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TRAFFIC IMPACT ANALYSIS

3800 CHAPMAN APARTMENTS

Orange, California
June 7, 2016
(Update of March 24, 2016 Report)

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1.0 INTRODUCTION

This traffic impact analysis addresses the potential traffic impacts and circulation needs associated with the proposed 3800 Chapman Apartments Project (hereinafter referred to as Project). The project applicant, Greenlaw Partners, proposes to construct a 280-unit apartment complex. The project site is located at 3800 Chapman Avenue, generally on the south side of Chapman Avenue east of Lewis Street in the City of Orange, California.

This report documents the findings and recommendations of a traffic impact analysis conducted by Linscott, Law & Greenspan, Engineers (LLG) to determine the potential impacts associated with the Project. The traffic analysis evaluates the existing operating conditions at eleven (11) key study intersections and eight (8) key roadway segments within the project vicinity, estimates the trip generation potential of the Project, and forecasts future operating conditions without and with the proposed Project. Where necessary, intersection improvements/mitigation measures are identified.

This traffic report satisfies the *City of Orange Traffic Impact Analysis Guidelines, dated August 15, 2007*, the *Caltrans Guide for the Preparation of Traffic Impact Studies*, dated December 2002, where applicable, and is consistent with the requirements and procedures outlined in the most current *Congestion Management Program (CMP) for Orange County.* The Scope of Work for this traffic study, which is included in ***Appendix A***, was developed in conjunction with City of Orange Traffic Engineering staff.

The project site has been visited and an inventory of adjacent area roadways and intersections was performed. Existing traffic information has been collected at eleven (11) key study intersections and eight (8) key roadway segments on a "typical" weekday for use in the preparation of intersection and roadway segment level of service calculations. Information concerning cumulative projects (planned and/or approved) in the vicinity of the proposed Project has been researched at the City of Orange, the City of Garden Grove, the City of Santa Ana and the City of Anaheim. Based on our research, there are seven (7) cumulative projects in the City of Orange, three (3) cumulative projects in the City of Garden Grove, three (3) cumulative projects in the City of Santa Ana, and twenty-two (22) cumulative projects in the City of Anaheim within the vicinity of the subject site. These thirty-five (35) planned and/or approved cumulative projects were considered in the cumulative traffic analysis for this project.

This traffic report analyzes existing and future weekday daily, AM peak hour and PM peak hour traffic conditions for a near-term (Year 2019) traffic setting upon completion of the proposed Project. Daily and peak hour traffic forecasts for the Year 2019 horizon year have been projected by

increasing existing traffic volumes by an annual growth rate of one percent (1.0%) per year and adding traffic volumes generated by thirty-five (35) cumulative projects.

1.1 Study Area

The eleven (11) key study intersections and eight (8) key roadway segments selected for evaluation were determined based on coordination with City of Orange Traffic Engineering staff and application of the "51 or more peak hour trip threshold" criteria outlined in the *City of Orange Traffic Impact Analysis Guidelines*, dated August 15, 2007. The intersections and roadway segments listed below provide local access to the study area and define the extent of the boundaries for this traffic impact investigation. The jurisdiction where each key study intersection/roadway segment is located is also identified with the following nomenclature utilized; (O) = City of Orange and (GG) = City of Garden Grove.

Key Study Intersections
1. Lewis Street at Chapman Avenue (O/GG)
2. Lewis Street at Lampson Avenue/Metropolitan Drive (O/GG)
3. Manchester Avenue at Chapman Avenue (O)
4. SR-22 WB Ramps at Metropolitan Drive (O)
5. State College Boulevard at Anaheim Way/I-5 NB Ramps (O)
6. State College Boulevard at I-5 SB Ramps (O)
7. The City Drive at Chapman Avenue (O)
8. The City Drive at Metropolitan Drive (O)
9. The City Drive at SR-22 EB Ramps (O)
10. I-5 SB Ramps at Chapman Avenue (O)
11. Rampart Street at Chapman Avenue (O)

Key Roadway Segments
A. Chapman Avenue, between Lewis Street and Manchester Avenue (O)
B. Chapman Avenue, between Manchester Avenue and The City Drive (O)
C. Chapman Avenue, between The City Drive and I-5 SB Ramps (O)
D. Metropolitan Drive, between Lewis Street and SR-22 WB Ramps (O)
E. Metropolitan Drive, between SR-22 WB Ramps and The City Drive (O)
F. Lewis Street, between Chapman Avenue and Lampson Avenue (O/GG)
G. State College Boulevard, between I-5 SB Ramps and Chapman Avenue (O)
H. The City Drive, between Dawn Way and Metropolitan Drive (O)

Figure 1-1 presents a Vicinity Map, which illustrates the general location of the proposed Project and depicts the study locations and surrounding street system. The Level of Service (LOS) investigations at these key locations were used to evaluate the potential traffic-related impacts associated with area growth, cumulative projects and the proposed Project. When necessary, this report recommends intersection improvements that may be required to accommodate future traffic volumes and restore/maintain an acceptable Level of Service and/or mitigate the impact of the project.

Included in this Traffic Impact Analysis are:

- Existing traffic counts,
- Estimated project traffic generation/distribution/assignment,
- Estimated cumulative project traffic generation/distribution/assignment,
- Daily, AM and PM peak hour capacity analyses for existing conditions,
- Daily, AM and PM peak hour capacity analyses for existing plus project conditions,
- Daily, AM and PM peak hour capacity analyses for future (Year 2019) conditions without and with project traffic,
- Caltrans Analysis,
- Site Access Evaluation,
- Recommended Improvements, and
- Congestion Management Program (CMP) Analysis.

2.0 PROJECT DESCRIPTION

The project site is located at 3800 Chapman Avenue, generally on the south side of Chapman Avenue east of Lewis Street in the City of Orange, California. ***Figure 2-1*** presents an aerial depiction of the existing site.

Figure 2-2 presents the proposed site plan for the proposed Project, prepared by KTGY Group. Review of the proposed site plan indicates that the proposed Project consists of a 280-unit apartment complex, one seven-story parking structure for the proposed apartments and one five-story parking structure for the existing 170,000 square-foot (SF) office building. The proposed Project is expected to be constructed in one phase and will be fully occupied by the Year 2019.

As proposed, the apartments will be constructed over an existing surface parking lot that currently provides parking for the existing 170,000 SF office building. To account for the re-route of existing trips currently utilizing the surface parking lot to the new office parking structure, it was assumed that fifty percent (50%) of the existing traffic entering the existing driveway on Lewis Street would re-route to the existing office driveway located along Chapman Avenue.

The Project site currently has 552 surface parking spaces to serve the existing office building. The proposed residential development will include 502 parking spaces and the office parking reconfiguration will include 704 parking structure spaces for a total of 704 office parking spaces.

2.1 Site Access

As shown in *Figure 2-2*, access to the proposed Project will be provided via one existing full-access driveway located along Lewis Street and one proposed right-turn in/right-turn out only driveway located along Chapman Avenue. It should be noted that there is an additional existing full movement driveway located along Chapman Avenue on the east of the office building, which currently provides access to the office parking and will provide direct access into the proposed parking structure. Although no residential Project traffic will enter through this driveway, it is assumed that some existing traffic would be rerouted to this driveway with the development of the Project.

3.0 EXISTING CONDITIONS

3.1 Existing Street System

Regional access to the site is provided via the Santa Ana (I-5) Freeway and the Garden Grove (SR-22) Freeway. The principal local network of streets serving the proposed Project includes Chapman Avenue and Lewis Street. The following discussion provides a brief synopsis of these key area streets. The descriptions are based on an inventory of existing roadway conditions.

Chapman Avenue is generally a six-lane, divided roadway oriented in the east-west direction in the vicinity of the project. Chapman Avenue borders the project site to the north and will provide access to the site via one right-turn in/right-turn out only driveway. An existing full movement office driveway is also located along Chapman Avenue and will remain unchanged. On-street parking is generally not permitted along this roadway within the vicinity of the project. The posted speed limit on Chapman Avenue is 40 miles per hour (mph) between Lewis Street and Manchester Avenue, 35 mph between Manchester Avenue and The City Drive and 40 mph east of The City Drive. Traffic signals control the study intersections of Chapman Avenue at Lewis Street, Manchester Avenue, The City Drive, the I-5 Freeway Ramps, and Rampart Street.

Lewis Street is generally a four-lane, divided roadway oriented in the north-south direction. Lewis Street borders a portion of the project site to the west and will provide access to the site via one full-access driveway. On-street parking is generally not permitted along this roadway within the vicinity of the project. The posted speed limit on Lewis Street is 45 mph north of Chapman Avenue and 40 mph south of Chapman Avenue. Traffic signals control the study intersections of Lewis Street at Chapman Avenue and Lampson Avenue/Metropolitan Drive.

Figure 3-1 presents an inventory of the existing roadway conditions for the arterials and intersections evaluated in this report. This figure identifies the number of travel lanes for key arterials, as well as intersection configurations and controls for the key area study intersections.

3.2 Existing Traffic Volumes

Eleven (11) key study intersections and eight (8) key roadway segments have been identified as the locations at which to evaluate existing and future traffic operating conditions. Some portion of potential project-related traffic will pass through each of these intersections/roadway segments, and their analysis will reveal the expected relative impacts of the project. These key intersections and roadway segments were selected for evaluation based on coordination with City of Orange Traffic Engineering staff and application of the "51 or more peak hour trip threshold" criteria outlined in the *City of Orange Traffic Impact Analysis Guidelines*, dated August 15, 2007.

Existing daily, AM peak hour, and PM peak hour traffic volumes for the eleven (11) key study intersections and eight (8) key roadway segments evaluated in this report were conducted by Transportation Studies Inc. in February 2016. Additionally, counts were conducted at the existing Project driveway along Lewis Street and the existing office driveway along Chapman Avenue. ***Figures 3-2*** and ***3-3*** illustrate the existing AM and PM peak hour traffic volumes at the eleven (11)

key study intersections and three Project site driveways evaluated in this report, respectively. *Figure 3-3* also presents the existing average daily traffic volumes for the eight (8) key roadway segments in the vicinity of the proposed Project.

