INITIAL STUDY

FOR THE

GENERAL PLAN AMENDMENT (GPA) 2017-01 AND ZONE CHANGE (ZC) 2017-01 TO ESTABLISH THE PACKING HOUSE DISTRICT TRANSIT-ORIENTED DEVELOPMENT PROJECT

Prepared for:

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INTRODUCTION

1.	Project Title:	General Plan Amendment (GPA) 2017-01 and Zone Change (ZC) 2017-01 to Establish the Packing House District Transit-Oriented Development (TOD) Project
2.	Lead Agency Name: Address:	City of Placentia 401 E. Chapman Avenue Placentia, CA 92870
3.	Contact Person: Phone Number:	Joe Lambert, Director of Development Services (714) 993-8124; jlambert@placentia.org
4.	Project Location:	See below
5.	Project Sponsor's Name and Address:	City of Placentia

6. General Plan Designation: Industrial (IND)

7. Zoning: Manufacturing (M)

8. Project Description:

<u>Introduction</u>

In conjunction with the County of Orange, Orange County Transit Authority (OCTA), the City of Placentia (City) will install a new train station to accommodate access for City residents to the regional passenger train (Metrolink and Surfliner) system. The City proposes to support this new regional system connection by creating a Transit-Oriented Development (TOD) zone classification and land use designation in the Packing House District of the City, which is located immediately adjacent to the proposed train platform. The objective of these new land use designations/classifications is to allow high-density transit-oriented development in the immediate vicinity of the train platform to facilitate use of the regional system and redevelopment of the area surrounding the new station. To accomplish this, the City is proposing to adopt a TOD land use designation (General Plan Amendment (GPA 2017-01)); Zone Classification (Municipal Code, ZC 2017-01); and Development Standards to establish the Packing House District Transient-Oriented Development Project. This document evaluates the potential impacts on the environment of the City's proposed modifications to the General Plan land use designation and Municipal Code zone classification to accomplish this objective.

<u>Project Location</u>

The proposed project consists of the adoption of TOD designations and related development standards to establish a new land use district on approximately 28.2 acres located in the City of Placentia, south of and adjacent to the existing BNSF Railway east-west mainline rail corridor.

Figures 1 and 2 show the regional and area locations of this 28.2-acre area. The approximate 28.2-acre area where the TOD land use designation will be established is located north and south of Crowther Avenue, east of the State Highway 57 Freeway, south of the BNSF railroad tracks, and west of the extension of Bradford Avenue in the City of Placentia. East and west boundaries are defined by property parcel boundaries. Figure 3 consists of an aerial photo of the area that will be encompassed by the new TOD designation/classification.

Project Characteristics

The approximate 28.2-acre site is located in the southwestern portion of the City of Placentia. It encompasses approximately 30 parcels of land that support a mix of existing land uses which includes: single-family residential; multi-family residential; commercial-light industrial; industrial; and one vacant lot. The current General Plan Land Use Designation of the TOD area is Industrial (IND) and the current zone classification (zoning) is Manufacturing (M). This is an old area of the City that contains older structures, some dating back to 1910. Because of this, many of the existing uses are “non-conforming” with the existing General Plan and zoning. Thus, most future development within the area will require removal of existing uses and redevelopment of the properties with new uses that must conform to the General Plan Land Use Designations in place at the time of a development proposal, including the proposed TOD land use designations and development standards. Included in this project area is the 73,000 SF former Placentia Orange Growers Association packing warehouse. This building dates to 1935 and it is proposed to be re-used for mixed commercial uses.

The proposed location of the new Metrolink passenger platform is shown on Figure 4. To facilitate TOD development in the area adjacent to the platform, the City is proposing to adopt a new TOD land use district designation (which will support multiple uses) as part of the General Plan and Municipal Development Code. If the Zoning Code Amendment (ZCA) and General Plan Amendment (GPA) are approved, it will be accompanied by adoption of specific development standards in a new TOD zone classification. A copy of the proposed development standards for the TOD district is provided in Appendix 1 of this document.

The City has determined to limit the maximum number of residential units and commercial activities within the TOD area to the generation of a maximum of 5,000 daily vehicle trips, which is conceptually consistent with the 28.2-acre TOD designation. Appendix 1 provides the “Transit-Oriented Development Packing House District Development Standards.” The stated purpose and intent of the new TOD land use designation *“is to encourage an appropriate mixture and density of activity around the Metrolink station to increase ridership and promote alternative modes of transportation to the automobile. The consequent intent is to decrease auto-dependency, and mitigate the effects of congestion and pollution. The development standards seek to achieve this by providing a pedestrian-, bicycle-, and transit-supportive environment configured in a compact pattern and a complementary mix of land uses all within a comfortable walking distance of the station.”*

The specific objectives of the TOD land use district include:

- *Encourage mixed-use and transit-oriented development;*
- *Encourage people to walk, ride a bicycle or use transit;*
- *Promote public art and creative public spaces;*

- *Allow for a complementary mix of land uses to create an environment that engages people at the pedestrian level;*
- *Achieve a compact pattern of development that is more conducive to walking and bicycling;*
- *Provide sufficient density of employees, residents and recreational users to support transit;*
- *Provide a high level of amenities that create a comfortable environment for pedestrians, bicyclists, and other users;*
- *Create a physical connection with Old Town Placentia by activating the station area with a plaza and ground floor shops and restaurants in the TOD Packing House District;*
- *Promote affordable housing and provide housing for all economic segments of the community consistent with the City's housing goals;*
- *Maintain an adequate level of parking and access for automobiles;*
- *Create fine-grained detail in architectural and urban form that provides interest and complexity at the level of the pedestrian and bicyclist;*
- *Generate a relatively high percentage of trips serviceable by transit;*
- *Encourage integrated development, including the consolidation of parcels; and*
- *Encourage lot and building orientation on Crowther Avenue and parcels extending from Crowther to the Railroad right-of-way, to create an active streetscape...*

The following text summarizes the content of the TOD Development Standards that are provided in Appendix 1. Where more detailed information is needed, please refer to Appendix 1.

A. All new development fronting Crowther Avenue within the TOD district must be mixed use development, except for the "catalyst site" which is defined in the definitions section of Appendix 1.
B. Allowable Land Uses: The allowable land uses are listed in Table 1 of Appendix 1. Uses are identified as "permitted," "use permit" required, or "not permitted." Mixed Use development is required for all developments fronting Crowther Avenue within the TOD zone, except for the catalyst site, which can be developed as all residential and is defined in the definitions section of the Zoning Code. The City Development Services Director can approve an unlisted use if such use is determined to be similar in character and impacts to any allowable uses identified in Table 1.
C. Certain uses, such as libraries, live work, or museums are only permitted in the historic Packing House Building.
D. Park and Playground uses are permitted only when integrated into the overall development of a site.
E. Certain uses, such as studios (art, dance, etc.), are permitted only above the ground floor within a mixed use development.
F. Mixed use residential can have a maximum of 3 bedrooms per unit and ground floors must have exhaust and grease traps installed for future restaurant possibilities.
G. Density: 65 du/ac min. and 95 du/ac max.; maximum building length without breaks in building massing is 350 feet; Setbacks: front yard 5 feet min/15 feet max; side yard: 5 feet min; 10 feet required where façade contains windows for residential; rear yard: 10 feet; 10' setback recommended from the railroad ROW.
H. Building Height: 3 stories minimum and five stories maximum; and minimum 15 foot ground floor, floor to ceiling height required. Rooftop Amenities are allowed 12 feet

above maximum height limit if integrated into the overall design of the project and maximum rooftop building coverage is limited to 30% of rooftop floor area.

I. Open Space: 50/64 square feet for each residential unit and Live Work Units. Rooftop amenities do not count for square footage requirements for private or common open space.
J. Parking: Parking requirements vary from three spaces minimum per 1,000 square feet of retail to 1.5 spaces minimum for a two bedroom unit. Refer to Section 8, Parking, in Appendix 1 for details. This section also includes bicycle parking requirements, electric vehicle charging station requirements, and includes requirements for surface and parking structure requirements.
K. Sign regulations are outlined section 23.110.050 of Appendix 1.
L. All properties in the TOD district shall be legally nonconforming buildings, structures, uses, or signs for a period of five years from the effective date of this chapter's approval.
M. Affordable Housing (only with a development agreement): Minimum 10% of total dwellings for sale must be designed to low-moderate income levels; and density bonuses may be granted in accordance with existing Municipal Code.
N. Public art/plaza: encouraged and may be required as part of development agreements.
O. TOD development impact fees will be adopted to support public sector infrastructure improvements and a community facilities district may be established to fund infra-structure improvements.

The potential uses permitted under the proposed TOD district range from retail commercial through service uses and residential uses to office uses, some allowed only with a use permit. Maximum residential density within the project area would be 95 units per acre with a 65 unit per acre minimum. Maximum number of units within the new TOD district area will be 752 units, unless supplemental environmental evaluation is completed. For all but residential uses the floor area ratios established in the existing zone classification, such as commercial use or office use, would control the maximum square footage of development within the TOD area.

This Initial Study will examine the potential impacts of future development under the TOD district Development Standards (Appendix 1) compared to the existing environmental setting and the existing land use designation/zoning classification, Industrial (GPA) and Manufacturing Zone (M). At this time there is one specific project being considered by the City under the TOD district, which consists of an approximate 200 unit residential project, being considered as the "catalyst site". The catalyst site is being considered as the initial project to seed the transition to TOD uses within the 28.2-acre project area. The City anticipates additional potential uses and development within the TOD district may be considered in the near future as the Metrolink platform is implemented over the next 2 years. The potential environmental effects of adopting and implementing the TOD district as a General Plan designation and a zone classification will be evaluated at a general plan/zoning level of review, without examining detailed site specific issues at this time.

9. Surrounding land uses and setting: The project area is one of the older developer areas within the City of Placentia. Although designated for industrial use due to historic proximity to the BNSF Railway, the project area consists of a mix of land uses, including: commer-cial; single-family residential; light industrial; industrial; and warehouse.

10. Other agencies whose approval is required: None known

The City has identified the following agencies or parties that may have interest in the City's consideration and addition of a TOD district to its General Plan and Municipal Code. These are: Orange County, Metrolink and BNSF Railway.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

X	Aesthetics		Agriculture and Forestry Resources	*X*	Air Quality
	Biological Resources	*X*	Cultural Resources	*X*	Geology / Soils
X	Greenhouse Gas Emissions	*X*	Hazards & Hazardous Materials	*X*	Hydrology & Water Quality
	Land Use / Planning		Mineral Resources	*X*	Noise
	Population / Housing	*X*	Public Services		Recreation
X	Transportation / Traffic	*X*	Utilities / Service Systems	*X*	Mandatory Findings of Significance

Note that all potentially significant impacts can be reduced to a less than significant impact level with implementation of identified mitigation measures.

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation, the following finding is made:

	The proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
X	Although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
	The proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
	The proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
	Although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Tom Dodson & Associates
Prepared by

January 2017
Date

Signature

1/31/2017
Date

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
I. AESTHETICS: Would the project:				
a) Have a substantial adverse effect on a scenic vista?			X	
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?		X		
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?		X		

SUBSTANTIATION

a) Have a substantial adverse effect on a scenic vista?

Less Than Significant Impact – Adverse impact to scenic vistas can occur in one of two ways. First, an area itself may contain an existing scenic vista that could be altered by new development. A field review of the project area determined that there are no scenic vistas located internally within the approximate 28.2-acre TOD project area. The TOD area visual setting consists of older structures, minimal landscaping, and no identifiable components of a scenic vista. Therefore, development in compliance with the new TOD development standards is not forecast to alter any important scenic vistas within the project area. A second scenic vista impact can occur when a scenic vista occurs from the project area or immediate vicinity and a proposed development may interfere with the view to the scenic vista in the middle ground or background views from or across the project area. Based on the level of development within the project area and the City as a whole, there are few scenic vistas and any such views are aligned with north-south roads which provide limited views to the higher topography of the Puente Hills. Field investigations of potential scenic vistas from the surrounding freeways (State Highway (SH) 91 and SH 57) resulted in the following findings. SH 91 is not elevated through the City of Placentia and there are no scenic vistas visible to the north into or over the City of Placentia. Although there are views to the east-northeast from overpasses and connecting bridge structures along SH 57, these views of Placentia are very fleeting and do not contain high value scenic resource values, essentially an urban visual setting with no distinctive scenic features. New structures of up to six stories integrated into the existing fully developed City will provide visual variety and will not interfere with any significant scenic vistas. Given these limited potential scenic views and the location of new structures outside of north/south roadway alignments (that provide limited views), approval of the proposed TOD designation is not forecast to cause any substantial adverse effects on any scenic vistas. This potential impact is considered a less than significant adverse aesthetic impact. No mitigation is required.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Less Than Significant With Mitigation Incorporated – The project area encompassed by the proposed Packing House District Transit-Oriented Development (TOD) is an older developed area of the City with a mix of land uses as described in the project description. There are no state scenic highways located within the project area according to the City's General Plan. As a result of this eclectic mix of land uses, the project area does not contain any substantial scenic resources, including structures, trees, and/or rock outcroppings. However, many of the buildings are more than 50 years in age and some of these structures may be considered to have scenic value. Therefore, the following mitigation measure will be implemented to ensure that buildings within the TOD area that contain scenic resource value are not replaced by future high density residential uses without offsetting the loss of such resources, such as recordation or incorporation of scenic elements into the new project design. The following mitigation measure shall be implemented.

