 background conditions].

Table 5. Intersection Capacity Analysis Results - Projected Total Traffic Conditions

		2008 Traffic Conditions								2012 Traffic Conditions								2016 Traffic Conditions							
		Level of Service (LOS)		Average Delay (sec/veh)		V/C Ratio (if stop control and LOS D or lower)		95th-%ile Queue (ft)		Level of Service (LOS)		Average Delay (sec/veh)		V/C Ratio (if stop control and LOS D or lower)		95th-%ile Queue (ft)		Level of Service (LOS)		Average Delay (sec/veh)		V/C Ratio (if stop control and LOS D or lower)		95th-%ile Queue (ft)	
	Intersection - Movement	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
INTERSECTIONS PRESENT IN BACKGROUND & TOTAL CONDITIONS	Lamb/Cox at Arica																								
	EB Approach	E	E	39.3	47.7	0.86	0.83	229	189	A	A	0.1	~0	-	-	< 25	< 25	A	A	0.1	~0	-	-	< 25	< 25
	WB Through/Left	B	F	11.5	245.7	-	1.47	34	895	A	A	1.4	~0	-	-	< 25	< 25	A	A	2.1	3.2	-	-	< 25	< 25
	WB Right	B	F	11.5	245.7	-	1.47	34	895	A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	NB Approach	A	A	~0	~0	-	-	< 25	< 25	B	B	14.5	10.0	-	-	< 25	< 25	C	C	21.1	21.8	-	-	56	39
	SB Approach	A	A	7.3	7.6	-	-	< 25	< 25	E	F	48.4	81.6	0.71	0.95	122	234	F	*	319.1		1.49		336	
	Arica at Sunland Gin	***E***	***C***	55.0	28.4					***B***	***B***	***18.3***	***17.2***					***C***	***C***	***20.5***	***20.6***				
	EB Approach/Left	F	D	81.3	51.2	-	-	721	587	D	D	36.2	42.5	-	-	250	320	D	D	41.0	53.0	-	-	342	396
	NB Through	F	C	80.1	29.5	-	-	619	276	B	B	13.9	12.8	-	-	203	111	B	B	16.9	13.2	-	-	285	145
	SB Through	C	C	21.6	30.9	-	-	134	269	A	B	9.7	11.4	-	-	62	110	A	B	9.9	12.6	-	-	75	127
	SB Right	A	A	4.1	5.9	-	-	37	< 25	A	A	3.5	5.8	-	-	22	35	A	A	3.9	7.6	-	-	47	< 25
	I-10 EB Off-Ramp at Sunland Gin	***B***	***F***	***12.8***	***118.3***					***A***	***C***	***6.4***	***20.8***					***A***	***E***	***8.3***	***55.6***				
	EB Left/Through	D	B	54.4	19.9	-	-	123	587	C	B	33.5	17.0	-	-	97	90	D	C	37.9	22.4	-	-	125	127
	EB Right	B	F	15.3	241.6	-	-	111	276	A	D	5.7	36.4	-	-	37	411	A	F	5.9	120.5	-	-	42	607
	NB Through	B	E	13.3	59.0	-	-	290	269	A	B	6.1	12.2	-	-	243	202	A	B	6.8	11.5	-	-	181	180
	NB Right	A	A	0.4	2.6	-	-	< 25	< 25	A	A	1.6	3.6	-	-	< 25	25	A	A	1.8	3.4	-	-	< 25	33
	I-10 WB Off-Ramp at Sunland Gin	***C***	***D***	***23.0***	***36.7***					***C***	***C***	***21.6***	***28.2***					***B***	***C***	***16.4***	***20.1***				
	WB Left/Through	E	E	60.4	68.6	-	-	153	247	D	E	35.3	55.6	-	-	104	218	D	D	36.1	54.2	-	-	111	222
	WB Right	B	B	13.1	10.4	-	-	38	46	A	A	8.9	9.2	-	-	31	46	A	A	8.8	8.8	-	-	34	51
	NB Left	C	E	32.9	70.2	-	-	777	459	C	C	28.9	30.0	-	-	597	541	B	C	19.9	24.8	-	-	361	262
	NB Through	A	A	2.4	2.0	-	-	35	< 25	A	A	2.3	1.1	-	-	37	< 25	A	A	2.2	2.6	-	-	< 25	44
	I-10 WB On-/Off-Ramp at Jimmie Kerr																	***B***	***C***	***10.4***	***17.3***				
	EB Left	A	C	9.1	15.6	-	-	< 25	134	B	F	10.1	171.0	-	1.33	25	1192	C	B	33.8	24.7	-	-	62	290
	SB Right	C	B	17.0	13.0	-	-	77	25	C	B	22.6	14.6	-	-	118	34	A	A	9.7	0.8	-	-	27	< 25