Appendix B contains the detailed peak hour count sheets for the key intersections and driveways evaluated in this report. *Appendix B* also contains the average daily traffic volumes for the key roadway segments.

3.3 Existing Intersection Conditions

Existing AM and PM peak hour operating conditions for the eleven (11) key study intersections were evaluated using the *Intersection Capacity Utilization* (ICU) methodology for signalized intersections and the methodology outlined in Chapter 19 of the *Highway Capacity Manual 2010* (HCM2010) for unsignalized intersections.

3.3.1 *Intersection Capacity Utilization (ICU) Method of Analysis (Signalized Intersections)*

In conformance with City of Orange requirements, existing AM and PM peak hour operating conditions for the key signalized study intersections were evaluated using the Intersection Capacity Utilization (ICU) method. The ICU technique is intended for signalized intersection analysis and estimates the volume to capacity (V/C) relationship for an intersection based on the individual V/C ratios for key conflicting traffic movements. The ICU numerical value represents the percent signal (green) time and thus capacity, required by existing and/or future traffic. It should be noted that the ICU methodology assumes uniform traffic distribution per intersection approach lane and optimal signal timing.

Per City of Orange requirements, the ICU calculations use a lane capacity of 1,700 vehicles per hour (vph) for through and all turn lanes. A clearance adjustment factor of 0.05 was added to each Level of Service calculation.

The ICU value translates to a Level of Service (LOS) estimate, which is a relative measure of the intersection performance. The ICU value is the sum of the critical volume to capacity ratios at an intersection; it is not intended to be indicative of the LOS of each of the individual turning movements. The six qualitative categories of Level of Service have been defined along with the corresponding ICU value range and are shown in ***Table 3-1***.

3.3.2 *Highway Capacity Manual (HCM) Method of Analysis (Unsignalized Intersections)*

The 2010 HCM unsignalized methodology for stop-controlled intersections was utilized for the analysis of the unsignalized intersections (i.e. the proposed project driveways). This methodology estimates the average control delay for each of the subject movements and determines the level of service for each movement. For all-way stop controlled intersections, the overall average control delay measured in seconds per vehicle, and level of service is then calculated for the entire intersection. For one-way and two-way stop-controlled (minor street stop-controlled) intersections, this methodology estimates the worst side street delay, measured in seconds per vehicle and determines the level of service for that approach. The HCM control delay value translates to a Level

of Service (LOS) estimate, which is a relative measure of the intersection performance. The six qualitative categories of Level of Service have been defined along with the corresponding HCM control delay value range, as shown in ***Table 3-2***.

3.4 Volume to Capacity (V/C) Ratio Method of Analysis (Roadway Segments)

Existing daily operating conditions for the eight (8) key roadway segments have been investigated according to the daily volume-to-capacity (V/C) ratio of each link. The daily V/C relationship is used to estimate the LOS of the roadway segment with the volume based on the 24-hour traffic count data and the existing daily capacity based on the respective City's classification of each roadway. The roadway link capacity of each street classification according to the City of Orange General Plan Circulation and Mobility Element is presented in ***Table 3-3***, along with the six corresponding service levels and associated V/C ratios.

3.5 Level of Service Criteria

3.5.1 *City of Orange Locations*

According to the City of Orange General Plan Circulation Element and stated in the *City of Orange Traffic Impact Analysis Guidelines, dated August 15, 2007,* LOS D is the minimum acceptable condition that should be maintained during the morning and evening peak commute hours on all intersections and LOS D is the minimum acceptable condition that should be maintained on a daily basis on all roadway segments.

3.5.2 *City of Garden Grove Locations*

According to the City of Garden Grove, LOS D is the minimum acceptable condition that should be maintained during the morning and evening peak commute hours on all intersections and LOS D is the minimum acceptable condition that should be maintained on a daily basis on all roadway segments.

3.6 Existing Level of Service Results

3.6.1 *Intersections*

Table 3-4 summarizes the existing peak hour service level calculations for the eleven (11) key study intersections based on existing traffic volumes and current street geometry. Review of *Table 3-4* indicates that one (1) of the eleven key study intersections currently operates at an unacceptable level of service during the AM peak hour. The intersection of Lewis Street at Chapman Avenue currently operates at unacceptable LOS E during the AM peak hour. The remaining ten (10) key study intersections currently operate at acceptable LOS D or better during the AM and PM peak hours.

Appendix C presents the ICU/LOS calculations for the eleven (11) key study intersections for the AM peak hour and PM peak hour.

3.6.2 *Roadway Segments*

Table 3-5 summarizes the existing service level calculations for the eight (8) key roadway segments based on existing 24-hour traffic volumes and current roadway geometry. The first column (1)

shows the number of lanes, the second column (2) shows the arterial classification and the third column (3) shows the existing LOS "E" capacity. The fourth column (4) shows the daily volume, V/C ratio and resulting level of service. Review of *Table 3-5* indicates that all eight (8) key roadway segments currently operate at acceptable LOS C or better on a daily basis.

TABLE 3-1

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS[1]

Level of Service (LOS)	Intersection Capacity Utilization Value (V/C)	Level of Service Description
A	≤ 0.60	EXCELLENT. No vehicle waits longer than one red light, and no approach phase is fully used.
B	0.61 – 0.70	VERY GOOD. An occasional approach phase is fully utilized; many drivers begin to feel somewhat restricted within groups of vehicles.
C	0.71 – 0.80	GOOD. Occasionally drivers may have to wait through more than one red light; backups may develop behind turning vehicles.
D	0.81 – 0.90	FAIR. Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive backups.
E	0.91 – 1.00	POOR. Represents the most vehicles intersection approaches can accommodate; may be long lines of waiting vehicles through several signal cycles.
F	> 1.00	FAILURE. Backups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches. Potentially very long delays with continuously increasing queue lengths.

[1] Source: *Transportation Research Board Circular 212 – Interim Materials on Highway Capacity*.

TABLE 3-2

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[2]

Level of Service (LOS)	Highway Capacity Manual Delay Value (sec/veh)	Level of Service Description
A	≤ 10.0	Little or no delay
B	> 10.0 and ≤ 15.0	Short traffic delays
C	> 15.0 and ≤ 25.0	Average traffic delays
D	> 25.0 and ≤ 35.0	Long traffic delays
E	> 35.0 and ≤ 50.0	Very long traffic delays
F	> 50.0	Severe congestion

[2] Source: *Highway Capacity Manual 2010*, Chapter 19 (Unsignalized Intersections).

TABLE 3-3

ROADWAY LINK CAPACITIES

Facility Type	Number of Lanes	Level of Service Criteria With Associated Roadway Capacity Daily Values (VPD) Level of Service (LOS)					
		A	**B**	**C**	**D**	**E[3]**	**F**
Principal	8-lanes divided	45,000	52,500	60,000	67,500	75,000	--
Major	6-lanes divided	33,900	39,400	45,000	50,600	56,300	--
Primary	4-lanes divided	22,500	26,300	30,000	33,800	37,500	--
Secondary	4-lanes undivided	14,400	16,800	19,200	21,600	24,000	--
Collector	2-lanes undivided	7,200	8,400	9,600	10,800	12,000	--
V/C Ratio		≤ 0.60	0.61-0.70	0.71-0.80	0.81-0.90	0.91-1.00	≥ 1.00

Notes:

- VPD = vehicles per day
- VPH = vehicles per hour

[3] Source: City of Orange General Plan; Circulation and Mobility.

TABLE 3-4

EXISTING PEAK HOUR LEVELS OF SERVICE

Key Intersection	Time Period	Jurisdiction	Minimum Acceptable LOS	Control Type	ICU	LOS
1. Lewis Street at Chapman Avenue	AM	Orange/ Garden Grove	D	8 Phase	**0.912**	**E**
	PM			Signal	0.853	D
2. Lewis Street at Lampson Ave/Metropolitan Dr	AM	Orange/ Garden Grove	D	2 Phase	0.605	B
	PM			Signal	0.625	B
3. Manchester Avenue at Chapman Avenue	AM	Orange	D	6 Phase	0.675	B
	PM			Signal	0.552	A
4. SR-22 WB Ramps at Metropolitan Drive	AM	Orange/ Caltrans	D	4 Phase	0.447	A
	PM			Signal	0.514	A
5. State College Boulevard at Anaheim Way/I-5 NB Ramps	AM	Orange/ Caltrans	D	5 Phase	0.412	A
	PM			Signal	0.639	B
6. State College Boulevard at I-5 SB Ramps	AM	Orange/ Caltrans	D	2 Phase	0.414	A
	PM			Signal	0.350	A
7. The City Drive at Chapman Avenue	AM	Orange	D	8 Phase	0.724	C
	PM			Signal	0.659	B
8. The City Drive at Metropolitan Drive	AM	Orange	D	3 Phase	0.459	A
	PM			Signal	0.475	A
9. The City Drive at SR-22 EB Ramps	AM	Orange/ Caltrans	D	6 Phase	0.595	A
	PM			Signal	0.533	A
10. I-5 SB Ramps at Chapman Avenue	AM	Orange/ Caltrans	D	4 Phase	0.554	A
	PM			Signal	0.587	A
11. Rampart Street at Chapman Avenue	AM	Orange	D	3 Phase	0.380	A
	PM			Signal	0.449	A

Notes:

- **BOLD ICU/LOS** values indicate unacceptable service level

TABLE 3-5

EXISTING ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY

	Key Roadway Segment	Jurisdiction	Min. Acc. LOS	(1) No. of Existing Lanes	(2) Arterial Classification	(3) Existing Capacity at LOS "E"	(4) Existing Traffic Conditions		
							Daily Volume	V/C Ratio	LOS
A.	Chapman Ave between Lewis St and Manchester Ave	Orange	D	6D	Major	56,300	33,665	0.598	A
B.	Chapman Ave between Manchester Ave and The City Dr	Orange	D	6D	Major	56,300	39,359	0.699	B
C.	Chapman Ave between The City Dr and I-5 SB Ramps	Orange	D	6D	Major	56,300	43,838	0.779	C
D.	Metropolitan Dr between Lewis St and SR-22 WB Ramps	Orange	D	4D	Primary	37,500	8,932	0.238	A
E.	Metropolitan Dr between SR-22 WB Ramps and The City Dr	Orange	D	4D	Primary	37,500	20,235	0.540	A
F.	Lewis St between Chapman Ave and Lampson Ave	Orange/ Garden Grove	D	4D	Secondary	24,000	17,171	0.715	C
G.	State College Blvd between I-5 SB Ramps and Chapman Ave	Orange	D	8D	Principal	75,000	31,707	0.423	A
H.	The City Dr between Dawn Way and Metropolitan Dr	Orange	D	8D	Principal	75,000	29,761	0.397	A

4.0 TRAFFIC FORECASTING METHODOLOGY

In order to estimate the traffic impact characteristics of the proposed Project, a multi-step process has been utilized. The first step is trip generation, which estimates the total arriving and departing traffic on a peak hour and daily basis. The traffic generation potential is forecast by applying the appropriate vehicle trip generation equations or rates to the project development tabulation.

The second step of the forecasting process is trip distribution, which identifies the origins and destinations of inbound and outbound project traffic. These origins and destinations are typically based on demographics and existing/anticipated travel patterns in the study area.

The third step is traffic assignment, which involves the allocation of project traffic to study area streets and intersections. Traffic assignment is typically based on minimization of travel time, which may or may not involve the shortest route, depending on prevailing operating conditions and travel speeds. Traffic distribution patterns are indicated by general percentage orientation, while traffic assignment allocates specific volume forecasts to individual roadway links and intersection turning movements throughout the study area.

With the forecasting process complete and project traffic assignments developed, the impact of the proposed Project is isolated by comparing operational (LOS) conditions at selected key intersections using expected future traffic volumes with and without forecast project traffic. The need for site-specific and/or cumulative local area traffic improvements can then be evaluated and the significance of the project's impacts identified.

5.0 PROJECT TRAFFIC CHARACTERISTICS

5.1 Project Traffic Generation

Traffic generation is expressed in vehicle trip ends, defined as one-way vehicular movements, either entering or exiting the generating land use. Generation equations and/or rates used in the traffic forecasting procedure are found in the 9th Edition of *Trip Generation*, published by the Institute of Transportation Engineers (ITE) [Washington D.C., 2012].

Table 5-1 summarizes the trip generation rates used in forecasting the vehicular trips generated by the proposed Project and also presents the project's forecast peak hour and daily traffic volumes. As shown, the trip generation potential of the Project was estimated using ITE Land Use 220: Apartments trip rates. Review of *Table 5-1* indicates that the proposed Project is forecast to generate 1,490 daily trips, with 122 trips (25 inbound, 97 outbound) produced in the AM peak hour and 139 trips (90 inbound, 49 outbound) produced in the PM peak hour on a "typical" weekday.

Please note that the aforementioned overall project trip generation includes adjustments for mode split/internal capture. A twenty percent (20%), fifteen percent (15%) and twenty percent (20%) mode split/internal capture reduction has been applied to the daily, AM peak hour and PM peak hour project trip generation, respectively, to account for the numerous employment and entertainment/retail/restaurant opportunities located in the immediate vicinity of the proposed project site. The proposed 20%/15%/20% mode split/internal capture reductions are based on internal capture calculations prepared for the project utilizing the recommended methodology contained within the *Trip Generation Handbook*. The proposed project was analyzed with the existing adjacent office, medical office and retail/restaurant/entertainment uses in the area to develop internal capture reductions.

Appendix C also contains the internal capture worksheets and, as shown, the calculated internal capture potential is measurably greater than what was utilized in the analysis.

5.2 Project Traffic Distribution and Assignment

Figure 5-1 illustrates the general, directional traffic distribution pattern for the proposed Project. Project traffic volumes both entering and exiting the project site have been distributed and assigned to the adjacent street system based on the following considerations:

- directional flows on the freeways in the immediate vicinity of the project site (i.e. I-5 Freeway and SR-22 Freeway),
- the site's proximity to major traffic carriers (i.e. Chapman Avenue, The City Drive, etc.),
- expected localized traffic flow patterns based on adjacent street channelization and presence of traffic signals,
- ingress/egress availability at the project site, and
- input from City of Orange Traffic Engineering staff.

The anticipated AM and PM peak hour project traffic volumes associated with the proposed Project are presented in ***Figures 5-2*** and ***5-3***, respectively. *Figure 5-3* also presents the daily project traffic volumes. The traffic volume assignments presented in *Figures 5-2* and *5-3* reflect the traffic distribution characteristics shown in *Figure 5-1* and the traffic generation forecast presented in *Table 5-1*.

5.3 Existing Plus Project Traffic Conditions

The existing plus project traffic conditions have been generated based upon existing conditions and the estimated project traffic. These forecast traffic conditions have been prepared pursuant to the California Environmental Quality Act (CEQA) guidelines, which require that the potential impacts of a Project be evaluated upon the circulation system as it currently exists. This traffic volume scenario and the related intersection capacity analyses will identify the roadway improvements necessary to mitigate the direct traffic impacts of the Project, if any.

Figures 5-4 and ***5-5*** present projected AM and PM peak hour traffic volumes at the eleven (11) key study intersections and three Project site driveways with the addition of the trips generated by the proposed Project to existing traffic volumes, respectively. *Figure 5-5* also presents the existing plus project daily traffic volumes.

TABLE 5-1

PROJECT TRAFFIC GENERATION FORECAST[4]

ITE Land Use Code / Project Description	Daily 2-Way	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Generation Factors:							
▪ 220: Apartments (TE/DU)	6.65	0.10	0.41	0.51	0.40	0.22	0.62
Generation Forecast:							
▪ 3800 Chapman Apartments (280 DU)	1,862	29	114	143	113	61	174
Mode Split/Internal Capture Reduction (20% daily / 15% AM / 20% PM)[5]	-372	-4	-17	-21	-23	-12	-35
Subtotal	1,490	25	97	122	90	49	139
Total Traffic Generation Forecast	**1,490**	**25**	**97**	**122**	**90**	**49**	**139**

4 Source: *Trip Generation*, 9th Edition, Institute of Transportation Engineers (ITE), Washington, D.C. (2012).

5 A twenty percent (20%), fifteen percent (15%), and twenty percent (20%) mode split/internal capture reduction has been applied to the daily, AM peak hour, and PM peak hour project trip generation, respectively, to account for the numerous employment and entertainment/retail/restaurant opportunities located in the immediate vicinity of the proposed project site.

6.0 FUTURE TRAFFIC CONDITIONS

6.1 Ambient Traffic Growth

Horizon year, background traffic growth estimates have been calculated using an ambient traffic growth factor. The ambient traffic growth factor is intended to include unknown and future cumulative projects in the study area, as well as account for regular growth in traffic volumes due to the development of projects outside the study area. The future growth in traffic volumes has been calculated at one percent (1.0%) per year. Applied to the Year 2016 existing traffic volumes, this factor results in a 3.0% growth in existing volumes to the near-term horizon year 2019.

6.2 Cumulative Projects Traffic Characteristics

In order to make a realistic estimate of future on-street conditions prior to implementation of the proposed Project, the status of other known development projects (cumulative projects) in the vicinity of the proposed Project has been researched at the City of Orange, the City of Garden Grove, the City of Santa Ana, and the City of Anaheim. With this information, the potential impact of the proposed Project can be evaluated within the context of the cumulative impact of all ongoing development.

Based on our research, there are seven (7) cumulative projects in the City of Orange, three (3) cumulative projects in the City of Garden Grove, three (3) cumulative projects in the City of Santa Ana, and twenty-two (22) cumulative projects in the City of Anaheim within the vicinity of the subject site that have either been built, but not yet fully occupied, or are being processed for approval. These thirty-five (35) cumulative projects have been included as part of the cumulative background setting.

Table 6-1 provides a brief description for each of the thirty-five (35) cumulative projects. ***Figure 6-1*** graphically illustrates the location of the cumulative projects. These cumulative projects are expected to generate vehicular traffic, which may affect the operating conditions of the key study intersections and/or roadway segments.

Table 6-2 presents the development totals and resultant trip generation for the thirty-five (35) cumulative projects. As shown in *Table 6-2*, the thirty-five (35) cumulative projects are forecast to generate a total of 117,172 daily trips, with 7,863 trips (3,304 inbound and 4,559 outbound) forecast during the AM peak hour and 10,524 trips (5,756 inbound and 4,768 outbound) forecast during the PM peak hour.

6.3 Year 2019 Traffic Volumes

The AM and PM peak hour traffic volumes associated with the thirty-five (35) cumulative projects are presented in ***Figures 6-2*** and ***6-3***, respectively. *Figure 6-3* also presents the daily cumulative project traffic volumes.

Figures 6-4 and ***6-5*** present the AM and PM peak hour cumulative traffic volumes (existing traffic + ambient growth traffic + cumulative project traffic) at the eleven (11) key study intersections for the Year 2019, respectively. *Figure 6-5* also presents the Year 2019 daily cumulative traffic volumes.

Figures 6-6 and ***6-7*** illustrate the Year 2019 forecast AM and PM peak hour traffic volumes, with the inclusion of the trips generated by the proposed Project, respectively. *Figure 6-7* also presents the Year 2019 daily cumulative plus project traffic volumes.