I-1 ***Prior to approval of any new TOD facilities within the project area, the applicant shall submit an evaluation of the scenic value of structures that will be replaced by the new TOD facility. Based on the findings, the following actions may be required: no further action if no resource; recordation of the scenic values of a structure if merited; and integration of existing building scenic elements into the new building design. Implementation of these measures will avoid loss of any scenic resource values due to future TOD-related development within the project area.***

With implementation of this measure the potential for significant adverse impact to scenic resource values within the TOD project area can be controlled to a less than significant impact level.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

Less Than Significant Impact – A field review of the project area determined that there are no areas within the approximately 28.2 acre TOD project area that contain areas with substantial visual character or quality. New structures constructed within the project area will be reviewed by the City, which will evaluate the visual character of the new structures for consistency with the City's design guidelines, including the new TOD design guidelines, and through such mandatory reviews any potential degradation of existing visual quality characteristics can be reduced to an acceptable level. The purpose of the TOD designation is to bring in new, high quality, high-density development that can enhance the visual character of the TOD area. With this as a principle objective of the proposed project, the potential for adverse impact to visual quality within the existing area is considered a less than significant adverse aesthetic impact.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less Than Significant With Mitigation Incorporated – The proposed TOD designations will introduce new structures into the project area, some of which may be five stories, which would equate to approximately 50-75 feet in height if a 10-15 foot per story average height is assumed. Potential new structures will require lighting, both exterior and interior. This will introduce a new source of lighting and glare into the project area. During design review of new structures, lighting would be evaluated by the City as part of the approval process. However, to ensure that light or glare (particularly off of structures with glass exteriors) does not result in intrusive lighting or glare to existing structures or persons in the project area, the following mitigation measures will be implemented.

I-2 ***Future developers shall submit an analysis of potential glare from lighting or sunlight that may impact vehicles on adjacent roadways or structures. This analysis shall demonstrate that due to building orientation or exterior treatment of windows, no significant light or glare impacts may be caused that could adversely impact driver safety on the adjacent roadways or occupied structures in the vicinity of the new development. This analysis shall be***

submitted to the City for review and approval prior to issuance of the final building permit(s) for new structures within the TOD area.

I-3 ***Future developers shall submit an analysis that potential lighting from new structures does not create an adverse light impact on adjacent structures. This analysis shall demonstrate that based on an approved lighting plan for new structures, adjacent structures or areas are not exposed to intrusive or harmful amounts of light. This analysis shall be submitted to the City for review and approval prior to issuance of the final building permit(s) for new structures within the TOD area.***

With implementation of these two measures in conjunction with existing City development code (requirements, the City can control potential adverse light and glare impacts due to the new TOD designation to a less than significant impact level.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
II. AGRICULTURE AND FORESTRY RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X
b) Conflict with existing zoning for agricultural use or a Williamson Act contract?				X
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				X
d) Result in the loss of forest land or conversion of forest land to non-forest use?				X
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?				X

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a) *Convert Prime Farmland, Unique Farmland or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?*

No Impact – The TOD project area is 100% urbanized with no open land, except for a small parcel being reclaimed for use. There are no current agricultural land use designations within the City; no farmland being used for agriculture; and no potential for impact to any agricultural uses or values. Refer to Figure 3 the aerial photo of the TOD project area. No adverse impact to any agricultural resources can occur from implementing the proposed project. No mitigation is required.

b) *Conflict with existing zoning for agricultural use or a Williamson Act contract?*

No Impact – The project area is designated for Industrial uses and zoned for Manufacturing. No potential exists for a conflict between the proposed project and agricultural zoning or Williamson Act contracts within the project area as none exist. No mitigation is required.

c) *Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?*

No Impact – Please refer to issues a) and b) above and Figure 3. The project site is 100% urbanized and the land use designation/classification (IND/M) does no support forest land or timberland uses or designations. No potential exists for a conflict between the proposed project and forest/timberland zoning. No mitigation is required.

d) *Result in the loss of forest land or conversion of forest land to non-forest use?*

No Impact – There are no forest lands within the project area as it is 100% urbanized. No potential for loss of forest land can occur if the project is implemented. No mitigation is required.

e) *Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?*

No Impact – The proposed project has no activities that could cause conversion of Farmland or forest land to alternative uses. No adverse impact can occur. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?		X		
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?		X		
d) Expose sensitive receptors to substantial pollutant concentrations?		X		
e) Create objectionable odors affecting a substantial number of people?		X		

SUBSTANTIATION

Background

Placentia's climate, as with all of Southern California, is largely dominated by the strength and position of the semi-permanent high-pressure center over the Pacific Ocean near Hawaii. It creates cool summers, mild winters, infrequent rainfall, it drives the refreshing daytime sea breeze, and it maintains comfortable humidity's and ample sunshine. Unfortunately, the same atmospheric processes that create the desirable living climate combine to severely restrict the ability of the atmosphere to disperse the air pollution generated mainly by the large population attracted by the climate. Portions of the Los Angeles Basin, including northern Orange County, therefore, experience some of the worst air quality in the nation for certain pollutant species.

Regional air quality is controlled by the location and strength of pollutant sources and by the winds and inversions that control the horizontal and vertical regional dispersion patterns. Winds near the project site, as monitored at the South Coast Air Quality Management District (SCAQMD) measurement station in Anaheim, display several characteristic regimes. During the day, especially in summer, winds are from the west and southwest at 7-9 miles per hour. At night, especially in winter, the land becomes cooler than the ocean and an offshore wind of 3-5 miles per hour develops. One other important wind regime occurs when a high-pressure center forms over the western United States and creates strong offshore winds. These winds are warmed and dried by air compression as they descend from the upper desert regions into the basin. These winds are accelerated through local canyons and create hot, dry, gusty Santa Ana's from the east and northeast across northern Orange and southern Los Angeles counties.

The low frequency of calms and adequate daytime ventilation speed typically do not allow for any daytime stagnation of air pollutants in the Placentia area. The moderate onshore breeze carries any locally generated emissions eastward toward the Chino Hills or across northern Orange County and then up Santa Ana or Carbon Canyons toward receptors in western San Bernardino and Riverside Counties. Any daytime air quality problems occur mainly when winds shift more into the northwest and the daytime clean sea breeze is replaced by airflow across substantial pollution generation areas of southwestern Los Angeles County. These winds bring occasional unhealthful smog levels across the project site during the summer and early fall. Wind at night drifting seaward across the air basin and off the nearby hills is much slower and does allow for localized stagnation of pollution, but the density of vehicular sources in the upwind area is generally low enough to minimize any major air pollution problems. Any air pollution episodes, if they occur, are, therefore, due mainly to pollutants transported into the area rather than any locally generated emissions.

In addition to winds that govern the horizontal rate and trajectory of any air pollutants, Southern California experiences several characteristic temperature inversions that control the vertical depth through which pollutants can be mixed. The daytime onshore flow of marine air is capped by a massive dome of warm air that acts like a giant lid over the basin. As the clean ocean air moves inland, pollutants are continually added from below without any dilution from above. As this layer slows down in inland valleys of the basin and undergoes photochemical transformations under abundant sunlight, it creates very unhealthful levels of smog (mainly ozone).

Ambient Air Quality Standards

In order to gauge the significance of the air quality impacts of the proposed project, those impacts, together with existing background air quality levels, must be compared to the applicable ambient air quality standards. These standards are the levels of air quality considered safe, with an adequate margin of safety, to protect the public health and welfare. They are designed to protect those people most susceptible to further respiratory distress such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise, called "sensitive receptors." Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed. Recent research has shown, however, that chronic exposure to ozone (the primary ingredient in photochemical smog) may lead to adverse respiratory health even at concentrations close to the ambient standard.

National AAQS were established in 1971 for six pollution species with states retaining the option to add other pollutants, require more stringent compliance, or to include different exposure periods. The initial attainment deadline of 1977 was extended several times in air quality problem areas like Southern California. In 2003, the Environmental Protection Agency (EPA) adopted a rule, which extended and established a new attainment deadline for ozone for the year 2021. Because the State of California had established AAQS several years before the federal action and because of unique air quality problems introduced by the restrictive dispersion meteorology, there is considerable difference between state and national clean air standards. Those standards currently in effect in California are shown in Table III-1. Sources and health effects of various pollutants are shown in Table III-2.

The Federal Clean Air Act Amendments (CAAA) of 1990 required that the U.S. Environmental Protection Agency (EPA) review all national AAQS in light of currently known health effects. EPA was charged with modifying existing standards or promulgating new ones where appropriate. EPA subsequently developed standards for chronic ozone exposure (8+ hours per day) and for very small diameter particulate matter (called "PM-2.5"). New national AAQS were adopted in 1997 for these pollutants.

Planning and enforcement of the federal standards for PM-2.5 and for ozone (8-hour) were challenged by trucking and manufacturing organizations. In a unanimous decision, the U.S. Supreme Court ruled that EPA did not require specific congressional authorization to adopt national clean air standards. The Court also ruled that health-based standards did not require preparation of a cost-benefit analysis. The Court did find, however, that there was some inconsistency between existing and "new" standards in their required attainment schedules. Such attainment-planning schedule inconsistencies centered mainly on the 8-hour ozone standard. EPA subsequently agreed to downgrade the attainment designation for a large number of communities to "non-attainment" for the 8-hour ozone standard.

Evaluation of the most current data on the health effects of inhalation of fine particulate matter prompted the California Air Resources Board (ARB) to recommend adoption of the statewide PM-2.5 standard that is more stringent than the federal standard. This standard was adopted in 2002. The State PM-2.5 standard is more of a goal in that it does not have specific attainment planning requirements like a federal clean air standard, but only requires continued progress towards attainment.

Similarly, the ARB extensively evaluated health effects of ozone exposure. A new state standard for an 8-hour ozone exposure was adopted in 2005, which aligned with the exposure period for the federal 8-hour standard. The California 8-hour ozone standard of 0.07 ppm is more stringent than the federal 8-hour standard of 0.075 ppm. The state standard, however, does not have a specific attainment deadline. California air quality jurisdictions are required to make steady progress towards attaining state standards, but there are no hard deadlines or any consequences of non-attainment. During the same re-evaluation process, the ARB adopted an annual state standard for nitrogen dioxide ($NO_{2)}$ that is more stringent than the corresponding federal standard, and strengthened the state one-hour NO_2 standard.

As part of EPA's 2002 consent decree on clean air standards, a further review of airborne particulate matter (PM) and human health was initiated. A substantial modification of federal clean air standards for PM was promulgated in 2006. Standards for PM-2.5 were strengthened, a new class of PM in the 2.5 to 10 micron size was created, some PM-10 standards were revoked, and a distinction between rural and urban air quality was adopted. In December 2012, the federal annual standard for PM-2.5 was reduced from 15 $\mu g/m^3$ to 12 $\mu g/m^3$, which matches the California AAQS. The severity of the basin's non-attainment status for PM-2.5 may be increased by this action and thus require accelerated planning for future PM-2.5 attainment.

In response to continuing evidence that ozone exposure at levels just meeting federal clean air standards is demonstrably unhealthful, EPA had proposed a further strengthening of the 8-hour standard. A new 8-hour ozone standard was adopted in 2015 after extensive analysis and public input. The adopted national 8-hour ozone standard is 0.07 ppm, which matches the current California standard. It will require 3 years of ambient data collection, and then 2 years of non-attainment findings and planning protocol adoption, then several years of plan development and approval. Final air quality plans for the new standard are likely to be adopted around 2022. Ultimate attainment of the new standard in ozone problem areas such as Southern California might be after 2030.

In 2010 a new federal one-hour primary standard for nitrogen dioxide (NO_2) was adopted. This standard is more stringent than the existing state standard. Based upon air quality monitoring data in the South Coast Air Basin, the California Air Resources Board has requested the EPA to designate the basin as being in attainment for this standard. The federal standard for sulfur dioxide (SO_2) was also recently revised. However, with minimal combustion of coal and mandatory use of low sulfur fuels in California, SO_2 is typically not a problem pollutant.