	I-10 EB On-/Off-Ramp at Jimmie Kerr									D	F	35.7	145.6	-	-			***F***	***D***	***83.9***	***39.7***				
	EB Left	A	A	8.3	8.6	-	-	< 25	< 25	B	D	10.6	40.8	-	-	27	97	D	D	39.0	41.4	-	-	69	111
	WB Left	A	A	8.9	9.3	-	-	30	< 25	E	F	73.7	349.1	-	-	365	223	F	F	128.0	289.1	-	-	533	252
	NB Approach/Right	*	*							B	F	19.3	315.3	-	-	65	1523	A	D	2.7	35.9	-	-	25	565
	SB Left/Through	*	*							D	B	49.7	14.7	-	-	436	73	F	C	109.8	32.4	-	-	870	143
	Peart at Jimmie Kerr	***B***	***D***	***16.5***	42.1					***B***	***C***	***16.2***	***32.3***					***F***	***E***	***80.3***	***59.6***				
	EB Through/Right	B	E	18.5	***58.7***	-	-	221	433	A	B	6.6	13.6	-	-	74	143	D	E	49.9	73.4	-	-	384	556
	WB Left	B	C	12.6	32.9	-	-	< 25	64	B	F	16.6	94.8	-	-	28	127	F	F	133.5	136.4	-	-	742	273
	NB Left/Through	C	E	22.0	64.7	-	-	220	416	C	E	32.4	60.0	-	-	208	264	F	F	137.7	101.7	-	-	636	587
	SB Left	B	C	12.1	31.5	-	-	45	143	A	B	9.2	11.9	-	-	42	89	D	C	54.8	27.0	-	-	246	143
	SB Through	B	B	10.4	10.5	-	-	98	113	B	B	10.7	11.0	-	-	151	198	F	F	90.0	87.9	-	-	360	502
INTERSECTIONS PRESENT IN TOTAL CONDITIONS ONLY	Arica at Rdwy A																								
	EB Approach	A	A	0.8	0.9	-	-	< 25	< 25	A	A	0.8	0.9	-	-	< 25	< 25	A	A	0.8	0.9	-	-	< 25	< 25
	WB Approach	A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	SB Approach	B	C	14.0	15.1	-	-	58	43	B	C	14.6	15.6	-	-	64	48	B	C	14.9	16.4	-	-	68	55
	Rdwy A at Rdwy B																								
	EB Approach/Left	A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25	A	A	***8.6***	8.4	-	-	< 25	< 25
	WB Approach	A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	NB Approach/Left	A	A	9.1	9.1	-	-	< 25	< 25	B	B	11.8	11.4	-	-	< 25	< 25	F	F	429.1	179.2	-	-	310	159
	SB Approach/Through																	E	D	35.3	26.7	-	-	< 25	< 25
	I-8 WB Off-Ramp at Henness																								
	WB Left/Through									D	F	33.1	78.8	-	0.95	104	240	F	*	***886.5***		2.83		978	
	WB Right									D	A	29.6	8.9	-	-	241	< 25	F	A	397.8	9.7	1.83	-	1682	< 25
	NB Left									A	A	7.8	9.3	-	-	< 25	< 25	A	C	8.3	19.4	-	-	< 25	92
	NB Through									A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	SB Through									A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	I-8 EB Off-Ramp at Henness																								
	EB Left/Through									C	E	21.8	42.4	-	-	79	< 25	F	*	450.6		-		712	
	EB Right									B	B	10.3	11.5	-	-	< 25	< 25	C	D	16.9	26.8	-	-	60	123
	SB Left									A	A	8.5	9.4	-	-	< 25	33	A	F	9.6	83.3	-	-	< 25	531
	SB Through									A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	NB Through									A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	NB Right									A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25
	Rdwy B at Henness																								
	EB Left									F	F	62.3	55.3	0.67	0.59	98	79	*	*						
	WB Right									A	A	9.9	9.5	-	-	34	27	B	C	12.6	20.8	-	-	91	237
	SB Left									A	A	7.5	7.5	-	-	< 25	< 25	A	A	8.5	8.8	-	-	40	53
	SB Right									A	A	~0	~0	-	-	< 25	< 25	A	A	~0	~0	-	-	< 25	< 25