TABLE 6-1

LOCATION AND DESCRIPTION OF CUMULATIVE PROJECTS[6]

No.	Description	Location/Address	Size
City of Orange			
1.	AMLI Residential	3537 The City Way	334 Apartments
2.	Oakmont Senior Living	630 The City Drive South	98 DU Senior Adult Housing
3.	City Parkway West Apartments	Northeast corner of Lewis Street and City Parkway West	220 Apartments
4.	City Plaza	South side of City Parkway West and on the northeast side of Metropolitan Drive	335 Apartments, 165 Room Hotel
5.	Eleven 10 West	1110 Town and Country Road	260 Apartments
6.	999 Town and Country Apartments	999 Town and Country	250 Apartments
7.	Koll Center Parking Structure	3510 West Orangewood Avenue	Net increase of 222 parking spaces
City of Garden Grove			
8.	Single Family Homes	Northwest corner of Lewis Street and Garden Grove Boulevard	70 DU Single Family Homes
9.	Site "C" Hotel and Restaurant	Northeast corner of Harbor Boulevard and Twintree Lane	769 Room Hotel and 45,000 SF Restaurant
10.	Great Wolf Hotel and Water Park	12681 Harbor Boulevard	605 Room Hotel and 8,000 SF Restaurant
City of Santa Ana			
11.	Park View at Town and Country Manor	555 East Memory Lane	174 Apartments
12.	Jeanette Lane Residential Project	301 East Jeanette Lane	182 Apartments
13.	The Academy Charter High School	1901 North Fairview Street	8 Apartments and 110,500 SF High School
City of Anaheim			
14.	Jefferson Platinum Triangle I & II	Generally north of Katella Avenue and west of State College Boulevard	400 Apartments
15.	Anaheim Apartment Communities	Generally north of Katella Avenue and west of State College Boulevard	244 Apartments
16.	A-Town Metro	Southwest corner of State College Boulevard and Katella Avenue	1,746 Apartments and 50,000 SF Commercial
17.	A-Town Stadium	Northeast corner of State College Boulevard and Orangewood Avenue	405 Apartments, 200 Room Hotel, 77,000 SF Office and 433,000 SF Commercial
18.	Experience at Gene Autry	Southwest corner of State College Boulevard and Gene Autry Way	1,208 Apartments, 50,000 SF Commercial and 100,000 SF Office

[6] Source: Cities of Orange, Garden Grove, Santa Ana and Anaheim Planning Departments staff.

TABLE 6-1 (CONTINUED)
LOCATION AND DESCRIPTION OF CUMULATIVE PROJECTS[7]

No.	Description	Location/Address	Size
19.	Orangewood Apartments (The George)	Orangewood Avenue east of A-Town Stadium	341 Apartments
20.	Platinum Vista	Northeast corner of Lewis Street and Katella Avenue (east of Platinum Gateway)	389 Apartments
21.	Platinum Gateway	Northeast corner of Lewis Street and Katella Avenue	399 Apartments
22.	Gateway Apartments Phase II	Southeast corner of State College Boulevard and Orangewood Avenue	395 Apartments
23.	Trumark Condominiums	Eastside of Lewis Street generally north of Katella Avenue	154 Condominiums
24.	Holiday Inn Express	1411 South Manchester Avenue	96 Room Hotel
25.	Park Vue Inn	1570 South Harbor Boulevard	180 Room Hotel and 10,654 SF Commercial
26.	Ramada Maingate	1650 South Harbor Boulevard	13 Room Hotel (addition)
27.	Country Inn and Suites	1640 South Clementine Street	174 Room Hotel
28.	Luxury Hotel	1700 South Harbor Boulevard	580 Room Resort Hotel
29.	Gardenwalk – Resort Hotel	300 West Disney Way	400 Room Resort Hotel
30.	Gardenwalk – Westgate Timeshare	500 West Disney Way	392 Room Resort Hotel
31.	Gardenwalk – JW Marriott	1775 South Clementine Street	466 Room Resort Hotel
32.	The Anabella Hotel Redevelopment	1030 West Katella Avenue	634 Room Resort Hotel
33.	Anaheim Convention Center Exp.	800 West Katella Avenue	200,000 SF Convention Center Exp.
34.	Marriott Residence Inn	640 West Katella Avenue	294 Room All Suites Hotel
35.	Hyatt House	1800 South Harbor Boulevard	252 Room Hotel, 2,300 SF Restaurant, 2,000 SF Coffee Shop and 14,550 SF Pharmacy

[7] Source: Cities of Orange, Garden Grove, Santa Ana and Anaheim Planning Departments staff.

TABLE 6-2

CUMULATIVE PROJECTS TRAFFIC GENERATION FORECAST[8]

No.	Cumulative Project Description	Daily Two-Way	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
1.	AMLI Residential[9]	1,777	28	116	144	107	58	165
2.	Oakmont Senior Living	211	4	2	6	10	7	17
3.	City Parkway West Apartments[10]	1,170	19	76	95	70	39	109
4.	City Plaza[11]	3,130	80	152	232	158	107	265
5.	Eleven 10 West[12]	1,729	26	107	133	104	57	161
6.	999 Town and Country Apartments[13]	1,663	25	103	128	100	55	155
7.	Koll Center Parking Structure[14]	622	43	12	55	38	46	84
8.	Single Family Homes	666	13	40	53	44	26	70
9.	Site "C" Hotel and Restaurant[15]	8,256	271	176	447	348	269	617
10.	Great Wolf Hotel and Water Park[16]	2,891	135	55	190	129	155	284
11.	Park View at Town and Country Manor	1,157	18	71	89	70	38	108
12.	Jeanette Lane Residential Project[17]	1,210	18	75	93	73	40	113
13.	The Academy Charter High School[18]	686	107	52	159	25	29	54
14.	Jefferson Platinum Triangle I & II	2,660	41	163	204	161	87	248
15.	Anaheim Apartment Communities	1,623	25	99	124	98	53	151
16.	A-Town Metro	26,576	418	1,182	1,600	1,411	941	2,352
17.	A-Town Stadium	18,380	422	354	776	751	790	1,541
18.	Experience at Gene Autry	10,737	287	528	815	571	450	1,021
19.	Orangewood Apartments (The George)	2,268	35	139	174	137	74	211
20.	Platinum Vista	2,587	40	158	198	157	84	241

8 Unless otherwise noted, Source: *Trip Generation, 9th Editions*, Institute of Transportation Engineers (ITE) [Washington, D.C. (2012)].

9 Source: *AMLI Uptown Orange Project Traffic Impact Analysis,* prepared by LLG Engineers.

10 Source: *City Parkway West Apartments Project Traffic Impact Analysis,* prepared by LLG Engineers.

11 Source: *City Plaza Project Traffic Impact Analysis,* prepared by LLG Engineers.

12 Source: *1100 Town & Country Project Traffic Impact Analysis,* prepared by LLG Engineers.

13 Source: *999 Town & Country Apartments Project Traffic Impact Analysis,* prepared by LLG Engineers.

14 Source: *Koll Center Parking Structure Focused Traffic Impact Assessment,* prepared by LLG Engineers.

15 Source: *Traffic Impact Analysis Report for The Garden Grove Site "C" Hotel and Restaurant,* prepared by RK Engineering Group.

16 Source: *Traffic Impact Analysis Report for The Garden Grove Water Park Hotel,* prepared by RK Engineering Group.

17 Source: *301 East Jeanette Lane Residential Project Traffic Impact* Analysis, prepared by RBF.

18 Source: *The Academy Charter high School Traffic Impact* Analysis, prepared by Fehr and Peers.

TABLE 6-2 (CONTINUED)

CUMULATIVE PROJECTS TRAFFIC GENERATION FORECAST[19]

No.	Cumulative Project Description	Daily Two-Way	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
21.	Platinum Gateway	2,653	41	162	203	161	86	247
22.	Gateway Apartments Phase II	2,627	40	161	201	159	86	245
23.	Trumark Condominiums	1,466	29	87	116	97	57	154
24.	Holiday Inn Express	784	30	21	51	30	28	58
25.	Park Vue Inn	2,659	79	52	131	97	99	196
26.	Ramada Maingate	106	4	3	7	4	4	8
27.	Country Inn and Suites	853	36	30	66	32	38	70
28.	Luxury Hotel	2,440	130	50	180	105	139	244
29.	Gardenwalk – Resort Hotel	1,680	89	35	124	72	96	168
30.	Gardenwalk – Westgate Timeshare	1,646	88	34	122	71	94	165
31.	Gardenwalk – JW Marriott	1,957	104	40	144	84	112	196
32.	The Anabella Hotel Redevelopment	2,660	142	55	197	114	152	266
33.	Anaheim Convention Center Exp.	2,206	275	37	312	51	247	298
34.	Marriott Residence Inn	1,441	62	50	112	53	65	118
35.	Hyatt House[20]	1,995	100	82	182	64	60	124
Total Cumulative Projects Trip Generation Forecast		**117,172**	**3,304**	**4,559**	**7,863**	**5,756**	**4,768**	**10,524**

[19] Unless otherwise noted, Source: *Trip Generation, 9th Editions*, Institute of Transportation Engineers (ITE) [Washington, D.C. (2012)].

[20] Source: *Traffic Impact Analysis Report for the Hyatt House Hotel Project,* prepared by LLG Engineers.

7.0 TRAFFIC IMPACT ANALYSIS METHODOLOGY

The relative impact of the proposed Project during the AM peak hour/PM peak hour and on a daily basis was evaluated based on analysis of future operating conditions at the eleven (11) key study intersections and eight (8) key roadway segments, without, then with the proposed Project. The previously discussed capacity analysis procedures were utilized to investigate the future volume-to-capacity relationships and service level characteristics at each study intersection and roadway segment. The significance of the potential impacts of the Project at each key intersection and key roadway segment was then evaluated using the following traffic impact criteria.