Table III-1
AMBIENT AIR QUALITY STANDARDS

Pollutant	Average Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m3)	Ultraviolet Photometry	–	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m3)		0.075 ppm (147 µg/m3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m3	Gravimetric or Beta Attenuation	150 µg/m3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m3		–		
Fine Particulate Matter (PM2.5)	24 Hour	–	–	35 µg/m3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m3	Gravimetric or Beta Attenuation	15 µg/m3		
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m3)	–	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9 ppm (10 mg/m3)		9 ppm (10 mg/m3)	–	
	8 Hour (Lake Tahoe)	6 ppm (7 g/m3)		–	–	
Nitrogen Dioxide (NO_2) [8]	1 Hour	0.18 ppm (339 µg/m3)	Gas Phase Chemiluminescence	100 ppb (118 pg/m3)	–	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)		0.053 ppm (100 µg/m3)	Same as Primary Standard	
Sulfur Dioxide (SO_2) [9]	1 Hour	0.25 ppm (655 µg/m3)	Ultraviolet Fluorescence	75 ppb (196 pg/m3)	–	Ultraviolet Flourescense; Spectrophotometry (Paraosaniline Method)
	3 Hour	–		–	0.5 ppm (1300 µg/m3)	
	24 Hour	0.04 ppm (105 µg/m3)		0.14 ppm (for certain areas) [9]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas) [9]	–	
Lead 8 [10,11]	30-Day Average	1.5 µg/m3	Atomic Absorption	–	–	–
	Calendar Quarter	–		1.5 µg/m3 (for certain areas) [11]	Same as Primary Standard	High Volume Sampler and Atomic Absorption
	Rolling 3-Month Avg	–		0.15 µg/m3)		
Visibility Reducing Particles [12]	8 Hour	See footnote 12	Beta Attenuation and Transmittance through Filter Tape	**No Federal Standards**		
Sulfates	24 Hour	25 µg/m3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m3)	Ultraviolet Fluorescence			
Vinyl Chloride [10]	24 Hour	0.01 ppm (26 µg/m3)	Gas Chromatography			

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.
5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.
6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.
8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.
9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.
10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.
11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.
12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.
14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (10/1/15)**

Table III-2
HEALTH EFFECTS OF MAJOR CRITERIA POLLUTANTS

Pollutants	Sources	Primary Effects
Carbon Monoxide (CO)	• Incomplete combustion of fuels and other carbon-containing substances, such as motor exhaust. • Natural events, such as decomposition of organic matter.	• Reduced tolerance for exercise. • Impairment of mental function. • Impairment of fetal development. • Death at high levels of exposure. • Aggravation of some heart diseases (angina).
Nitrogen Dioxide (NO_2)	• Motor vehicle exhaust. • High temperature stationary combustion. • Atmospheric reactions.	• Aggravation of respiratory illness. • Reduced visibility. • Reduced plant growth. • Formation of acid rain.
Ozone (O_3)	• Atmospheric reaction of organic gases with nitrogen oxides in sunlight.	• Aggravation of respiratory and cardiovascular diseases. • Irritation of eyes. • Impairment of cardiopulmonary function. • Plant leaf injury.
Lead (Pb)	• Contaminated soil.	• Impairment of blood function and nerve construction. • Behavioral and hearing problems in children.
Fine Particulate Matter (PM-10)	• Stationary combustion of solid fuels. • Construction activities. • Industrial processes. • Atmospheric chemical reactions.	• Reduced lung function. • Aggravation of the effects of gaseous pollutants. • Aggravation of respiratory and cardio respiratory diseases. • Increased cough and chest discomfort. • Soiling. • Reduced visibility.
Fine Particulate Matter (PM-2.5)	• Fuel combustion in motor vehicles, equipment, and industrial sources. • Residential and agricultural burning. • Industrial processes. • Also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics.	• Increases respiratory disease. • Lung damage. • Cancer and premature death. • Reduces visibility and results in surface soiling.
Sulfur Dioxide (SO_2)	• Combustion of sulfur-containing fossil fuels. • Smelting of sulfur-bearing metal ores. • Industrial processes.	• Aggravation of respiratory diseases (asthma, emphysema). • Reduced lung function. • Irritation of eyes. • Reduced visibility. • Plant injury. • Deterioration of metals, textiles, leather, finishes, coatings, etc.

Source: California Air Resources Board, 2002.

Baseline Air Quality

Existing and probable future levels of air quality around the project area can best be best inferred from ambient air quality measurements conducted by the SCAQMD at the Anaheim monitoring station. This station measures both regional pollution levels such as smog, as well as primary vehicular pollution levels near busy roadways such as carbon monoxide and nitrogen oxides. Pollutants such as particulates (PM-10 and PM-2.5) are also monitored at Anaheim. Table III-3 is a 6-year summary of monitoring data for the major air pollutants compiled from this air monitoring station. From this data the following conclusions regarding air quality trends can be drawn:

a. Photochemical smog (ozone) levels occasionally exceed standards. All state and federal ozone standards have been exceeded one percent or less of all days in the past 6 years. Measurements from more recent years demonstrate progressively improved ozone levels in the area except perhaps for some temporary "backsliding" in 2014. While ozone levels are still occasionally elevated, they are much lower than 10 to 20 years ago.

b. Respirable dust (PM-10) levels occasionally exceed the state standard on approximately 2 percent of measured days. The less stringent federal PM-10 standard has not been exceeded in the last 6 years.

c. The federal ultra-fine particulate (PM-2.5) standard of 35 $\mu g/m^3$ has been exceeded on less than one percent of measurement days in the last 6 years.

d. More localized pollutants such as carbon monoxide, nitrogen oxides, etc. are very low near the project site. There is substantial excess dispersive capacity to accommodate localized vehicular air pollutants such as NOx or CO without any threat of violating applicable AAQS. Data from a recent "near roadway" monitoring study directly along the I-5 shoulder (<50 feet) in Anaheim showed noticeably elevated levels of NOx and CO, but even at this close distance federal clean air standards were not exceeded.

Although complete attainment of every clean air standard is not yet imminent, extrapolation of the steady improvement trend suggests that such attainment could occur within the reasonably near future.

Standards or Thresholds of Significance

Air quality impacts are considered "significant" if they cause clean air standards to be violated where they are currently met, or if they "substantially" contribute to an existing violation of standards. Any substantial emissions of air contaminants for which there is no safe exposure, or nuisance emissions such as dust or odors, would also be considered a significant impact.

Appendix G of the California CEQA Guidelines offers the following five tests of air quality impact significance. A project would have a potentially significant impact if it:

a. Conflicts with or obstructs implementation of the applicable air quality plan.
b. Violates any air quality standard or contributes substantially to an existing or projected air quality violation.
c. Results in a cumulatively considerable net increase of any criteria pollutants for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).
d. Exposes sensitive receptors to substantial pollutant concentrations.
e. Creates objectionable odors affecting a substantial number of people.

Table III-3
AIR QUALITY MONITORING SUMMARY (2009-2014)
(NUMBER OF DAYS STANDARDS WERE EXCEEDED, AND MAXIMUM LEVELS DURING SUCH VIOLATIONS)
(ENTRIES SHOWN AS RATIOS = SAMPLES EXCEEDING STANDARD/SAMPLES TAKEN)

Pollutant/Standard	2009	2010	2011	2012	2013	2014
Ozone						
1-Hour > 0.09 ppm (S)	0	1	0	0	0	2
8-Hour > 0.07 ppm (S)	2	1	1	0	0	6
8- Hour > 0.075 ppm (F)	1	1	0	0	0	4
Max. 1-Hour Conc. (ppm)	0.093	0.104	0.088	0.079	0.084	0.111
Max. 8-Hour Conc. (ppm)	0.077	0.088	0.072	0.067	0.070	0.081
Carbon Monoxide						
8- Hour > 9. ppm (S,F)	0	0	0	0	0	0
Max 8-hour Conc. (ppm)	2.7	2.0	2.1	2.3	2.6	2.1
Nitrogen Dioxide						
1-Hour > 0.18 ppm (S)	0	0	0	0	0	0
Max. 1-Hour Conc. (ppm)	0.068	0.073	0.074	0.067	0.082	0.076
Inhalable Particulates (PM-10)						
24-hour > 50 $\mu g/m^3$ (S)	1/56	0/57	2/57	0/61	1/59	2/61
24-hour > 150 $\mu g/m^3$ (F)	0/56	0/57	0/57	0/61	0/59	0/61
Max. 24-Hr. Conc. ($\mu g/m^3$)	62.	43.	53.	48.	77.	85.
Ultra-Fine Particulates (PM-2.5)						
24-Hour > 35 $\mu g/m^3$ (F)	4/334	0/331	2/352	4/347	1/331	6/334
Max. 24-Hr. Conc. ($\mu g/m^3$)	64.5	31.7	39.2	50.1	37.8	56.2

Source: South Coast AQMD Air Monitoring Station Data Summary, Anaheim Station (3176)

Primary Pollutants

Air quality impacts generally occur on two scales of motion. Near an individual source of emissions or a collection of sources such as a crowded intersection or parking lot, levels of those pollutants that are emitted in their already unhealthful form will be highest. Carbon monoxide (CO) is an example of such a pollutant. Primary pollutant impacts can generally be evaluated directly in comparison to appropriate clean air standards. Violations of these standards where they are currently met, or a measurable worsening of an existing or future violation, would be considered a significant impact. Many particulates, especially fugitive dust emissions, are also primary pollutants. Because of the non-attainment status of the South Coast Air Basin (SCAB) for PM-10, an aggressive dust control program is required to control fugitive dust during project construction.

Secondary Pollutants

Many pollutants, however, require time to transform from a more benign form to a more unhealthful contaminant. Their impact occurs regionally far from the source. Their incremental regional impact is minute on an individual basis and cannot be quantified except through complex photochemical computer models. Analysis of significance of such emissions is based upon a specified amount of emissions (pounds, tons, etc.) even though there is no way to translate those emissions directly into a corresponding ambient air quality impact.

Because of the chemical complexity of primary versus secondary pollutants, the SCAQMD has designated significant emissions levels as surrogates for evaluating regional air quality impact significance independent of chemical transformation processes. Projects with daily emissions that exceed any of the following emission thresholds are recommended by the SCAQMD to be considered significant under CEQA guidelines. These daily emissions thresholds are included in Table III-4).

Table III-4
DAILY EMISSIONS THRESHOLDS

Pollutant	Construction	Operations
ROG	75	55
NOx	100	55
CO	550	550
PM-10	150	150
PM-2.5	55	55
SOx	150	150
Lead	3	3

Source: SCAQMD CEQA Air Quality Handbook, November, 1993 Rev.

Additional Indicators

In its CEQA Handbook, the SCAQMD also states that additional indicators should be used as screening criteria to determine the need for further analysis with respect to air quality. The additional indicators are as follows:

- Project could interfere with the attainment of the federal or state ambient air quality standards by either violating or contributing to an existing or projected air quality violation.
- Project could result in population increases within the regional statistical area which would be in excess of that projected in the AQMP and in other than planned locations for the project's build-out year.
- Project could generate vehicle trips that cause a CO hot spot.

Proposed Project

The proposed project consists of a General Plan Amendment to the City of Placentia General Plan to create the Transient Oriented Development (TOD) and the establishment of a new TOD Zone Classification and related development standards. There is no specific development project proposed at this time, although the TOD Zone development standards envision a catalyst site that is anticipated to develop in the near future. The proposed project will be established within an area of the City that is almost 100% developed (refer to the aerial photo in Figure 3). Therefore, it is very difficult to forecast changes in air emissions from future development for the following reasons. First, it is not possible to know whether future development will reuse existing structures, demolish existing structures, or add on to existing structures to meet the TOD designation objectives. Second, it would be speculative to make a forecast regarding future area source emissions. For example, new development using modern building standards could add substantial additional square footage and still use less energy than existing buildings. To avoid speculation, the only viable analytical alternative is to require detailed evaluations of each specific future project, which is imposed as a mitigation measure in the following analysis.

The only available project-related emission variable to evaluate is the maximum 5,000 vehicle trips that will be permitted within the 20-acre TOD area at buildout. Based on the trip generation forecast contained in the Traffic Impact Study (refer to Appendix 5), the existing development in the project area generates an estimated 1,247 average trips per day (ADT). The cap of 5,000 vehicle trips (net) at buildout assumes that an estimated 752 dwelling units (DU) could be constructed under an all residential development scenario and stay within the 5,000 vehicle trip cap or, alternatively, a mix of 75% residential (564 DU) and 25% commercial (~30,000 square feet of gross leasable area (GLA)) could also stay within the 5,000 vehicle trip cap. The trip generation component of the proposed project can be analyzed for air emissions and an emission forecast is presented below that assumes buildout in 2018 (a worst case assumption).

Impact Evaluation – Air Quality

a) Conflict with or obstruct implementation of the applicable air quality plan?

Less Than Significant Impact **–** Criteria for determining consistency with the AQMP are defined in Chapter 12, Section 12.2 and Section 12.3 of the SCAQMD's CEQA Air Quality Handbook (1993) (21). These indicators are discussed below.

- Consistency Criterion No. 1: The proposed project will not result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations, or delay the timely attainment of air quality standards or the interim emissions reductions specified in the AQMP.

<u>Operational Impacts</u>
The project regional analysis demonstrates that project-related vehicle operation emissions would not exceed the applicable SCAQMD threshold, and would therefore not result in or cause violations of the CAAQS and NAAQS. On the basis of the preceding discussion, the project is consistent with the first criterion.

- Consistency Criterion No. 2: The Project will not exceed the assumptions in the AQMP based on the years of Project build-out phase.

The 2012 AQMP demonstrates that the applicable ambient air quality standards can be achieved within the timeframes required under federal law. Growth projections from local general plans adopted by cities in the district are provided to the Southern California Association of Governments (SCAG), which develops regional growth forecasts, which are then used to develop future air quality forecasts for the AQMP. The proposed TOD GPA, Zone Change and Development Standards will replace the existing Industrial and Manufacturing land use designations within the 28.2-acre project area. Even though the new designations will replace the existing land use designations, the proposed new land use designations are clearly consistent with SCAG regional programs.

<u>SCAG RTP/SCS Regional Policies</u>
The following analysis of SCAG's Regional Transportation Plan/Sustainable Communities policies is provided.

SCAG's 2012-2035 RTP/SCS Plan identifies coordinated transportation and land use planning strategies intended to reduce greenhouse gas (GHG) emissions in accordance with SB 375 and to benefit regional quality of life. The RTP/SCS Plan emphasizes placing higher intensity housing and jobs in locations with existing high quality transit infrastructure that make daily travel via transit or active transportation (biking, walking, etc) feasible and attractive alternatives to single occupancy vehicle travel. Placentia's TOD designation (refer to Appendix 1) is designed to achieve this specific goal. Specific metrics identified in the SCAG Facts About California's Sustainable Communities Plans[1] (Fact Sheet) are: 2/3 of new housing will be multi-family by 2035; over 60% of all jobs will be within High Quality Transit Areas (HQTAs) by 2035; over half of new homes and jobs will be within walking distance of transit; fewer drive-alone trips and more transit use, biking and walking and HOV (high occupancy) trips; average auto trip length decreases through 2035; per capita vehicle miles traveled (VMT) decreases through 2035. The proposed project includes sidewalks, bike paths and most important, close proximity to mass transit, including the new Placentia Metrolink Station. The site is located within a HQTA and future TOD development will be within reasonable walking distance of mass transit. The project encourages the construction of mixed use development, including multi-family residences in a region where abundant job opportunities exist, such that future residents would be able to access employment via transit, biking or walking (multiple use development is highly encouraged.