* operations failure - no computed results

* operations failure - no computed results

Roadway Improvements Due to 2012 Total Conditions (cont'd)

- Interchange at Henness Road and I-8 needs to be functional. Minimal configuration with unsignalized ramp termini intersections should function adequately.

Roadway Improvements Due to 2016 Total Conditions

- The intersection of Arica Road and Lamb/Cox will need to be signalized and improved to provide turn lanes at all approaches.
- Dual left and right turn lanes needed at northbound approach to I-10 on-/off-ramps intersection with Jimmie Kerr Boulevard. Also, protected/permitted left turn phasing for the westbound approach is needed. A right turn lane is needed for the eastbound approach.
- Dual left turn lanes needed at northbound approach of Peart Road at Jimmie Kerr Boulevard. An eastbound right turn overlap signal phase promotes better overall intersection operation.
- Henness Road interchange ramp terminus intersections need to be signalized as part of expanding overall capacity (from the basic initial configuration assumption) for the interchange.
- The on-site intersection of Roadway B at Henness Road will require signalization and coordination with interchange signals.
- The on-site intersection of Roadway B at Roadway A will require signalization, especially if proposed overpass of I-8 allows direct connection between north and south sections of the site.

CONCLUSIONS & RECOMMENDATIONS

Current traffic conditions are manageable and thus there are no pre-existing traffic conditions or concerns. Background growth in the form of other sites being developed nearby and general growth at elevated rates generate the need for specific improvements in order to maintain acceptable intersection operations. The specific needs were highlighted previously (see page 8). It is assumed that these improvements will be borne by the other developments contributing to their need or as part of City, County, or State sponsored capital improvements.

The site-generated traffic volumes will utilize these improvements as well, and in some cases require further improvements to maintain acceptable traffic operations. Below is a listing of the additional roadway improvements that can be specifically attributed to the proposed site at its Phase 1 buildout (note: these needs would be in addition to any City-required on-site needs for roadways):

<u>Recommendations for Roadway Improvements in Order to Support Phase 1 of the Proposed Site</u>

- Petition to have stop control switched from Arica Road to Lamb/Cox Road.
- Roadway A shall be stop controlled at its intersection with Arica Road.
- Expand eastbound Arica Road approach at Sunland Gin Road to include exclusive left turn lane.
- Ensure following improvements to State and County roadways are included in capital improvement programs so that they will be implemented before the buildout of Phase 1:
    - Additional eastbound right turn lane on I-10 eastbound off-ramp at Sunland Gin Road.
    - One additional through lane in each direction on Sunland Gin Road for at the least the area at the Arica Road and I-10 eastbound off-ramp intersections (and preferably continuing north to the westbound off-ramp intersection).

- Signalization of eastbound I-10 on-/off-ramp intersection with Jimmie Kerr Boulevard and associated lane additions/improvements to take advantage of signalized control.
- Establish valid roadway connection between northern section of the site and Peart Road to the west. Participate in advancing the projected lane improvements at the Peart Road/Jimmie Kerr Boulevard intersection in support of the anticipated site traffic use of this intersection.

Roadway improvement needs for the subsequent analysis years are contingent on the assumptions made in the course of conducting this study. Therefore, the likely needs referenced on pages 21 and 22 should be re-evaluated at a future time when actual traffic conditions are observable. It does appear that the trip generation magnitude of the site will require access to the proposed Henness Road/I-8 interchange at some point during construction/occupation of Phase 2. Since the additional traffic from Phase 3 further burdens this interchange, it should be built to its ultimate configuration at the outset, although signalization of the ramp termini may not be warranted until a later point.