7.1 Impact Criteria and Thresholds

7.1.1 *City of Orange*

Impacts to local and regional transportation systems located in the City of Orange are considered significant if:

Intersections:

- An unacceptable peak hour Level of Service (LOS) at any of the key intersections is projected. According to the City's Circulation Element and stated in the *City of Orange Traffic Impact Analysis Guidelines, dated August 15, 2007,* LOS D is the minimum acceptable condition that should be maintained during the morning and evening peak commute hours on all intersections; and

- The project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010), causing or worsening LOS E or LOS F (ICU > 0.900).

Roadway Segments:

- An unacceptable daily Level of Service (LOS) at any of the key roadway segments is projected. According to the City of Orange General Plan Circulation Element and stated in the *City of Orange Traffic Impact Analysis Guidelines, dated August 15, 2007,* LOS D is the minimum acceptable condition that should be maintained on a daily basis on all roadway segments; and

- The project increases traffic demand at the roadway segment by 1% of capacity (V/C increase ≥ 0.010), causing or worsening LOS E or LOS F (V/C > 0.900).

7.1.2 *City of Garden Grove*

Impacts to local and regional transportation systems located in the City of Garden Grove are considered significant if:

Intersections:

- An unacceptable peak hour Level of Service (LOS) at any of the key intersections is projected. According to the City of Garden Grove, LOS D is the minimum acceptable condition that should be maintained during the morning and evening peak commute hours on all intersections; and

- The project increases traffic demand at the study intersection by 1% of capacity (ICU increase ≥ 0.010), causing or worsening LOS E or LOS F (ICU > 0.900).

Roadway Segments:

- An unacceptable daily Level of Service (LOS) at any of the key roadway segments is projected. According to the City of Garden Grove, LOS D is the minimum acceptable condition that should be maintained on a daily basis on all roadway segments; and

- The project increases traffic demand at the roadway segment by 1% of capacity (V/C increase ≥ 0.010), causing or worsening LOS E or LOS F (V/C > 0.900).

7.2 Traffic Impact Analysis Scenarios

The following scenarios are those for which volume/capacity calculations have been performed at the eleven (11) key study intersections and eight (8) key roadway segments for existing plus project and near-term (Year 2019) traffic conditions:

(a) Existing Traffic Conditions;
(b) Existing Plus Project Traffic Conditions;
(c) Scenario (b) with Improvements, if necessary;
(d) Near-Term (Year 2019) Cumulative Traffic Conditions,
(e) Near-Term (Year 2019) Cumulative plus Project Traffic Conditions; and
(f) Scenario (e) with Improvements, if necessary.

8.0 EXISTING PLUS PROJECT ANALYSIS

The following summarizes the "Existing Plus Project" level of service results for the eleven (11) key study intersections and eight (8) key roadway segments.

8.1 Intersections

Table 8-1 summarizes the peak hour level of service results at the eleven (11) key study intersections for existing plus project traffic conditions. The first column (1) of ICU/LOS values in *Table 8-1* presents a summary of existing AM and PM peak hour traffic conditions (which were also presented in *Table 3-4*). The second column (2) lists existing plus project traffic conditions. The third column (3) shows the increase in ICU value due to the added peak hour project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report.

8.1.1 *Existing Plus Project Traffic Conditions*

Review of Columns (2) and (3) of *Table 8-1* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the eleven (11) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report. Although the intersection of Lewis Street at Chapman Avenue is forecast to operate at unacceptable LOS E during the AM peak hour with the addition of project traffic, the proposed Project is expected to add less than the allowable threshold to the ICU value. The remaining ten (10) key study intersections currently operate and are forecast to continue to operate at an acceptable service level during the AM and PM peak hours with the addition of Project generated traffic to existing traffic.

Appendix C also presents the existing plus project ICU/LOS calculations for the eleven (11) key study intersections for the AM peak hour and PM peak hour.

8.2 Roadway Segments

Table 8-2 summarizes the roadway segment level of service results at the eight (8) key roadway segments for existing plus project traffic conditions. The first column (1) shows the number of lanes, the second column (2) shows the arterial classification and the third column (3) shows the existing LOS "E" capacity. The fourth column (4) presents a summary of existing daily traffic conditions (which were also presented in *Table 3-5*). The fifth column (5) lists existing plus project daily traffic conditions. Column (5) also shows the increase in V/C ratio value due to the added daily project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report.

8.2.1 *Existing Plus Project Traffic Conditions*

Review of Column 5 of *Table 8-2* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the eight (8) key roadway segments when compared to the LOS standards and significant impact criteria specified in this report. The eight (8) key roadway segments currently operate and are forecast to continue to operate at an acceptable service level on a daily basis with the addition of Project generated traffic to existing traffic.

TABLE 8-1

EXISTING PLUS PROJECT PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersections	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Existing Plus Project Traffic Conditions		(3) Project Significant Impact	
			ICU	LOS	ICU	LOS	Increase	Yes/No
1. Lewis Street at Chapman Avenue	AM	D	**0.912**	**E**	**0.919**	**E**	0.007	No
	PM		0.853	D	0.852	D	0.000	No
2. Lewis Street at Lampson Ave/Metropolitan Dr	AM	D	0.605	B	0.614	B	0.009	No
	PM		0.625	B	0.627	B	0.002	No
3. Manchester Avenue at Chapman Avenue	AM	D	0.675	B	0.690	B	0.015	No
	PM		0.552	A	0.565	A	0.013	No
4. SR-22 WB Ramps at Metropolitan Drive	AM	D	0.447	A	0.449	A	0.002	No
	PM		0.514	A	0.516	A	0.002	No
5. State College Boulevard at Anaheim Way/I-5 NB Ramps	AM	D	0.412	A	0.412	A	0.000	No
	PM		0.639	B	0.640	B	0.001	No
6. State College Boulevard at I-5 SB Ramps	AM	D	0.414	A	0.414	A	0.000	No
	PM		0.350	A	0.358	A	0.008	No

Notes:

- **BOLD ICU/LOS** values indicate unacceptable service level

TABLE 8-1 (CONTINUED)

EXISTING PLUS PROJECT PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersections	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Existing Plus Project Traffic Conditions		(3) Project Significant Impact	
			ICU	LOS	ICU	LOS	Increase	Yes/No
7. The City Drive at Chapman Avenue	AM	D	0.724	C	0.733	C	0.009	No
	PM		0.659	B	0.664	B	0.005	No
8. The City Drive at Metropolitan Drive	AM	D	0.459	A	0.463	A	0.004	No
	PM		0.475	A	0.478	A	0.003	No
9. The City Drive at SR-22 EB Ramps	AM	D	0.595	A	0.597	A	0.002	No
	PM		0.533	A	0.536	A	0.003	No
10. I-5 SB Ramps at Chapman Avenue	AM	D	0.554	A	0.561	A	0.007	No
	PM		0.587	A	0.597	A	0.010	No
11. Rampart Street at Chapman Avenue	AM	D	0.380	A	0.383	A	0.003	No
	PM		0.449	A	0.451	A	0.002	No

Notes:

- **BOLD ICU/LOS** values indicate unacceptable service level

TABLE 8-2

EXISTING PLUS PROJECT ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY

Key Roadway Segment	Min. Acc. LOS	(1) No. of Existing Lanes	(2) Arterial Classification	(3) Existing Capacity at LOS "E"	(4) Existing Traffic Conditions			(5) Existing Plus Project Traffic Conditions				
					Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Inc.	Significant (Yes/No)
A. Chapman Ave between Lewis St and Manchester Ave	D	6D	Major	56,300	33,665	0.598	A	34,783	0.618	B	0.020	No
B. Chapman Ave between Manchester Ave and The City Dr	D	6D	Major	56,300	39,359	0.699	B	40,477	0.719	C	0.020	No
C. Chapman Ave between The City Dr and I-5 SB Ramps	D	6D	Major	56,300	43,838	0.779	C	44,464	0.790	C	0.011	No
D. Metropolitan Dr between Lewis St and SR-22 WB Ramps	D	4D	Primary	37,500	8,932	0.238	A	9,156	0.244	A	0.006	No
E. Metropolitan Dr between SR-22 WB Ramps and The City Dr	D	4D	Primary	37,500	20,235	0.540	A	20,347	0.543	A	0.003	No
F. Lewis St between Chapman Ave and Lampson Ave	D	4D	Secondary	24,000	17,171	0.715	C	17,469	0.728	C	0.013	No
G. State College Blvd between I-5 SB Ramps and Chapman Ave	D	8D	Principal	75,000	31,707	0.423	A	32,124	0.428	A	0.005	No
H. The City Dr between Dawn Way and Metropolitan Dr	D	8D	Principal	75,000	29,761	0.397	A	29,836	0.398	A	0.001	No

9.0 YEAR 2019 PLUS PROJECT ANALYSIS

The following summarizes the "Year 2019 Plus Project" level of service results for the eleven (11) key study intersections and eight (8) key roadway segments.

9.1 Intersections

Table 9-1 summarizes the peak hour level of service results at the eleven (11) key study intersections for Year 2019 traffic conditions. The first column (1) of ICU/LOS values in *Table 9-1* presents a summary of existing AM and PM peak hour traffic conditions (which were also presented in *Table 3-4*). The second column (2) lists projected cumulative traffic conditions (existing plus ambient traffic plus cumulative project traffic) based on existing intersection geometry, but without any traffic generated from the proposed Project. The third column (3) presents forecast Year 2019 near-term traffic conditions with the addition of Project traffic. The fourth column (4) shows the increase in ICU value due to the added peak hour project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report.