The proposed project constitutes infill development, through redevelopment of an aging industrial area of the City. The California Air Resources Board (CARB) Technical Evaluation of the Greenhouse Gas Emission Reduction Quantification for the Southern California Association of Governments' SB 375 Sustainable Communities Strategy dated May 2012 notes that SCAG's SCS relies on the following key policies and strategies:

- Focusing new growth in existing and emerging population centers and along major transportation corridors;
- Creating significant areas of mixed use development and walkable communities;
- Targeting growth around existing and planned transit stations; and
- Preserving existing open space and protecting established residential areas.

The CARB Evaluation further states, "The preferred alternative is believed to meet demand for a broader range of housing types, with new housing and land use focused on the development of smaller lot single-family homes, townhomes, and multi-family condominiums and apartments." The proposed Project is consistent with the focus of future development on townhomes and multi-family condominiums and apartments. The Project area will eventually integrate into a walkable community oriented towards high quality mass transit availability after redevelopment is completed.

The proposed Project would be consistent with SCAG 2012 RTP/SCS Goals summarized as follows.

RTP/ SCS Goal 1: Align the plan investments and policies with improving regional economic development and competitiveness

Consistent. The proposed project establishes a new land use designation (TOD) that will facilitate redevelop an older area of the City to take advantage of a new Metrolink Station adjacent to the site. Appendix 1 identifies the anticipate infrastructure improvements (roadways, bike trails, sidewalks and mass transit) that will be created through the new TOD land use designation.

RTP/ SCS Goal 2: Maximize mobility and accessibility for all people and goods in the region

Consistent. Through a combination of higher density development; connections to mass transit systems; incorporation of new mass transit features and mixed-use (commercial and residential development), the new TOD designation fulfills this goal.

[1] http://www.arb.ca.gov/cc/sb375/scag_fact_sheet.pdf

RTP/ SCS Goal 3: Ensure travel safety and reliability for all people and goods in the region

Consistent. The proposed project will re-construct roadways within and surrounding the project site to their ultimate or half-width paved sections. Through fair share contributions improvements to the connecting circulation system will be enhanced. Both routine and emergency response will be enhanced to the project area.

RTP/ SCS Goal 4: Preserve and ensure a sustainable regional transportation system

Consistent. The proposed project will contribute to a sustainable regional transportation system through creation of high density residential development combined with high quality connections to both the local and regional transportation systems. Implementation of the TOD GPA and Zone Change is designed specifically to sustain alternative transportation systems to the automobile.

RTP/ SCS Goal 5: Maximize the productivity of our transportation system

Consistent. By creating a high density residential area adjacent to the new Metrolink Station the City's proposed TOD GPA and Zone Change will maximize productivity of the local and regional transportation systems.

RTP/ SCS Goal 6: Protect the environment and health of our residents by improving air quality and encouraging active transportation (non-motorized transportation, such as bicycling and walking)

Consistent. The proposed project includes sidewalks and bicycle trails that would provide safe and aesthetically pleasing opportunities for pedestrian and bicycle travel. The new land use designation is also designed to integrate retail commercial facilities to support the future residents. The specific goal of this new land use designation is to reduce vehicle trips and related air pollutant emissions while encouraging active alternative modes of transportation.

RTP/ SCS Goal 7: Actively encourage and create incentives for energy efficiency, where possible

Consistent. A specific objective of the new TOD designation is to facilitate redevelopment of the existing project area and to replace mostly older industrial buildings with either new buildings or through reuse of the existing structures. This transition to modern energy efficient structures will result in substantial incentive for energy efficient buildings.

RTP/ SCS Goal 8: Encourage land use and growth patterns that facilitate transit and non-motorized transportation

Consistent. The proposed project design requirements (Appendix 1) includes sidewalks and bike trails and connections to mass transit that will facilitate non-motorized transportation throughout the project area. The project is anticipated to foster a substantial reduction in average vehicle trip length, per capita vehicle miles traveled, and the percent of drive-alone vehicle trips.

RTP/ SCS Goal 9: Maximize the security of the regional transportation system through improved system monitoring, rapid recovery planning, and coordination with other security agencies

Consistent. The proposed project would have no direct impact on system monitoring, rapid recovery planning, and coordination with other security agencies. However, the proposed project would generate on-going demand and funds that are indirectly designed to make the new Metrolink Station and other mass transit and alternative modes of transportation successful.

AQMP Consistency Conclusion
The project would not result in or cause NAAQS or CAAQS violations. The project is specifically designed to support the local and regional goals for use of alternative modes of transportation. It will be fully consistent with the SCAG RTP/SCS goals designed to meet SB 375. The proposed project is therefore considered to be consistent with the AQMP.

b) *Violate any air quality standard or contribute substantially to an existing or projected air quality violation?*

Less Than Significant With Mitigation Incorporated **–** As indicated in the summary project description above, the proposed project does not presently consist of any specific projects for which construction emissions can be forecast. Due to the concept of redeveloping the project area that is already fully built out, it is too speculative for accurate construction emissions to be estimated. Also as noted above, the ability to forecast future area source emissions is considered too speculative until specific projects are submitted for review under the TOD designation/classification. However, to get a general assessment of a comparable project, research was conducted to identify a comparable local project with both demolition and construction impacts. Appendix 2 provides the air emission forecast for a project in nearby Anaheim (LA PALMA VILLAGE) and with appropriate mitigation incorporated the construction emissions can be controlled to a less than significant impact level. Based on this comparable example, it is reasonable to assume that future development within the TODA will be able to demonstrate compliance with the SCAQMD's construction CEQA significance thresholds. As older structures and uses are removed or reconstructed, the amount of energy consumed by the new use relative to the existing use will have to be estimated on a case-by-case basis.

III-1 ***For each future project implemented within the TOD project area, the development shall identify project construction related emissions and specific best available control measures (BACMs) identified in Rule 403 required to ensure that fugitive dust or construction equipment exhaust emissions will not exceed SCAQMD construction thresholds of significance or emission concentrations at the nearest receptors identified by local significance thresholds. The specific BACMs identified shall be made conditions of approval to ensure implementation.***

III-2 ***Only "Low-Volatile Organic Compounds" paints (no more than 100 gram/liter of VOC) and/or High Pressure Low Volume (HPLV) applications consistent with South Coast Air Quality Management District Rule 1113 shall be used.***

The City considered alternative development scenarios within the proposed TOD development area. As indicated in the project description, all efforts have been made to integrate mixed-uses and alternative modes into the project area to minimize future vehicle trips and vehicle miles traveled. The Traffic Impact Study estimated that the existing trips from the developed TOD area at 1,247 trips. Thus, to meet the objective of limiting future trips from the project area to 5,000 trips per day, the maximum number of trips that can be generated by future uses (all residential scenario and mix of residential and commercial) is 3,753. The following table provides the vehicle emission estimates based on based on CalEEMod defaults for the project area.

Table III-5
DAILY OPERATIONAL AIR POLLUTANT EMISSIONS YEAR 2018

Source	Operational Emissions[1]						
	ROG	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Mobile	8.2	39.6	111.4	0.3	27.6	7.7	36,031.1
SCAQMD Threshold	55	55	550	150	150	55	--
Exceeds Threshold (Yes/No)	No	No	No	No	No	No	--

[1]Emissions are expressed in pounds per day
SOURCE: Giroux & Associates (January 2017)

Based on this forecast, the future trips generated from the project area will not exceed the SCAQMD thresholds of significant for operational/occupancy emissions. Note that the detailed emission forecast data are provided in Appendix 2 of this document.

Because the City has included an assumption that total trips from the project area will not exceed 5,000 trips, the following mitigation measures will be implemented.

III-3 ***As individual projects are submitted for entitlements in the future, the City will maintain a record of each individual project's forecast trip generation and net area source emissions. When total trip generation (including the 1,247 existing trips) approaches 4,500, the City will not consider additional project entitlements within the TOD area, unless actual field monitoring of trips and area source verifies that actual trip generation is measured as being less than the SCAQMD thresholds when the verification is calculated. Field monitoring can consist of measuring trips and area source emissions from individual developments or monitoring trips on the local roadways entering and leaving the TOD area. Other verifiable measures may also be used to verify total trips, including interviews with residents or owners of businesses and verification of actual area source emissions. If the data indicate that the 5,000 trip ADT will be exceeded, the City will perform a new environmental evaluation in compliance with CEQA to assess whether continued development within the TOD area will exceed the emission significance thresholds in place at the time of measurement.***

Implementation of measure III-3 will ensure that air emission thresholds related to the adoption of the TOD GPA and Zone Change will not cause significant air pollution emissions within the South Coast Air Basin.

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Less Than Significant With Mitigation Incorporated – The project area is designated as an extreme non-attainment area for ozone, and a non- attainment area for PM_{10} and $PM_{2.5}$.

<u>Construction Impacts</u>
Project construction-source emissions would not exceed applicable SCAQMD regional thresholds based on implementing mitigation measures III-1 and III-2. Therefore, project construction-source emissions would be considered less than significant on a future project-specific and cumulative basis.

Operational Impacts

Project operational- source emissions would not exceed applicable SCAQMD regional thresholds with implementation of mitigation measure III-3. Therefore, project operational-source emissions would be considered less than significant on a project-specific and cumulative basis.

d) Expose sensitive receptors to substantial pollutant concentrations?

Less Than Significant With Mitigation Incorporated **–** In this section the potential to expose sensitive receptors to substantial pollutant concentrations is evaluated. This section focuses on Localized Significance Thresholds and Carbon Monoxide (CO) emissions. The potential impact of project-generated air pollutant emissions at sensitive receptors has also been considered. Sensitive receptors can include uses such as long term health care facilities, rehabilitation centers, and retirement homes. Residences, schools, playgrounds, child care centers, and athletic facilities can also be considered as sensitive receptors.

Background on Localized Significance Threshold (LST) Development

The analysis makes use of methodology included in the SCAQMD *Final Localized Significance Threshold Methodology* (Methodology). The SCAQMD has established that impacts to air quality are significant if there is a potential to contribute or cause localized exceedances of the federal and/or state ambient air quality standards (NAAQS/CAAQS). Collectively, these are referred to as Localized Significance Thresholds (LSTs).

The significance of localized emissions impacts depends on whether ambient levels in the vicinity of any given project are above or below State standards. In the case of CO and NO2, if ambient levels are below the standards, a project is considered to have a significant impact if project emissions result in an exceedance of one or more of these standards. If ambient levels already exceed a state or federal standard, then project emissions are considered significant if they increase ambient concentrations by a measurable amount. This would apply to PM10 and PM2.5; both of which are non-attainment pollutants.

The SCAQMD established LSTs in response to the SCAQMD Governing Board's Environmental Justice Initiative I-4. LSTs represent the maximum emissions from a project that will not cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard at the nearest residence or sensitive receptor. The SCAQMD states that lead agencies can use the LSTs as another indicator of significance in its air quality impact analyses.

LSTs were developed in response to environmental justice and health concerns raised by the public regarding exposure of individuals to criteria pollutants in local communities. To address the issue of localized significance, the SCAQMD adopted LSTs that show whether a project would cause or contribute to localized air quality impacts and thereby cause or contribute to potential localized adverse health effects. The analysis makes use of methodology included in the SCAQMD *Final Localized Significance Threshold Methodology* (LST Methodology).

Based on implementation of mitigation measures III-1, III-2, and III-3, LST emissions must be less than the LST significance thresholds for future individual projects, or the project would be required to prepare a follow-on CEQA compliance evaluation. Therefore, sensitive receptors would not be subject to a significant air quality impact during project construction or operation/occupancy.

CO Hotspot Analysis

As discussed below, the project would not result in potentially adverse CO concentrations or "hot spots." Further, detailed modeling of project-specific carbon monoxide (CO) "hot spots" is not needed to reach this conclusion.

An adverse CO concentration, known as a “hot spot”, would occur if an exceedance of the state one-hour standard of 20 ppm or the eight-hour standard of 9 ppm were to occur. At the time of the 1993 Handbook, the SCAB was designated nonattainment under the California AAQS and National AAQS for CO.

It has long been recognized that CO hotspots are caused by vehicular emissions, primarily when idling at congested intersections. In response, vehicle emissions standards have become increasingly stringent in the last 20 years. Currently, the allowable CO emissions standard in California is a maximum of 3.4 grams/mile for passenger cars (there are requirements for certain vehicles that are more stringent). With the turnover of older vehicles, introduction of cleaner fuels, and implementation of increasingly sophisticated and efficient emissions control technologies, CO concentration in the SCAB is now designated as attainment, as previously noted. Also, CO concentrations in the project vicinity have steadily declined, as indicated by historical emissions data presented previously (Table III-3).

To establish a more accurate record of baseline CO concentrations affecting the SCAB, a CO “hot spot” analysis was conducted in 2003 for four busy intersections in Los Angeles at the peak morning and afternoon time periods. This “hot spot” analysis did not predict any violation of CO standards, as shown on Table III-6.