9.1.1 *Year 2019 Cumulative Traffic Conditions*

An analysis of future (Year 2019) cumulative traffic conditions indicates that the addition of ambient traffic growth and cumulative project traffic will adversely impact one (1) of the eleven (11) key study intersections. The remaining ten (10) key study intersections are forecast to continue to operate at acceptable levels of service during the AM and PM peak hours with the addition of ambient traffic growth and cumulative project traffic. The location projected to operate at an adverse LOS is as follows:

	AM Peak Hour		PM Peak Hour	
Key Intersection	ICU	LOS	ICU	LOS
1. Lewis Street at Chapman Avenue	0.979	E	0.954	E

9.1.2 *Year 2019 Cumulative Plus Project Traffic Conditions*

Review of Columns (3) and (4) of *Table 9-1* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the eleven (11) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report. Although the intersection of Lewis Street/Chapman Avenue is forecast to operate at unacceptable LOS E during the AM and/or PM peak hours with the addition of project traffic, the proposed Project is expected to add less than the allowable threshold to the ICU value. The remaining ten (10) key study intersections are forecast to continue to operate at an acceptable service level during the AM and PM peak hours with the addition of project generated traffic in the Year 2019.

Appendix C also presents the Year 2019 plus project ICU/LOS calculations for the eleven (11) key study intersections.

9.2 Roadway Segments

Table 9-2 summarizes the roadway segment level of service results at the eight (8) key roadway segments for Year 2019 traffic conditions. The first column (1) shows the number of lanes, the second column (2) shows the arterial classification and the third column (3) shows the existing LOS "E" capacity. The fourth column (4) presents a summary of projected Year 2019 cumulative daily traffic conditions. The fifth column (5) lists Year 2019 plus project daily traffic conditions. Column (5) also shows the increase in V/C ratio value due to the added daily project trips and indicates whether the traffic associated with the Project will have a significant impact based on the LOS standards and significant impact criteria defined in this report.

9.2.1 *Year 2019 Cumulative Traffic Conditions*

An analysis of future (Year 2019) cumulative traffic conditions indicates that all eight (8) of the key roadway segments are forecast to operate at an acceptable service level on a daily basis under Year 2019 cumulative traffic conditions (i.e. existing plus ambient traffic plus cumulative project traffic).

9.2.2 *Year 2019 Cumulative Plus Project Traffic Conditions*

Review of Column 5 of *Table 9-2* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the eight (8) key roadway segments, when compared to the LOS standards and significant impact criteria specified in this report. The eight (8) key roadway segments are forecast to continue to operate at an acceptable service level on a daily basis with the addition of project generated traffic in the Year 2019 traffic condition.

TABLE 9-1

YEAR 2019 PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersections	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Year 2019 Cumulative Traffic Conditions		(3) Year 2019 Cumulative Plus Project Traffic Conditions		(4) Project Significant Impact	
			ICU	LOS	ICU	LOS	ICU	LOS	Increase	Yes/No
1. Lewis Street at Chapman Avenue	AM	D	**0.912**	**E**	**0.979**	**E**	**0.987**	**E**	0.008	No
	PM		0.853	D	**0.954**	**E**	**0.953**	**E**	0.000	No
2. Lewis Street at Lampson Ave/Metropolitan Dr	AM	D	0.605	B	0.656	B	0.665	B	0.009	No
	PM		0.625	B	0.664	B	0.666	B	0.002	No
3. Manchester Avenue at Chapman Avenue	AM	D	0.675	B	0.740	C	0.754	C	0.014	No
	PM		0.552	A	0.632	B	0.639	B	0.007	No
4. SR-22 WB Ramps at Metropolitan Drive	AM	D	0.447	A	0.495	A	0.496	A	0.001	No
	PM		0.514	A	0.569	A	0.571	A	0.002	No
5. State College Boulevard at Anaheim Way/I-5 NB Ramps	AM	D	0.412	A	0.623	B	0.623	B	0.000	No
	PM		0.639	B	0.794	C	0.794	C	0.000	No
6. State College Boulevard at I-5 SB Ramps	AM	D	0.414	A	0.501	A	0.503	A	0.002	No
	PM		0.350	A	0.464	A	0.472	A	0.008	No

Notes:

- **BOLD ICU/LOS** values indicate unacceptable service level

TABLE 9-1 (CONTINUED)

YEAR 2019 PEAK HOUR INTERSECTION CAPACITY ANALYSIS

Key Intersections	Time Period	Minimum Acceptable LOS	(1) Existing Traffic Conditions		(2) Year 2019 Cumulative Traffic Conditions		(3) Year 2019 Cumulative Plus Project Traffic Conditions		(4) Project Significant Impact	
			ICU	LOS	ICU	LOS	ICU	LOS	Increase	Yes/No
7. The City Drive at Chapman Avenue	AM	D	0.724	C	0.818	D	0.826	D	0.008	No
	PM		0.659	B	0.796	C	0.807	D	0.011	No
8. The City Drive at Metropolitan Drive	AM	D	0.459	A	0.524	A	0.528	A	0.004	No
	PM		0.475	A	0.541	A	0.545	A	0.004	No
9. The City Drive at SR-22 EB Ramps	AM	D	0.595	A	0.671	B	0.674	B	0.003	No
	PM		0.533	A	0.615	B	0.618	B	0.003	No
10. I-5 SB Ramps at Chapman Avenue	AM	D	0.554	A	0.596	A	0.603	B	0.007	No
	PM		0.587	A	0.621	B	0.631	B	0.010	No
11. Rampart Street at Chapman Avenue	AM	D	0.380	A	0.415	A	0.417	A	0.002	No
	PM		0.449	A	0.491	A	0.493	A	0.002	No

Notes:

- **BOLD ICU/LOS** values indicate unacceptable service level

TABLE 9-2

YEAR 2019 ROADWAY SEGMENT LEVEL OF SERVICE SUMMARY

Key Roadway Segment	Min. Acc. LOS	(1) No. of Existing Lanes	(2) Arterial Classification	(3) Existing Capacity at LOS "E"	(4) Year 2019 Cumulative Traffic Conditions			(5) Year 2019 Cumulative Plus Project Traffic Conditions				
					Daily Volume	V/C Ratio	LOS	Daily Volume	V/C Ratio	LOS	Inc.	Significant (Yes/No)
A. Chapman Ave between Lewis St and Manchester Ave	D	6D	Major	56,300	41,421	0.736	C	42,539	0.756	C	0.020	No
B. Chapman Ave between Manchester Ave and The City Dr	D	6D	Major	56,300	47,217	0.839	D	48,335	0.859	D	0.020	No
C. Chapman Ave between The City Dr and I-5 SB Ramps	D	6D	Major	56,300	49,824	0.885	D	50,450	0.896	D	0.011	No
D. Metropolitan Dr between Lewis St and SR-22 WB Ramps	D	4D	Primary	37,500	10,085	0.269	A	10,309	0.275	A	0.006	No
E. Metropolitan Dr between SR-22 WB Ramps and The City Dr	D	4D	Primary	37,500	22,882	0.610	B	22,994	0.613	B	0.003	No
F. Lewis St between Chapman Ave and Lampson Ave	D	4D	Secondary	24,000	18,681	0.778	C	18,979	0.791	C	0.013	No
G. State College Blvd between I-5 SB Ramps and Chapman Ave	D	8D	Principal	75,000	46,109	0.615	B	46,526	0.620	B	0.005	No
H. The City Dr between Dawn Way and Metropolitan Dr	D	8D	Principal	75,000	35,477	0.473	A	35,552	0.474	A	0.001	No

10.0 STATE OF CALIFORNIA (CALTRANS) METHODOLOGY

In conformance with the current Caltrans *Guide for the Preparation of Traffic Impact Studies*, existing and projected peak hour operating conditions at the five (5) state-controlled study intersections within the study area have been evaluated using the *Highway Capacity Manual 2010* (HCM 2010 for signalized intersections) operations method of analysis. These state-controlled locations include the following five (5) of the eleven key study intersections:

4. SR-22 WB Ramps at Metropolitan Drive
5. State College Boulevard at Anaheim Way/I-5 NB Ramps
6. State College Boulevard at I-5 SB Ramps
9. The City Drive at SR-22 EB Ramps
10. I-5 SB Ramps at Chapman Avenue

10.1 Impact Criteria and Thresholds

Consistent with the *Caltrans Guide for the Preparation of Traffic Impact Studies,* the following criteria has been utilized to determine project impacts at the aforementioned five (5) state-controlled study intersections.

- Caltrans endeavors to maintain a target LOS at the transition between LOS "C" and LOS "D" on State highway facilities. However, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. Caltrans has established that LOS D is the operating standard for all Caltrans facilities. Caltrans has determined that all state owned facilities that operate below LOS D should be identified and improved to an acceptable LOS. The *Caltrans Traffic Impact Study Guidelines dated December 2002* states that if an existing State-owned facility operates at less than the target LOS (i.e. LOS D); the existing service level should be maintained.

10.2 Highway Capacity Manual (HCM) Method of Analysis (Signalized Intersections)

Based on the HCM operations method of analysis, level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometries, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during ideal conditions: in the absence of traffic control, in the absence of geometric delay, in the absence of any incidents, and when there are no other vehicles on the road.

In Chapter 18 of the HCM, only the portion of total delay attributed to the control facility is quantified. This delay is called *control delay.* Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. In contrast, in previous versions of the HCM (1994 and earlier), delay included only stopped delay. Specifically, LOS criteria for traffic signals are stated in terms of the average control delay per vehicle. The six qualitative categories of Level of Service that have been defined along with the corresponding HCM control delay value range for signalized intersections are shown in ***Table 10-1.***

TABLE 10-1

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS (HCM METHODOLOGY)[21]

Level of Service (LOS)	Control Delay Per Vehicle (seconds/vehicle)	Level of Service Description
A	$\leq$ 10.0	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	> 10.0 and $\leq$ 20.0	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	> 20.0 and $\leq$ 35.0	Average traffic delays. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	> 35.0 and $\leq$ 55.0	Long traffic delays. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high *v/c* ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	> 55.0 and $\leq$ 80.0	Very long traffic delays. This level is considered by many agencies (i.e., SANBAG) to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high *v/c* ratios. Individual cycle failures are frequent occurrences.
F	$\geq$ 80.0	Severe congestion. This level, considered to be unacceptable to most drivers, often occurs with over saturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high *v/c* ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing factors to such delay levels.