Based on the SCAQMD's 2003 AQMP and the 1992 Federal Attainment Plan for Carbon Monoxide (1992 CO Plan), peak carbon monoxide concentrations in the SCAB were a result of unusual meteorological and topographical conditions and not a result of traffic volumes and congestion at a particular intersection. As evidence of this, for example, 9.3 ppm 8-hr CO concentration measured at the Long Beach Blvd. and Imperial Hwy. intersection (highest CO generating intersection within the “hot spot” analysis), only 0.7 ppm was attributable to the traffic volumes and congestion at this intersection; the remaining 8.6 ppm were due to the ambient air measurements at the time the 2003 AQMP was prepared (39). In contrast, the ambient 8-hr CO concentration within the Project study area is estimated at 2.7 ppm (please refer to previous Table III-3). Therefore, even if the traffic volumes for the proposed Project were double or even triple of the traffic volumes generated at the Long Beach Blvd. and Imperial Hwy. intersection, coupled with the on-going improvements in ambient air quality, the Project would not be capable of resulting in a CO “hot spot” at any study area intersections.

Table III-6
CO MODEL RESULTS

Intersection Location	Carbon Monoxide Concentrations (ppm)		
	Morning 1-hour	Afternoon 1-hour	8-hour
Wilshire-Veteran	4.6	3.5	4.2
Sunset-Highland	4	4.5	3.9
La Cienega-Century	3.7	3.1	5.8
Long Beach-Imperial	3	3.1	9.3

Similar considerations are also employed by other Air Districts when evaluating potential CO concentration impacts. More specifically, the Bay Area Air Quality Management District (BAAQMD) concludes that under existing and future vehicle emission rates, a given project would have to increase traffic volumes at a single intersection by more than 44,000 vehicles per hour—or 24,000 vehicles per hour where vertical and/or horizontal air does not mix—in order to generate a significant CO impact (40).

Traffic volumes generating the CO concentrations for the “hot spot” analysis, shown on Table III-7. The busiest intersection evaluated was that at Wilshire Blvd. and Veteran Ave., which has a daily traffic volume of approximately 100,000 vehicles per day. The 2003 AQMP estimated that the 1-hour concentration for this intersection was 4.6 ppm; this indicates that, should the daily traffic volume increase four times to 400,000 vehicles per day, CO concentrations (4.6 ppm x 4= 18.4 ppm) would still not likely exceed the most stringent 1-hour CO standard (20.0 ppm).[2]

The proposed project considered herein would not produce the volume of traffic required to generate a CO "hot spot" either in the context of the 2003 Los Angeles hot spot study, or based on representative BAAQMD CO threshold considerations. Therefore, CO "hot spots" are not an environmental impact of concern for the proposed Project. Localized air quality impacts related to mobile-source emissions would therefore be less than significant.

Table III-7
TRAFFIC VOLUMES FOR INTERSECTIONS EVALUATED IN AQMP

Intersection Location	Peak Traffic Volumes (vph)				
	Eastbound (AM/PM)	Westbound (AM/PM)	Southbound (AM/PM)	Northbound (AM/PM)	Total (AM/PM)
Wilshire-Veteran	4,954/2,069	1,830/3,317	721/1,400	560/933	8,062/7,719
Sunset-Highland	1,417/1,764	1,342/1,540	2,304/1,832	1,551/2,238	6,614/5,374
La Cienega-Century	2,540/2,243	1,890/2,728	1,384/2,029	821/1,674	6,634/8,674
Long Beach-Imperial	1,217/2,020	1,760/1,400	479/944	756/1,150	4,212/5,514

e) Create objectionable odors affecting a substantial number of people?

Less Than Significant With Mitigation Incorporated **–** The potential for the project to generate objectionable odors has also been considered. Land uses generally associated with odor complaints include:

- Agricultural uses (livestock and farming)
- Wastewater treatment plants
- Food processing plants
- Chemical plants
- Composting operations
- Refineries
- Landfills
- Dairies
- Fiberglass molding facilities

Residential uses typically do not generate offensive odors and do not require any mitigation to be a less than significant odor source. However, the proposed project would allow uses that can generate odors, including retail commercial uses such as dry cleaners and restaurants, including fast food. The City will implement the following mitigation measure for commercial uses that can generate offensive odors.

III-4 For each future project implemented within the TOD project area that can generate offensive odors, the development shall identify project-specific best available control measures (BACMs) for the specific odors that ensure adjacent sensitive receptors will not be exposed to odor concentrations that would conflict with residential uses. The specific BACMs identified for odor control shall be made conditions of approval to ensure implementation.

[2] Based on the ratio of the CO standard (20.0 ppm) and the modeled value (4.6 ppm).

Potential sources of operational odors generated by the project could also include disposal of miscellaneous commercial refuse. Consistent with City requirements, all project-generated refuse would be stored in covered containers and removed at regular intervals in compliance with solid waste regulations, thereby precluding substantial generation of odors due to temporary holding of refuse on-site. Moreover, SCAQMD Rule 402 acts to prevent occurrences of odor nuisances and can be utilized by sensitive odor receptors in the future to enforce effective management of any nuisance odors.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?				**X**
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?				**X**
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				**X**
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				**X**
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				**X**
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				**X**

SUBSTANTIATION: The following information utilized in this Section of the Initial Study was obtained from both a review of the project area and from the U.S. Fish and Wildlife Service IPaC Trust Resources Report, generated on October 12, 2016, pertaining to the TOD Project area only. The IPaC report is provided as Appendix 3 to this document.

a) *Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?*

No Impact – The TOD project area is 100% urbanized with no open land, no natural habitat and no potential habitat to support any species identified as candidate, sensitive or special status species. Though the IPaC report states that some threatened and endangered species exist within the project region, this report is provided as a general overview of the project area with no data specific to the project site itself. Therefore, because the TOD project area is 100% urbanized, there is no potential for impacts to any listed species as part of the implementation of the proposed project. With no habitat or species of concern located within the project area, the implementation of the TOD designation has no potential for impact to any native biological resources. No impacts are anticipated. No mitigation is required.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

No Impact – The project area is 100% urbanized and does not contain any riparian habitat or other sensitive natural community resources. Therefore, no adverse impact to any native biological resources can occur from implementing the proposed project.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No Impact – The project area is 100% urbanized and does not contain any wetlands a defined by Section 404 of the Clean Water Act) or any other sensitive natural community resources. Therefore, no adverse impact to any native biological resources, including wetlands, can occur from implementing the proposed project.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No Impact – With no native habitat and no wildlife corridors through the project area, the project has no potential to interfere with the movement of native animals of any kind or to impede the use of any native wildlife nursery sites.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact – The project area is 100% urbanized and does not contain any native plants, including trees. Landscape plants and trees do occur sporadically throughout the area (refer to Figure 3), but these non-native plants are not covered by local policies or ordinances as there are no ordinances regarding the removal or preservation of native trees within the City of Placentia. Therefore, the proposed project does not have a potential to conflict with any policies or ordinances that protect native biological resources.

f) *Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?*

No Impact – The project site is 100% urbanized and there are no adopted plans to protect native habitats or natural communities. As previously stated, the City of Placentia does not have any Habitat Conservation Plans, Natural Community Conservation Plans, or other local, regional or state habitat plans that would pertain to the project area. Therefore, the proposed project does not have a potential to conflict with any such plans.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
V. CULTURAL RESOURCES: Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in '15064.5?		X		
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to '15064.5?				X
c) Directly or indirectly destroy a unique paleon-tological resource or site or unique geologic feature?				X
d) Disturb any human remains, including those interred outside of formal cemeteries?			X	
e) Cause a substantial adverse change in the significance of a tribal cultural resource pursuant to AB 52?			X	

SUBSTANTIATION

a) Cause a substantial adverse change in the significance of a historical resource as defined in '15064.5?

Less Than Significant With Mitigation Incorporated – As noted in the project description, the TOD project area is 100% developed with urban uses. Many of the existing structures are older than 50 years, some of them much older. Development of future TOD facilities will likely require demolition of existing structures in some instances. The exception to the currently proposed development is the former Placentia Orange Growers Association packing warehouse which is known to have some historic value and which is proposed to be retained and reused for mixed commercial uses. Although none of the structures have been identified by the City as historic, a potential does exist that such structures may have historical significance as defined in Section 15064.5 of the State CEQA Guidelines. Therefore, the following mitigation measure will be implemented to ensure that no significant adverse impact to a significant cultural resource will result from future redevelopment of a property within the TOD project area.

V-1 Prior to demolition of any structure greater than 50 years in age in support of a TOD facility, the City will require a comprehensive historical resource evalua-tion of the structure. If it is determined that the structure has significant historical value, specific management actions will be defined to reduce impacts to a less than significant impact level. If mitigation to a less than significant historical impact level cannot be achieved, the City will require the preparation of a second tier environmental document, most probably EIR, prior to allowing the TOD project to proceed.

This measure can control the historical impacts of the TOD approval to a less than significant impact level, or it will result in preparation of a higher level document prior to demolition of any historically significant structure in support of the TOD project area.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to '15064.5?

No Impact – The whole of the TOD area has been historically disturbed through grading, compaction and building or infrastructure construction. Therefore, the project area can no longer contain any archaeological resources/sites with integrity or contextual value. The proposed project has no potential to adversely impact significant archaeological resources or values.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

No Impact – The whole of the TOD area has been historically disturbed through grading, compaction and building or infrastructure construction. Therefore, the project area can no longer contain any paleontological resources/sites with integrity or contextual value. The proposed project has no potential to adversely impact significant paleontological resources or values.

d) Disturb any human remains, including those interred outside of formal cemeteries?

Less Than Significant Impact – Based on historic disturbance of the whole project area, the potential for encountering human remains is very low. If human remains are accidentally exposed during demolition or site grading, Section 7050.5 of the California Health and Safety Code requires a contractor to immediately stop work in the vicinity of the discovery and notify the County Coroner. The Coroner must then determine whether the remains are human and if such remains are human, the Coroner must determine whether the remains are or appear to be of a Native American. If deemed potential Native American remains, the Coroner contacts the Native American Heritage Commission to identify the most likely affected tribe and to initiate proper recovery of such remains. Since this process is mandatory, no mitigation is required to ensure that the impacts to human remains will be less than significant.

e) Cause a substantial adverse change in the significance of a tribal cultural resource pursuant to AB 52?

Less Than Significant Impact – The City of Placentia has been notified by two Native American tribes regarding possible occurrence of traditional cultural resources within its boundaries. AB 52 notification was sent to the following Native American groups: Gabrieleño Band of Mission Indians – Kizh Nation and Juaneño Band of Mission Indians – Acjachemen Nation. At the date of this publication no responses had been received.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VI. GEOLOGY AND SOILS: Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
• Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
• Strong seismic ground shaking?			X	
• Seismic-related ground failure, including liquefaction?			X	
• Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?		X		
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction or collapse?		X		
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?		X		
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X

SUBSTANTIATION

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- *Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.*

No Impact – According to the Draft General Plan Safety Element, the City of Placentia does not have any active faults located within its boundary, this is shown on the Fault Map obtained from the United States

Geological Survey (Figure VI-1). Therefore, future residential and commercial structures constructed within the TOD area will not be subject to surface rupture from a know earthquake fault.

- *Strong seismic ground shaking?*

Less Than Significant Impact – The Draft General Plan Safety Element indicates that the City is exposed to moderate to severe seismic shaking. Some degree of structural damage may occur due to stronger seismic shaking. However, the risk can be reduced through adherence to seismic design codes in the California Building Code, 2013. Since this is a General Plan policy and therefore mandatory for future development within the TOD area, no mitigation is required in order to minimize future impact to structures from ground shaking.

- *Seismic-related ground failure, including liquefaction?*

Less Than Significant Impact – The Draft General Plan Safety Element indicates that portions of the City are exposed to limited liquefaction hazards. The State of California Seismic Hazard Zones, Orange Quadrangle shows that the proposed project area is located within an area with historic occurrences of liquefaction (Figure VI-2). Some degree of structural damage may occur due to potential liquefaction within the project area. The City's building code requires structures in liquefaction areas to be designed to withstand the potential impacts that could be caused by liquefaction. Since this is a building code requirement and therefore mandatory, no mitigation is required in order to minimize future impact to structures from liquefaction hazard.

- *Landslides?*

No Impact – The project area does not have substantial slopes or steep topography located within its boundaries. The majority of the City, including the TOD area, is not identified as having a significant landslide hazard. With no potential for landslides, the proposed project will not expose future development in the TOD area to such hazards.

b) Result in substantial soil erosion or the loss of topsoil?

Less Than Significant With Mitigation Incorporated – All future development under the TOD designation will occur within an existing urbanized area as re-development. The TOD area is an engineered environment with an existing stormwater runoff system already in place. Each City is required to ensure that site development implements a Storm Water Pollution Prevention Plan to control soil erosion, loss of topsoil and water pollution during construction and a Water Quality Management Plan to control soil erosion, loss of topsoil and water pollution over the long term. With implementation of these mandatory Plans, the mitigation outlined below, and their Best Management Practices (BMPs), future development under the TOD designation will not result in substantial soil erosion or loss of topsoil.