[21] Source: *Highway Capacity Manual 2010,* Chapter 18 (Signalized Intersections).

10.3 Existing Plus Project Traffic Conditions

Table 10-2 summarizes the peak hour *Highway Capacity Manual 2010* level of service results at the five (5) state-controlled study intersections within the study area for Existing Plus Project traffic conditions. The first column (1) of HCM/LOS values in *Table 10-2* presents a summary of existing traffic conditions. The second column (2) presents existing plus project traffic conditions based on existing intersection geometry. The third column (3) indicates whether the traffic associated with the Project will have a significant impact based on the significant impact criteria defined in this report.

10.3.1 *Existing Traffic Conditions*

Review of column one (1) of *Table 10-2* indicates that all of the state-controlled study intersections currently operate at an acceptable LOS C or better during the AM and PM peak hours.

10.3.2 *Existing Plus Project Traffic Conditions*

Review of columns two (2) and three (3) of *Table 10-2* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the five (5) state-controlled study intersections, when compared to the LOS standards specified in this report. The five (5) state-controlled study intersections are forecast to continue to operate at an acceptable LOS C or better with the addition of project generated traffic to existing traffic.

10.4 Year 2019 Plus Project Traffic Conditions

Table 10-3 summarizes the peak hour *Highway Capacity Manual 2010* level of service results at the five (5) state-controlled study intersections within the study area for the 2019 horizon year. The first column (1) of HCM/LOS values in *Table 10-3* presents a summary of existing traffic conditions. The second column (2) presents Year 2019 cumulative traffic conditions based on existing intersection geometry, but without any Project generated traffic. The third column (3) presents future forecast traffic conditions with the addition of project traffic. The fourth column (4) indicates whether the traffic associated with the Project will have a significant impact based on the significant impact criteria defined in this report.

10.4.1 *Year 2019 Cumulative Traffic Conditions*

An analysis of future (Year 2019) cumulative traffic conditions indicates that the addition of ambient traffic growth and cumulative projects traffic will not adversely impact any of the five (5) state-controlled study intersections. The five (5) state-controlled study intersections are forecast to continue to operate at acceptable LOS C or better during the AM and PM peak hours with the addition of ambient traffic growth and cumulative projects traffic.

10.4.2 *Year 2019 Cumulative Plus Project Traffic Conditions*

Review of Columns (3) and (4) of *Table 10-3* indicates that traffic associated with the proposed Project ***will not*** significantly impact any of the five (5) state-controlled study intersections, when compared to the LOS standards specified in this report. The five (5) state-controlled study intersections are forecast to continue to operate at acceptable LOS C or better with the addition of project generated traffic in the Year 2019.

Appendix D presents the existing plus project and Year 2019 plus project HCM/LOS calculations for the five (5) state-controlled study intersections.

10.5 Recommended Improvements – Caltrans Analysis

The results of the Caltrans analyses presented previously in *Tables 10-2* and *10-3* indicate that the proposed Project will not significantly impact any of the five (5) state-controlled study intersections under "Existing Plus Project" and "Year 2019 Cumulative Plus Project" traffic conditions. As there are no significant impacts, no traffic mitigation measures are required or recommended for the five (5) state-controlled study intersections.

TABLE 10-2

EXISTING PLUS PROJECT PEAK HOUR INTERSECTION CAPACITY ANALYSIS – CALTRANS

Key Intersection		Time Period	(1) Existing Traffic Conditions		(2) Existing Plus Project Traffic Conditions		(3) Project Significant Impact
			HCM	LOS	HCM	LOS	Yes/No
4.	SR-22 WB Ramps at	AM	22.7 s/v	C	22.6 s/v	C	No
	Metropolitan Drive	PM	27.9 s/v	C	27.8 s/v	C	No
5.	State College Boulevard at	AM	12.3 s/v	B	12.3 s/v	B	No
	Anaheim Way/I-5 NB Ramps	PM	26.8 s/v	C	26.9 s/v	C	No
6.	State College Boulevard at	AM	11.4 s/v	B	11.4 s/v	B	No
	I-5 SB Ramps	PM	8.5 s/v	A	8.8 s/v	A	No
9.	The City Drive at	AM	27.1 s/v	C	27.2 s/v	C	No
	SR-22 EB Ramps	PM	27.7 s/v	C	27.8 s/v	C	No
10.	I-5 SB Ramps at	AM	17.9 s/v	B	18.1 s/v	B	No
	Chapman Avenue	PM	18.2 s/v	B	18.7 s/v	B	No

Notes:

s/v = seconds per vehicle

TABLE 10-3

YEAR 2019 PEAK HOUR INTERSECTION CAPACITY ANALYSIS (CALTRANS)

Key Intersections		Time Period	(1) Existing Traffic Conditions		(2) Year 2019 Cumulative Traffic Conditions		(3) Year 2019 Cumulative Plus Project Traffic Conditions		(4) Project Significant Impact
			HCM	LOS	HCM	LOS	HCM	LOS	Yes/No
4.	SR-22 WB Ramps at	AM	22.7 s/v	C	24.9 s/v	C	24.8 s/v	C	No
	Metropolitan Drive	PM	27.9 s/v	C	27.7 s/v	C	27.6 s/v	C	No
5.	State College Boulevard at	AM	12.3 s/v	B	15.8 s/v	B	15.8 s/v	B	No
	Anaheim Way/I-5 NB Ramps	PM	26.8 s/v	C	31.6 s/v	C	31.7 s/v	C	No
6.	State College Boulevard at	AM	11.4 s/v	B	11.4 s/v	B	11.4 s/v	B	No
	I-5 SB Ramps	PM	8.5 s/v	A	9.7 s/v	A	10.0 s/v	B	No
9.	The City Drive at	AM	27.1 s/v	C	28.9 s/v	C	29.0 s/v	C	No
	SR-22 EB Ramps	PM	27.7 s/v	C	28.8 s/v	C	29.0 s/v	C	No
10.	I-5 SB Ramps at	AM	17.9 s/v	B	19.5 s/v	B	19.8 s/v	B	No
	Chapman Avenue	PM	18.2 s/v	B	19.9 s/v	B	20.6 s/v	C	No

Notes:

s/v = seconds per vehicle

11.0 SITE ACCESS AND INTERNAL CIRCULATION EVALUATION

11.1 Site Access Evaluation

As shown previously in *Figure 2-2*, access to the proposed Project will be provided via one existing full-access driveway located along Lewis Street and one proposed right-turn in/right-turn out only driveway located along Chapman Avenue.

Table 11-1 summarizes the intersection operations at the proposed project driveways for near-term (Year 2019) traffic conditions at completion and full occupancy of the proposed Project. The operations analysis for the project driveways is based on the *Highway Capacity Manual 2010* (HCM 2010) unsignalized methodology. Review of *Table 11-1* shows that the proposed project driveways are forecast to operate at acceptable LOS D or better during the AM and PM peak hours for Year 2019 traffic conditions. As such, project access will be adequate. Motorists entering and exiting the Project site will be able to do so comfortably, safely, and without undue congestion.

It should be noted that the existing office driveway along Chapman Avenue was also analyzed. Although no residential Project traffic enters through this driveway, it was assumed that some existing traffic would be rerouted to this driveway with the development of the Project. As seen in *Table 11-1*, this existing driveway is also forecast to operate at an acceptable level of service under Year 2019 Plus Project traffic conditions.

Appendix E presents the level of service calculation worksheets for the proposed project driveways.

11.2 Internal Circulation Evaluation

The on-site circulation layout of the proposed Project as illustrated in *Figure 2-2* on an overall basis is adequate. Curb return radii have been confirmed and are generally adequate for small service/delivery (FedEx, UPS) trucks and trash trucks.

TABLE 11-1

PROJECT DRIVEWAY PEAK HOUR LEVELS OF SERVICE SUMMARY

Project Driveway	Time Period	Intersection Control	Year 2019 Plus Project Traffic Conditions	
			HCM	LOS
A. Lewis Street at Project Driveway 1	AM	One – Way	16.9 s/v	C
	PM	Stop	20.7 s/v	C
B. Project Driveway 2 at Chapman Avenue	AM	One – Way	26.6 s/v	D
	PM	Stop	22.2 s/v	C
C. Existing Office Driveway at Chapman Avenue	AM	One – Way	21.3 s/v	C
	PM	Stop	34.4 s/v	D

Notes:

s/v = seconds per vehicle

12.0 RECOMMENDED IMPROVEMENTS

12.1 Existing Plus Project Traffic Conditions

The results of the intersection capacity analysis presented previously in *Table 8-1* shows that the proposed Project will not significantly impact any of the eleven (11) key study intersections under the "Existing Plus Project" traffic scenario. Given that there are no significant project impacts, no improvements are required under this traffic scenario.

The results of the "Existing Plus Project" daily roadway segment analysis presented previously in *Table 8-2* indicates that the proposed Project will not significantly impact any of the eight (8) key roadway segments. Given that there are no significant project impacts, no improvements are required under this traffic scenario.

12.2 Year 2019 Plus Project Traffic Conditions

The results of the intersection capacity analysis presented previously in *Table 9-1* shows that the proposed Project will not significantly impact any of the eleven (11) key study intersections under the "Year 2019 Plus Project" traffic scenario. Given that there are no significant project impacts, no improvements are required under this traffic scenario.

The results of the "Year 2019 Plus Project" daily roadway segment analysis presented previously in *Table 9-2* indicates that the proposed Project will not significantly impact any of the eight (8) key roadway segments. Given that there are no significant project impacts, no improvements are required under this traffic scenario.