VI-1 ***Prior to approval of specific development projects within the TOD area in the future, the City will require comprehensive documentation of the erosion control and water quality best management practices (BMPs) that will be implemented by a proposed site specific project. This documentation shall demonstrate that erosion, sedimentation and discharge of storm water from the site during construction and after development will not cause degradation of storm water runoff from the project site that could cause or contribute to a violation of the beneficial uses and water quality standards downstream from the project site.***

c) *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction or collapse?*

Less Than Significant With Mitigation Incorporated – Within the TOD area future structures may be about 75 feet in height (five stories). Although the existing development within the TOD area includes structures up to about 50 feet in height, the new structures may require additional geotechnical engineering to address the potential for lateral spreading, subsidence or liquefaction issues. Therefore, the following mitigation measure shall be implemented for new structures constructed within the TOD area that are over two stories.

VI-2 ***Concurrent with accepting an application for a residential structures within the TOD area, the developer shall submit a professionally prepared geotechnical report that includes geotechnical design specifications for the proposed structure at the project site. These design specifications shall demonstrate that any site specific sources of instability can be controlled to a less than significant impact level and these requirements shall be implemented through a condition of approval imposed by the City on the proposed structure.***

With implementation of this mitigation measure, the potential for geotechnical instability to adversely impact future structures constructed under the TOD designation can be controlled to a less than significant impact level.

d) *Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?*

Less Than Significant With Mitigation Incorporated – All future development under the TOD designation will occur within an existing, relatively flat, urbanized area as re-development. As discussed in the General Plan, expansive soils within the City appear "to pose no significant development constraint or land use planning impact so long as adequate pre-development and designs are utilized" (Safety Element 1-13 to 1-14). These pre-development and design requirements are addressed in the City's building code, and are therefore mandatory. Additionally, according to the United States Department of Agriculture Web Soil Survey, the project Area of Potential Effect (APE) is underlain by Mocho loam and Myford sandy loam, which are, according to the National Cooperative Soil Survey (see links below), moderately to extremely well-drained with slow permeability, and therefore are not considered expansive soils. However, there is insufficient information to conclude whether any expansive soil exists within the whole of the TOD area. Mitigation measure VI-2 contains requirements that will ensure that if expansive soil occurs at any location within the area, it will not result in creating a substantial risk to life or property.

https://soilseries.sc.egov.usda.gov/OSD_Docs/M/MOCHO.html
https://soilseries.sc.egov.usda.gov/OSD_Docs/M/MYFORD.html

e) *Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?*

No Impact – The whole TOD area is presently served by a wastewater collection system (sewer) and no future structures will be utilizing septic tanks or alternative onsite disposal systems. Therefore, the proposed TOD designation does not rely on such soils and no adverse impact can result under this issue.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VII. GREENHOUSE GAS EMISSIONS: Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?		X		
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?		X		

SUBSTANTIATION

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Less Than Significant With Mitigation Incorporated – “Greenhouse gases” (so called because of their role in trapping heat near the surface of the earth) emitted by human activity are implicated in global climate change, commonly referred to as “global warming.” These greenhouse gases contribute to an increase in the temperature of the earth’s atmosphere by transparency to short wavelength visible sunlight, but near opacity to outgoing terrestrial long wavelength heat radiation in some parts of the infrared spectrum. The principal greenhouse gases (GHGs) are carbon dioxide, methane, nitrous oxide, ozone, and water vapor. For purposes of planning and regulation, Section 15364.5 of the California Code of Regulations defines GHGs to include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. Fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) is the single largest source of GHG emissions, accounting for approximately half of GHG emissions globally. Industrial and commercial sources are the second largest contributors of GHG emissions with about one-fourth of total emissions.

California has passed several bills and the Governor has signed at least three executive orders regarding greenhouse gases. GHG statues and executive orders (EO) include AB 32, SB 1368, EO S-03-05, EO S-20-06 and EO S-01-07.

AB 32 is one of the most significant pieces of environmental legislation that California has adopted. Among other things, it is designed to maintain California’s reputation as a “national and international leader on energy conservation and environmental stewardship.” It will have wide-ranging effects on California businesses and lifestyles as well as far reaching effects on other states and countries. A unique aspect of AB 32, beyond its broad and wide-ranging mandatory provisions and dramatic GHG reductions are the short time frames within which it must be implemented. Major components of the AB 32 include:

- Require the monitoring and reporting of GHG emissions beginning with sources or categories of sources that contribute the most to statewide emissions.
- Requires immediate “early action” control programs on the most readily controlled GHG sources.
- Mandates that by 2020, California’s GHG emissions be reduced to 1990 levels.

- Forces an overall reduction of GHG gases in California by 25-40%, from business as usual, to be achieved by 2020.
- Must complement efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. Maximum GHG reductions are expected to derive from increased vehicle fuel efficiency, from greater use of renewable energy and from increased structural energy efficiency. Additionally, through the California Climate Action Registry (CCAR now called the Climate Action Reserve), general and industry-specific protocols for assessing and reporting GHG emissions have been developed. GHG sources are categorized into direct sources (i.e. company owned) and indirect sources (i.e. not company owned). Direct sources include combustion emissions from on-and off-road mobile sources, and fugitive emissions. Indirect sources include off-site electricity generation and non-company owned mobile sources.

Thresholds of Significance

In response to the requirements of SB97, the State Resources Agency developed guidelines for the treatment of GHG emissions under CEQA. These new guidelines became state laws as part of Title 14 of the California Code of Regulations in March, 2010. The CEQA Appendix G guidelines were modified to include GHG as a required analysis element. A project would have a potentially significant impact if it:

- Generates GHG emissions, directly or indirectly, that may have a significant impact on the environment, or,
- Conflicts with an applicable plan, policy or regulation adopted to reduce GHG emissions.

Section 15064.4 of the Code specifies how significance of GHG emissions is to be evaluated. The process is broken down into quantification of project-related GHG emissions, making a determination of significance, and specification of any appropriate mitigation if impacts are found to be potentially significant. At each of these steps, the new GHG guidelines afford the lead agency with substantial flexibility.

Emissions identification may be quantitative, qualitative or based on performance standards. CEQA guidelines allow the lead agency to “select the model or methodology it considers most appropriate.” The most common practice for transportation/combustion GHG emissions quantification is to use a computer model such as CalEEMod, as was used in the ensuing analysis.

The significance of those emissions then must be evaluated; the selection of a threshold of significance must take into consideration what level of GHG emissions would be cumulatively considerable. The guidelines are clear that they do not support a zero net emissions threshold. If the lead agency does not have sufficient expertise in evaluating GHG impacts, it may rely on thresholds adopted by an agency with greater expertise.

On December 5, 2008 the SCAQMD Governing Board adopted an Interim quantitative GHG Significance Threshold for industrial projects where the SCAQMD is the lead agency (e.g., stationary source permit projects, rules, plans, etc.) of 10,000 Metric Tons (MT) CO_2 equivalent/year. In September 2010, the SCAQMD CEQA Significance Thresholds GHG Working Group released revisions which recommended a threshold of 3,000 MT CO_2e for all land use projects. This 3,000 MT/year recommendation has been used as a guideline for this analysis. In the absence of an adopted numerical threshold of significance, project related GHG emissions in excess of the guideline level are presumed to trigger a requirement for enhanced GHG reduction at the project level. Project Related GHG Emissions Generation.

Proposed Project

The proposed project consists of a General Plan Amendment to the City of Placentia General Plan create the Transient Oriented Development (TOD) and the establishment of a new TOD Zone Classification and related development standards. There is no specific development project proposed at this time, although the TOD Zone development standards envision a catalyst site that is anticipated to develop in the near future. The proposed project will be established within an area of the City that is almost 100% developed (refer to the aerial photo in Figure 3). Therefore, it is very difficult to forecast changes in GHG emissions from future development for the following reasons. First, it is not possible to know whether future development will reuse existing structures, demolish existing structures, or add on to existing structures to meet the TOD designation objectives. Second, it would be speculative to make a forecast regarding future area source and energy emissions. For example, new development using modern building standards could add substantial additional square footage and still use less energy than existing buildings. This could result in an actual reduction in GHG emissions relative to the existing condition. To avoid speculation, the only viable analytical alternative is to require detailed evaluations of each specific future project, which is imposed as a mitigation measure in the following analysis.

The only available project-related GHG emission variable to evaluate is the maximum 5,000 vehicle trips that will be permitted within the 28.2-acre TOD area at buildout. Based on the trip generation forecast contained in the Traffic Impact Study (refer to Appendix 5), the existing development in the project area generates an estimated 1,247 average trips per day (ADT). The cap of 5,000 vehicle trips (net) at buildout assumes that an estimated 752 dwelling units (DU) could be constructed under an all residential development scenario and stay within the 5,000 vehicle trip cap or, alternatively, a mix of 75% residential (564 DU) and 25% commercial (~30,000 square feet of gross leasable area (GLA)) could also stay within the 5,000 vehicle trip cap. The trip generation component of the proposed project can be analyzed for GHG emissions and an emission forecast is presented below that assumes buildout in 2018 (a worst case assumption).

<u>Construction Activity GHG Emissions</u>

With no specific projects under consideration at this time, the amount of GHG emissions related to construction activities cannot be estimated. Regardless, the following mitigation measure will be Implemented to control future project specific GHG emissions to a less than significant impact level.

VII-1 ***As individual projects are submitted for review in the future, the City will require a GHG emission forecast for proposed construction activities. If construction-related GHG emissions exceed regionally accepted thresholds, the City will require mitigation to offset such emissions. Mitigation may be in the form of GHG emission offsets or credits obtained from other projects or mitigation banks. If the data indicate that the construction GHG emissions will exceed thresholds of significance in place at the time of construction after application of mitigation, the City will perform a new environmental evaluation in compliance with CEQA to assess whether continued development will exceed the emission significance thresholds in place at the time of measurement.***

<u>Project Operational GHG Emissions</u>

There is no GHG threshold of significance for a planning area project compared to an individual project, which has a threshold of 3,000 MTCO2(e). Therefore, the following mitigation measure will be implemented by the City to control future individual project-related GHG emissions to the 3,000 MTCO2(e), based on all GHG emissions generated by project operation/occupancy and the annualized construction emissions. To address future GHG emissions and control them below the 3,000 MTCO2(e) threshold for future project specific impacts, the following mitigation measure will be implemented by the City.

VII-2 ***As individual projects are submitted for entitlements in the future, the City will require a GHG evaluation on each project and ensure that project-related GHG emissions do not exceed the 3,000 MTCO2(e) threshold. Where this threshold will be exceeded, the City will require the developer to provide project-related GHG emission reductions (such as higher energy conservation), use of recycled water or other GHG reduction measures. The City will also accept verifiable GHG emission offsets from projects. However, if the data indicate that the project specific GHG threshold will be exceeded, the City will perform a new environmental evaluation in compliance with CEQA to assess whether the development within the TOD area will exceed the emission significance thresholds.***

This measure combined with the project's implementation of regional SB 375 goals associated with TOD development will ensure that the proposed TOD GPA and Zone Change will not cause significant GHG emissions.

<u>Consistency with GHG Plans, Programs and Policies</u>

The City of Placentia has not yet developed a Greenhouse Gas Reduction Plan. The applicable GHG planning document is AB-32. As discussed above, the project is not expected to result in a significant increase in GHG emissions. As a result, the project results in GHG emissions below the recommended SCAQMD 3,000 MTCO2(e) threshold established for future specific projects. Therefore, the project would not conflict with any applicable plan, policy, or regulation to reduce GHG emissions.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
VIII. HAZARDS AND HAZARDOUS MATERIALS: Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?		X		
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		X		
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?		X		
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?			X	
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

SUBSTANTIATION

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Less Than Significant Impact With Mitigation Incorporated – The proposed TOD designation will allow future residential, office and commercial development within the existing developed project area. During occupancy of the proposed project, either residential or commercial in nature, potentially hazardous materials such as fuel, paint products, solvents, and cleaning products, could be present on site once a TOD area site is developed. Such materials will be present on-site in small quantities for regular cleaning and maintenance activities associated with the operation of commercial uses. Residential uses do not routinely transport, use or generate hazardous materials or wastes in a quantity that poses a hazard to individual or the neighborhood. Minor quantities of household hazardous waste may be generated randomly by residential uses, but such generation is in small quantities and it is typically random, not routine. During the construction of future structures in the TOD area, there could be a potential for accidental release of petroleum products in sufficient quantity to pose a significant hazard to people or the environment. Therefore, the following mitigation measure will be incorporated into the SWPPP or erosion control plan prepared for all future construction within the TOD project area, and this will reduce any such potential hazards to a less than significant level.

VIII-1 All spills or leakage of petroleum products or other hazardous materials during construction activities will be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately licensed disposal or treatment facility. This measure will be incorporated into the SWPPP or erosion control plan prepared for site specific development within the project area.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Less Than Significant With Mitigation Incorporated – As noted in the previous discussion, residential uses have a very low potential to cause a significant hazard from release of hazardous material to the environment. Any household hazardous materials/wastes will be of such a small quantity that creation of a significant hazard due to upset or accident conditions is below a level of significant impact. Additionally, the commercial uses permitted under the TOD area are not of a nature that will require the use of and potential release of significant quantities of hazardous materials into the environment because hazardous materials will not be present on future sites in large enough quantities to pose a threat to the environment. However, during construction, accidental release of hazardous material, particularly construction equipment accidental release of petroleum products can occur and pose a hazard to the public or environment. Mitigation measure VIII-1 above is considered sufficient to mitigate any future significant impacts. Thus, implementation of this measure can ensure that no significant adverse impact to humans or the environment will result from future development under the TOD designation.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact – The project will not allow hazardous emissions to be emitted or to include handling hazardous or acutely hazardous materials, substances, or waste because the TOD restricts future uses to residential and commercial uses consistent with the TOD designation. No existing or proposed schools are located within a one-quarter mile distance of the project area. No adverse impacts are anticipated under this issue.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Less Than Significant With Mitigation Incorporated – Based on a review of hazardous materials sites gathered from the California State Water Board's GeoTracker website, there are 23 known hazardous materials sites located within one-half mile of the project area, with some occurring within the project area. Most of these sites have been remediated (cleaned) and the cases closed. However, there is a potential for future development under the TOD designated area to expose the public to significant hazards from re-developing property within the project area. Therefore, the following mitigation measure shall be implemented prior to approval of any future project proposed under the TOD designation.

VIII-2 Prior to approval of any project under the TOD designation, a Phase I and/or Phase II Environmental Site Assessment shall be prepared to document the potential for any residual contamination at a site being developed within the TOD area. Any identified residual contamination shall be remediated to a level that will permit residential use prior to approval of any project proposed under the TOD designation.

Implementation of this measure can ensure that no significant adverse impact to humans or the environment will result from future development under the TOD designation.

e) *For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?*

No Impact – There are no public airports located within two miles of the TOD designated area. Therefore, the project area has no potential to cause or experience any adverse impact related to public airport operations.

f) *For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?*

No Impact – There are no private airstrips located within two miles of the TOD designated area. Therefore, the project area has no potential to cause or experience any adverse impact related to public airport operations.

g) *Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?*

Less Than Significant Impact – The TOD project area is not located along any primary evacuation routes located within the City of Placentia. Therefore, the potential for future development to physically interfere with adopted emergency response plan or evacuation plan is considered a less than significant impact.

h) *Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?*

No Impact – The City of Placentia does contain areas (along the northern perimeter of the City) that are exposed to wildland fire hazards. However, the TOD area located south of the BNSF Railway tracks does not contain any wildland fire hazards areas. Therefore, no potential exists to expose people or structures to such significant hazard.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
IX. HYDROLOGY AND WATER QUALITY: Would the project:				
a) Violate any water quality standards or waste discharge requirements?			X	
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?		X		
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation onsite or offsite?				X
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?				X
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?			X	
f) Otherwise substantially degrade water quality?			X	
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?			X	
j) Inundation by seiche, tsunami, or mudflow?				X

SUBSTANTIATION

a) *Violate any water quality standards or waste discharge requirements?*

Less Than Significant Impact – The TOD area is 100% developed and with minor exceptions is covered with impervious surface. For a developed area the only three sources of potential violation of water quality standards or waste discharge requirements are from generation of municipal wastewater; from storm water runoff; and potential discharges of pollutants, such as accidental spills. Wastewater from the project area is delivered to Orange County water reclamation facilities that meet waste discharge requirements imposed by the Santa Ana Regional Water Quality Control Board. To address storm water and accidental spills within this engineered environment, any new project must ensure that site development implements a Storm Water Pollution Prevention Plan (SWPPP) or erosion control plan to control potential sources of water pollution that could violate any standards or discharge requirements during construction and a Water Quality Management Plan (WQMP) to control water pollution over the long term. Mitigation to address both of these circumstances has been identified. Specifically, measures VI-1 and VIII-1 identify specific measures with performance standards that will ensure neither source of water pollution result in violation of any water quality standards or waste discharge requirements. With implementation of these measures and the BMPs, future development under the TOD designation will not cause violation of any water quality standards or waste discharge requirements.

b) *Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?*

Less Than Significant With Mitigation Incorporated – The TOD area is 100% developed and with minor exceptions is covered with impervious surface. Thus, the project area does not presently function as a recharge area for the regional aquifer and will not serve this function after development under the TOD designation. There are no groundwater wells located within the project area and the future construction of new structures has no potential to directly intercept the groundwater table within the project area since it is at least 50 feet below the ground surface. The project area already consumes potable water, primarily for industrial uses within the TOD area. However, the shift of uses to multi-family residential and commercial uses under the TOD designation may result in a substantial increase in the number of water connections, and a possible increase in actual groundwater consumption. Since it was not possible to obtain an accurate estimate of current water consumption, the following mitigation measure shall be implemented to address future water consumption and potential groundwater extractions:

IX-1 ***Concurrent with individual project applications in the future, the applicant for a project in the TOD area shall submit a review of existing water consumption on the property, and a forecast of future water consumption by the proposed development. If water consumption by the new project is less than currently occurs on the property, no further action is required. If water consumption is forecast to increase by more 25% than current water demand or 5,000 gallons per day per acre, the project applicant shall fund sufficient water conservation measures within the project area (including the proposed project) to offset the increase in demand on the local water purveyor. Specific conservation measures that can by funded include, but are not limited to: use of recycled water for exterior landscaping, ultra low flush toilets; interior water fixtures that reduce water consumption, such as on-demand water heaters; replacement of existing high water demand landscaping with xeric landscaping; installation of smart landscape/irrigation management/control systems (such as drip systems); and use of onsite low water demand landscaping. To verify adequate***

water demand offset, the City shall consult with the local water purveyor and verify the adequacy of the offset.

With implementation of the above water conservation measures future development under the TOD designation can be implemented without adverse impact to any groundwater resources.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation onsite or offsite?

No Impact – The local drainage pattern for the TOD area is already established as runoff from private property enters the local streets and is transported to the regional system. As previously noted the project area is fully developed, and an estimated 95% or more of the rainfall leaves the area as surface runoff. There are no streams or channels within the project area, which is 100% developed. The proposed project will not alter this existing drainage system and therefore has no potential to cause substantial erosion or siltation on- or offsite.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding onsite or offsite?

No Impact – Please refer to the preceding discussion under issue c). The drainage pattern of the TOD area will not be altered and the existing development results in almost 100% impervious surface. Re-development of the project area under the TOD designation has no potential to cause an increase in surface runoff which could cause flooding onsite or offsite. In fact, by requiring additional landscaping and modern water quality management systems to be installed, less surface runoff may occur in the future.

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Less Than Significant Impact – As indicated under issues c) and d), the project area is 100% developed with urban uses and runoff from the area is not forecast to increase as a result of future re-development of the project area under the TOD designation. Potential sources of pollution within the project area remain essentially the same, except as noted in preceding discussions where new SWPPPs and WQMPs must be implemented in conjunction with future development (Mitigation Measures VI-1 and VIII-1).

f) Otherwise substantially degrade water quality?

Less Than Significant Impact – Under the TOD designation a mix of residential, office and commercial uses can be developed to replace primarily industrial uses. These are comparable uses to the existing development within the project area. Such uses will continue the pattern of urban pollution, but the future development with more stringent BMPs will not contribute to any additional substantial degradation of water quality, and should improve future storm water runoff. The proposed project impact is forecast to be a less than significant impact.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact – The TOD area is not located within an area subject to 100-year flood hazards. Therefore, future development under the TOD designation will not be exposed to such hazards.

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

No Impact – The TOD area is not located within an area subject to 100-year flood hazards. Therefore, future development under the TOD designation will not be exposed to such hazards. No potential exists to impede or redirect flood flows.

i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Less Than Significant Impact – The City of Placentia is exposed to limited dam inundation hazards from Carbon Canyon Dam. This hazard occurs in the eastern portion of the City along Carbon Canyon Creek. The TOD area is minimally exposed to this hazard, which represents a less than significant impact under this issue.

j) Inundation by seiche, tsunami, or mudflow?

No Impact – The project site is not located within a channel or area that would be exposed to any of the referenced hazards, i.e., seiche, tsunami or mudflow. No adverse impact under this issue can occur from future development under the TOD area.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
X. LAND USE AND PLANNING: Would the project:				
a) Physically divide an established community?			X	
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?			X	
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

SUBSTANTIATION

a) Physically divide an established community?

Less Than Significant Impact – The project area is already divided by the BNSF Railway east-west main line tracks. The rationale for considering the TOD district is that a proposed new Metrolink passenger train station that will be installed within the project area. This new station creates an opportunity to redevelop the area surrounding the Metrolink station with a higher density, transit-oriented development (TOD) neighborhood. However, the City's General Plan does not currently have a mixed-use land use designation that can accommodate higher density residential development with supporting commercial and office uses. The proposed TOD General Plan designation and zone classification will support this new circumstance and allow higher density residential, office and commercial uses to be developed to take advantage of this new mode of transportation that will provide transit connections throughout the southern California region. The TOD district is limited to the approximately 28.2-acre area shown on the project site maps and future TOD-related structures will not physically divide this existing highly urbanized area. Instead these new structures will be integrated into this existing mixed-use project area. Therefore, potential TOD designation impacts are forecast to result in a less than significant adverse impact to this established community. The objective of the City is to foster a major improvement in this area in conjunction with the installation of the new Metrolink station.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less Than Significant Impact – At the present time the land uses within the area encompassed by the proposed TOD district are mixed, with the primary use of the area for industrial-related activities. This is consistent with the area's historic proximity to the BNSF Railway east-west main line track serving as the northern boundary of this planning area. In anticipation of a new Metrolink passenger station, the City is seeking to allow high density residential development with supporting office and commercial uses to be developed in close proximity to the station (TOD development). The project area already contains limited residential and commercial uses, so the uses themselves will not be new. Future development under the TOD land use designation/classification must comply with all new TOD Development Standards and Policies as summarized in the Project Description and as detailed in Appendix 1. These Development Standards establish specific development and design standards that the City considers to be self mitigating with regarding to consistency with the existing City General Plan. Also note that all existing General Plan policies and other regulations from other agencies, such as the Regional Board, will continue to apply to the project area. Therefore, future TOD projects will not be relieved from conforming and implementing any policies designed to avoid or mitigate environmental effects. The proposed project is not forecast to conflict with the applicable land use designations once it is approved because all future projects within the TOD area must be developed consistent with this new General Plan land use designation and zone classification. The TOD district will provide a new development option within the City consistent with the regional rail transportation plan. Thus, implementation of the TOD designation will create a less than significant conflict with the existing land use plan, policies and regulations applicable to the project area. Also, please refer to the discussion in the Air Quality Section regarding the proposed project's consistency with the SCAG SB 375 programs.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact – The City of Placentia does not contain any areas that are located within a habitat conservation planning area or natural community conservation planning area. Therefore, the proposed TOD project zone district has no potential to conflict with such planning areas.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XI. MINERAL RESOURCES: Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

SUBSTANTIATION

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact – The project area has been developed 100% with urban land uses. There are no known mineral resources within the project area and it is not designated for mineral resource exploitation. The addition of the TOD district will not cause any loss of mineral resource values to the region or residents of the state.

b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No Impact – Refer to the text under a) above. There are no known mineral resource recovery sites located within the project area and none are delineated on the City's General Plan or any other plan. Therefore, the proposed project can not result in the loss of availability of a mineral resource recovery site.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XII. NOISE: Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?		X		
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?		X		
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?		X		
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?		X		
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

SUBSTANTIATION

Background

For a detailed analysis of the Noise and Vibration setting within the City of Placentia and in the vicinity of the BNSF Railway mainline tracks refer to Appendix 4, a noise study completed for a project just east of the project area. The thresholds of significance—noise standards—within the City of Placentia and as developed by the U.S. Department of Housing and Urban Management Guidelines and State of California Guidelines are utilized in this document as the applicable Noise Standards applied to the Project in determining whether a significant impact will occur. However, under the Placentia Municipal Code (Section 23.81.170), construction related activities are exempt from noise regulations provided that the activities take place between the hours of 7 a.m. to 7 p.m. Monday through Friday and 9:00 a.m. to 6:00 p.m. on Saturday. No construction activities are allowed on Sundays or Federal Holidays.

Baseline train operations noise levels at the Project site is 79 dB CNEL in the City of Placentia because the Burlington Northern Santa Fe Railroad (BNSF) line is located north and adjacent to the proposed project site. An estimated 50 trains per day, or two trains per hour, travel through this corridor.

CNEL-based standards apply to noise sources whose noise generation is preempted from local control (such as from on-road vehicles, trains, airplanes, etc.). Since local jurisdictions cannot regulate certain transportation noise generators (local jurisdictions are preempted by the State and Federal Governments), they typically exercise land use planning authority on the receiving property. Uses that are amenable to local control are generally considered "stationary sources." Local jurisdictions typically regulate the level of noise that one use may impose upon another.

a) *Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?*

Less Than Significant With Mitigation Incorporated – The Project site is located in an area of a high background noise environment (79 dB, CNEL) due to the presence of the BNSF railroad corridor just north of the project site, as described above. Other sources of ambient noise include traffic along roadways within the TOD project area. Table XII-1 provides existing noise levels along the various Placentia streets identified in the Traffic Impact Study, as well as forecasts into the future. Background noise levels throughout the TOD project area already exceed the residential noise standards for daytime and nighttime periods identified in Table XII-2. The modeled noise data indicate the noise levels “with” and “without” project conditions for the time frames evaluated in the Traffic Impact Study (Appendix 5). Project implementation does not create a change in noise levels greater than a +1.8 db CNEL impact at 50 feet from the roadway centerline. The greatest change is forecast for Crowther Avenue east of Melrose. By 2035, with a larger volume of background traffic, the noise impact at this location decreases to +0.5 dB CNEL. In addition, most roadway segments demonstrate less than a +0.2 dB CNEL noise impact from the proposed project.

From an impact standpoint, noise mitigation (attenuation) will be required for the future residential developments within the TOD area. Most commercial development will benefit from noise mitigation, but it may not be required in all instances. Modest attenuation will be required along Crowther because the maximum CNEL in 2018 (assumes buildout) will not exceed 65 dB CNEL. Other roadways, such as Melrose will slightly exceed the 65 dB CNEL value and will require substantial attenuation to conform to the City’s noise threshold in Table XII-2. From an cumulative adverse noise impact standpoint, the proposed project will not increase noise by 3 dB below 65 dB CNEL or above 1.5 dB CNEL above 65 dB CNEL. Because these cumulative noise thresholds are not exceeded for the proposed project, future noise impacts along roadways will not be considered cumulatively considerable.