While there are no significant traffic impacts, the intersection of Chapman Avenue at Lewis Street currently operates (AM only) and is forecast to operate at an unacceptable level of service during the AM and PM peak hours. Although no mitigation is required, the following improvement is forecast to return the adverse intersection to an acceptable level of service:

- Chapman Avenue at Lewis Street: Restripe southbound approach of Lewis Street to add an additional (second) southbound through lane. It should be noted that the current southbound shared through/right-turn lane is 24 feet wide, so no widening is required.

13.0 CONGESTION MANAGEMENT PROGRAM (CMP)

This analysis is consistent with the requirements and procedures outlined in the current *Orange County Congestion Management Program (CMP).* The CMP requires that a traffic impact analysis be conducted for any project generating 2,400 or more daily trips, or 1,600 or more daily trips for projects that directly access the CMP Highway System (HS). Per the CMP guidelines, this number is based on the desire to analyze any impacts that will be 3.0% or more of the existing CMP highway system facilities' capacity.

However, as noted in this traffic study, the proposed Project is expected to generate 1,490 daily trips, and thus does not meet the criteria required for a CMP traffic analysis. Therefore, it is concluded that the proposed Project will not have any significant traffic impacts on the Congestion Management Program Highway System.

14.0 SUMMARY OF FINDINGS AND CONCLUSIONS

- ***Project Description*** – The project site is located at 3800 Chapman Avenue, generally on the south side of Chapman Avenue east of Lewis Street in the City of Orange, California. The proposed Project consists of a 280-unit apartment complex, one seven-story parking structure for the proposed apartments and one five-story parking structure for the existing 170,000 SF office building. The proposed Project is expected to be constructed in one phase and will be fully occupied by the Year 2019.

  As proposed, the apartments will be constructed over an existing surface parking lot that currently provides parking for the existing 170,000 SF office building. To account for the re-route of existing trips currently utilizing the surface parking lot to the new office parking structure, it was assumed that fifty percent (50%) of the existing traffic entering the existing driveway on Lewis Street would re-route to the existing office driveway located along Chapman Avenue.

  The Project site currently has 552 surface parking spaces to serve the existing office building. The proposed residential development will include 502 parking spaces and the office parking reconfiguration will include 704 parking structure spaces for a total of 704 office parking spaces.

  Access to the proposed Project will be provided via one existing full-access driveway located along Lewis Street and one proposed right-turn in/right-turn out only driveway located along Chapman Avenue. It should be noted that there is an additional existing full movement driveway located along Chapman Avenue on the east of the office building, which currently provides access to the office parking and will provide direct access into the proposed parking structure. Although no residential Project traffic will enter through this driveway, it is assumed that some existing traffic would be rerouted to this driveway with the development of the Project.

- ***Study Scope*** – The following eleven (11) key study intersections and eight (8) key roadway segments selected for evaluation were determined based on coordination with City of Orange Traffic Engineering staff and application of the "51 or more peak hour trip threshold" criteria outlined in the *City of Orange Traffic Impact Analysis Guidelines*, dated August 15, 2007. The intersections and roadway segments listed below provide local access to the study area and define the extent of the boundaries for this traffic impact investigation. The jurisdiction where each key study intersection/roadway segment is located is also identified with the following nomenclature utilized; (O) = City of Orange and (GG) = City of Garden Grove.

Key Study Intersections
1. Lewis Street at Chapman Avenue (O/GG)
2. Lewis Street at Lampson Avenue/Metropolitan Drive (O/GG)
3. Manchester Avenue at Chapman Avenue (O)
4. SR-22 WB Ramps at Metropolitan Drive (O)
5. State College Boulevard at Anaheim Way/I-5 NB Ramps (O)
6. State College Boulevard at I-5 SB Ramps (O)
7. The City Drive at Chapman Avenue (O)

8. The City Drive at Metropolitan Drive (O)
9. The City Drive at SR-22 EB Ramps (O)
10. I-5 SB Ramps at Chapman Avenue (O)
11. Rampart Street at Chapman Avenue (O)

Key Roadway Segments
A. Chapman Avenue, between Lewis Street and Manchester Avenue (O)
B. Chapman Avenue, between Manchester Avenue and The City Drive (O)
C. Chapman Avenue, between The City Drive and I-5 SB Ramps (O)
D. Metropolitan Drive, between Lewis Street and SR-22 WB Ramps (O)
E. Metropolitan Drive, between SR-22 WB Ramps and The City Drive (O)
F. Lewis Street, between Chapman Avenue and Lampson Avenue (O/GG)
G. State College Boulevard, between I-5 SB Ramps and Chapman Avenue (O)
H. The City Drive, between Dawn Way and Metropolitan Drive (O)

Detailed peak hour level of service analyses were prepared for Existing Traffic Conditions, Existing Plus Project Traffic Conditions, Year 2019 Cumulative Traffic Conditions, and Year 2019 Cumulative Plus Project Traffic Conditions at these locations.

- ***Existing Traffic Conditions*** – One (1) of the eleven key study intersections currently operates at an unacceptable level of service during the AM peak hour. The intersection of Lewis Street at Chapman Avenue currently operates at unacceptable LOS E during the AM peak hour. The remaining ten (10) key study intersections currently operate at acceptable LOS D or better during the AM and PM peak hours. All eight (8) key roadway segments currently operate at acceptable LOS C or better on a daily basis.

- ***Project Trip Generation*** – The proposed Project is forecast to generate 1,490 daily trips, with 122 trips (25 inbound, 97 outbound) produced in the AM peak hour and 139 trips (90 inbound, 49 outbound) produced in the PM peak hour on a "typical" weekday.

- ***Cumulative Projects Traffic Characteristics*** – The thirty-five (35) cumulative projects are forecast to generate a total of 117,172 daily trips, with 7,863 trips (3,304 inbound and 4,559 outbound) forecast during the AM peak hour and 10,524 trips (5,756 inbound and 4,768 outbound) forecast during the PM peak hour.

- ***Existing Plus Project Traffic Conditions*** – The proposed Project ***will not*** significantly impact any of the eleven (11) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report. Although the intersection of Lewis Street at Chapman Avenue is forecast to operate at unacceptable LOS E during the AM peak hour with the addition of project traffic, the proposed Project is expected to add less than the allowable threshold to the ICU value. The remaining ten (10) key study intersections currently operate and are forecast to continue to operate at an acceptable service level during the AM and PM peak hours with the addition of Project generated traffic to existing traffic.

The proposed Project ***will not*** significantly impact any of the eight (8) key roadway segments when compared to the LOS standards and significant impact criteria specified in this report. The eight (8) key roadway segments currently operate and are forecast to continue to operate at an acceptable service level on a daily basis with the addition of Project generated traffic to existing traffic.

- ***Year 2019 Cumulative Plus Project Traffic Conditions*** – The proposed Project ***will not*** significantly impact any of the eleven (11) key study intersections, when compared to the LOS standards and significant impact criteria specified in this report. Although the intersection of Lewis Street/Chapman Avenue is forecast to operate at unacceptable LOS E during the AM and/or PM peak hours with the addition of project traffic, the proposed Project is expected to add less than the allowable threshold to the ICU value. The remaining ten (10) key study intersections are forecast to continue to operate at an acceptable service level during the AM and PM peak hours with the addition of project generated traffic in the Year 2019.

  The proposed Project ***will not*** significantly impact any of the eight (8) key roadway segments, when compared to the LOS standards and significant impact criteria specified in this report. The eight (8) key roadway segments are forecast to continue to operate at an acceptable service level on a daily basis with the addition of project generated traffic in the Year 2019 traffic condition.

- ***State of California (Caltrans) Methodology*** – The results of the "Existing Plus Project" and "Year 2019 Plus Project" traffic analyses using the State of California (Caltrans) Methodology indicate that the proposed Project will not significantly impact any of the five (5) state-controlled study intersections. As there are no significant impacts, no traffic mitigation measures are required or recommended for the five (5) state-controlled study intersections.

- ***Site Access and Internal Circulation Evaluation –*** The proposed project driveways are forecast to operate at acceptable LOS D or better during the AM and PM peak hours for Year 2019 traffic conditions. The existing driveway is also forecast to operate at an acceptable level of service under Year 2019 Plus Project traffic conditions. As such, project access will be adequate. Motorists entering and exiting the Project site will be able to do so comfortably, safely, and without undue congestion. The on-site circulation layout of the proposed Project as illustrated in *Figure 2-2* on an overall basis is adequate. Curb return radii have been confirmed and are generally adequate for small service/delivery (FedEx, UPS) trucks and trash trucks.

- ***Recommended Improvements (Intersections) –*** The results of the intersection capacity analysis presented previously in *Tables 8-1* and *9-1* shows that the proposed Project will not significantly impact any of the eleven (11) key study intersections under the "Existing Plus Project" and "Year 2019 Plus Project" traffic scenarios. Given that there are no significant project impacts, no intersection improvements are required of the proposed project.

  While there are no significant traffic impacts, the intersection of Chapman Avenue at Lewis Street currently operates (AM only) and is forecast to operate at an unacceptable level of service during the AM and PM peak hours. Although no mitigation is required, the following improvement is forecast to return the adverse intersection to an acceptable level of service:

- Chapman Avenue at Lewis Street: Restripe southbound approach of Lewis Street to add an additional (second) southbound through lane. It should be noted that the current southbound shared through/right-turn lane is 24 feet wide, so no widening is required.

- ***Recommended Improvements (Roadway Segments) –*** The results of the daily roadway segment analysis presented previously in *Tables 8-2* and *9-2* shows that the proposed Project will not significantly impact any of the eight (8) key roadway segments under the "Existing Plus Project" and "Year 2019 Plus Project" traffic scenarios. Given that there are no significant project impacts, no intersection improvements are required of the proposed project.

- ***Congestion Management Program (CMP) –*** The proposed Project will not have any significant traffic impacts on the Congestion Management Program Highway System.