Noise mitigation for specific projects will vary in the future and need to be identified for each specific project site. Therefore, the following measure shall be implemented to ensure that future residential and commercial development within the TOD area are not exposed to significant noise levels.

XII-1 ***The City shall require a noise study for each future specific project that will identify whether noise attenuation features (such as dual-paned windows with specific sound transmission features, mechanical ventilation, balcony buffers, or street level buffers) must be installed to meet the City’s noise standards as identified in Table XII-2. This noise study shall be submitted with the project design and noise attenuation features shall be incorporated and identified on design plans submitted to the City for review and approval. Specific measures shall be implemented that demonstrate compliance with City noise standards, or a follow-on CEQA environmental document must be prepared for a project that cannot meet the standards.***

Implementation of this measure can ensure that future development within the TOD project area will not be exposed to noise levels exceeding the City’s significance thresholds.

Table XII-1
NOISE AND LAND USE COMPATIBILITY MATRIX

Land Use Category	**Community Noise Exposure**			
	Ldn or CNEL, dB			
	Normally Acceptable	**Conditionally Acceptable**	**Normally Unacceptable**	**Clearly Unacceptable**
Residential-Low Density	50-60	60-65	65-75	75-85
Residential-Multiple Family	50-60	60-65	65-75	75-85
Transient Lodging-Motel, Hotels	50-65	65-70	70-80	80-85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50-60	60-65	65-80	80-85
Auditoriums, Concert Halls, Amphitheaters	NA	50-65	NA	65-85
Sports Arenas, Outdoor Spectator Sports	NA	50-70	NA	70-85
Playgrounds, Neighborhood Parks	50-70	NA	70-75	75-85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50-70	NA	70-80	80-85
Office Buildings, Business Commercial and Professional	50-67.5	67.5-75	75-85	NA
Industrial, Manufacturing, Utilities, Agriculture	50-70	70-75	75-85	NA

NOTES:

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New Construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

NA: Not Applicable

Source: Modified from U.S. Department of Housing and Urban Development Guidelines and State of California Standards.

Table XII-2
CITY OF PLACENTIA RESIDENTIAL NOISE STANDARDS

Noise Zone	Noise Level	Time Period
Residential	55 db(A) 50 dB(A)	7:00 a.m. – 10:00 p.m. 10:00 p.m. – 7:00 a.m.
Commercial	65 dB(A)	Anytime
Industrial	70 dB(A)	Anytime

b) *Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?*

Less Than Significant With Mitigation Incorporated – Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by vibration of room surfaces is called structure borne noises. Sources of groundborne vibrations include natural phenomena (e.g. earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g. explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous or transient. Vibration is often described in units of velocity (inches per second), and discussed in decibel (dB) units in order to compress the range of numbers required to describe vibration.

Due to the presence of the BNSF railroad corridor just north of the TOD project area, groundborne vibration is present within the area and may occur throughout the project area during construction of future development. Train vibration depends upon a variety of factors. The weight of the train, the travel speed, the condition of the track and the character of the subsoil all affect the observed vibration level. The USDOT (US Department of Transportation) Guideline called “Transit Noise and Vibration Impact Assessment” (May, 2006) suggests a significance threshold of 80 VdB for train vibrations if there are currently approximately 30 train movements per day, 75 VdB for between 30-70 events and 72 VdB for more than 70 events per day.

The closest TOD project area is approximately 100 feet to the track centerline. Vibration levels from heavy rail systems depend upon train travel speed. Freight trains are restricted to a 30-35 mph speed limit in areas of at-grade crossings. The RMS vibration level at 30 mph is approximately 3 VdB less than at 50 mph. A reference vibration level of 74 VdB has therefore been assumed at the closest building façade to the tracks. Vibration generally reduces as it propagates though a building.

Freight train vibration levels of 74 VdB at 115 feet from the track for a locomotive-powered freight train traveling at 30 mph would marginally exceed the VdB annoyance threshold without the effects of coupling losses if there are more than 70 train movements per day, which there are. Vibration mitigation for specific projects will vary in the future and need to be identified for each specific project site. Therefore, the following measure shall be implemented to ensure that future residential and commercial development within the TOD area are not exposed to significant vibration levels.

XII-2 ***The City shall require a vibration study for each future specific project that will identify whether noise attenuation features (such as dual-paned windows, spread footings, or other vibration features) must be installed to meet the 72 VdB vibration threshold recommended for the volume of train traffic. This vibration study shall be submitted with the project design and vibration attenuation features shall be incorporated and identified on design plans submitted to the City for review and approval. Specific measures shall be implemented that demonstrate compliance with the 72 VdB threshold, or a follow-on CEQA environmental document must be prepared for a project that cannot meet the standards.***

Implementation of this measure can ensure that future development within the TOD project area will not be exposed to vibration levels exceeding the referenced significance threshold.

c) *A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?*

Less Than Significant With Mitigation Incorporated – Refer to the analysis in XII. a) above that identifies the potential permanent noise level increase associated with future traffic and the mitigation required to ensure that future TOD development projects will meet the City's noise standards.

d) *A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?*

Less Than Significant With Mitigation Incorporated – As stated in the background provided in this section, the City of Placentia regulated construction noise by setting limits on allowable daytime hours of activity, which is shown in Table XII-2. The nearest sensitive receptors are the residential uses located at specific locations within the TOD project area and those located across Orangethorpe Avenue to the north.

Construction equipment noise levels would range between 80 and 90 dB (L_{eq}) at the about 50 feet from the equipment in use. Construction activities are allowed without limits only between the hours of 7:00 a.m. and 7:00 p.m. as stipulated in the City's Noise Ordinance. There does not appear to be any need for 24-hour construction activities, so the objective for short-term construction noise impacts is to minimize the intrusion on affected noise sensitive land uses, if they exist. The following is a list of potential construction noise mitigation that can be implemented in conjunction with a project that may adversely impact a noise sensitive land use. The specific construction noise mitigation measures that shall be implemented for a specific project must be identified in the noise study required in measure XII-1.

XII-3 ***Future projects that may adversely impact noise sensitive uses shall use noise reducing barriers and other devices to reduce exterior noise levels at the nearest sensitive receptor to 65 CNEL or less during the daytime construction hours. This shall include installation of a temporary construction barrier around the source of construction noise.***

XII-4 ***No construction activities shall occur during the hours of 7 PM through 7 AM, Monday through Saturday and at no time shall construction activities occur on Sundays or holidays, unless a declared emergency exists. Stated differently, construction activities shall be limited to 7 AM to 7 PM on weekdays; and no construction activities on Sunday or federal holidays.***

XII-5 ***Stationary construction equipment that generates noise above the 65 dB threshold at the nearest sensitive receptor shall be placed behind a temporary noise construction barrier while in use.***

XII-6 ***The project developer shall establish a noise complaint response program and shall respond to any noise complaints received for future specific project by measuring noise levels at the affected receptor site. If the noise level exceeds an CNEL of 60 dBA exterior or an CNEL of 45 dBA interior at the sensitive receptor, the applicant will implement adequate measures (which may include portable sound attenuation walls, use of quieter equipment, shift of construction schedule to avoid the presence of sensitive receptors, etc.) to reduce noise levels to the greatest extent feasible.***

XII-7 Project developer will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.

XII-8 Equipment not in use for five minutes shall be shut off.

XII-9 Equipment shall be maintained and operated such that loads are secured from rattling or banging.

XII-10 Where available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.

XII-11 Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unnecessary revving of equipment.

XII-12 No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.

XII-13 Public notice shall be given 10 days prior to initiating construction. This notice shall be provided to all property owners and residents within 300 feet of the project site and shall be provided to property owners/residents at least one week prior to initiating construction. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the project. The public notice shall encourage the adjacent residents to contact the supervisor in the case of a complaint. Resident's would be informed if there is a change in the construction schedule. The supervisor shall be available 24/7 throughout construction by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove or attenuate the sound source causing the complaint.

All of the preceding measures will not be required for every project and may need to be adjusted to minimize intrusion during future construction activities within the TOD project area. The noise study required in measure XII-1 shall identify the specific measures applicable to individual projects in the future.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact – As previously discussed under section VII, the proposed project is not located within two miles of a public airport and is not located in an airport land use plan area and therefore would not expose people residing or working in the project area to excessive noise levels as a result of overhead flights. No impacts are anticipated. No mitigation is required.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact – No private airstrips are located within the vicinity of the project. Implementation of the Project as it has been proposed would not subject people working or residing in the project area to excessive noise levels with operations at a private airstrip. No impacts are anticipated. No mitigation is required.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIII. POPULATION AND HOUSING: Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?			X	
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?			X	
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?			X	

SUBSTANTIATION

a) *Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?*

Less Than Significant Impact – According to SCAG's profile for the City of Placentia (May 2013), the City had a 2012 population of 51,084 persons and an average household size of 3.1 persons per unit, slightly higher than the 3.0 average household size for Orange County as a whole. Under a worst case assumption if the whole approximately 28.2-acre TOD area was developed with 752 residential units (the number of units that along with existing vehicle trips would result in the 5,000 trip cap assuming all residential within the TOD area, refer to Appendix 5, Traffic Impact Study), the population increase within the City under this proposed project could be approximately 1,550 persons (752 units – 11 sfr units = 741 units x 3.1 = 2,297 persons). This equates to an estimated 4.5% increase in the City's overall population (2,297 persons/51,084 persons = 0.04496%). This increase in population is not considered a substantial direct increase and given that this area of the City has sufficient existing infrastructure to serve the future development envisioned for the TOD area, the overall effect of the project will be a less than significant impact on induced growth.

b) *Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?*

Less Than Significant Impact – The project area encompasses approximately 28.2 acres. The area is occupied by mixed uses that include an estimated eleven residences and commercial activities, but primarily industrial uses. The TOD district envisions up to 752 multifamily residential units that will be able to take advantage of the new Metrolink station that will be installed in Placentia. Even if any single-family residence is displaced by future TOD development, at a minimum density of 65 units per acre the loss of single-family residences will be fully offset. Thus, the potential adverse impact under this issue is considered a less than significant impact.

c) *Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?*

Less Than Significant Impact – The analysis in the preceding section b) indicates that a small number of residents (about 34 persons) within the TOD area may be displaced, but a substantially greater number of new residences will be created and offset those lost. Based on the eleven residences located within the project area, substantial numbers of people (estimated to be 34 persons) would not be displaced if the new TOD designation is established. Since future development that may occur within the TOD area will be private developer driven, it is assumed that, if property is assembled that includes the single-family residential property, the property owners will agree to the property purchase and will find alternative housing on their own, including possible occupancy in the new multifamily residential structures. Based on these facts and assumptions, the proposed project is not forecast to cause displacement of substantial numbers of people that would require construction of replacement of housing elsewhere. Thus, the potential adverse impact under this issue is considered a less than significant impact.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XIV. PUBLIC SERVICES: Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a) Fire protection?			X	
b) Police protection?		X		
c) Schools?			X	
d) Recreation/Parks?		X		
e) Other public facilities?				X

SUBSTANTIATION

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

a) Fire protection?

Less Than Significant Impact – The Orange County Fire Authority provides fire protection and emergency response service to the City of Placentia. The nearest fire station, Station 35, is located at the intersection of Chapman Avenue and North Bradford Avenue within one-half mile of the TOD area. The TOD area is presently 100% developed with mixed urban uses, ranging from industrial uses and structures to commercial and single-family residential properties. The proposed project will allow redevelopment to proceed with high density residential use, office and commercial use structures in the TOD district, as well as the reuse of the historic Packing House Building. Many of the existing structures are very old (most more than 50 years old) and they do not include modern fire protection designs, such as fire sprinklers. The new structures that will be built under the TOD designation must incorporate all current fire protection measures included in the current applicable building code. Additionally, refurbishment and reuse of the historic Packing House Building will be required to incorporate all current fire protection measures included in the current building code, including any codes applicable to a historic structure if applicable. This requirement along with the increased value of the developed land, which will generate additional property tax, is considered sufficient to control impacts on the fire protection and emergency response system to a less than significant impact level. No substantial changes in existing fire protection facilities will result from implementing the proposed project.

b) Police protection?

Less Than Significant With Mitigation Incorporated – As noted in the preceding discussion regarding fire protection, the TOD area is already 100% developed with mixed urban uses. The proposed project would allow up to 5,000 new daily trips through a mixture of residential, office and commercial uses. These trips include the possibility of up to 752 new residential units at high density within the scope of the plans for the TOD project area. The City of Placentia Police Department provides police protection and assists with emergency responses to the project area. The proposed multifamily residential uses that can be developed within the project area, if the TOD district is approved, can add approximately 2,297 new City residents, assuming a density of 3.1 persons per unit. Based on current staffing levels at the City, between 50 and 60 sworn officers, the addition of these potential residents would require approximately one to two additional sworn officers, based solely on population. There are a variety of ways to assess the need for additional police officers, but using the population methodology would require proposed future development to demonstrate adequate funds to support additional police manpower. This can be accomplished by requiring the preparation of a fiscal impact analysis documenting future tax revenues or documenting with some detailed information that additional law enforcement personnel are not required. The following mitigation measure will be implemented.

XIV-1 Future projects implemented under the TOD district shall submit a fiscal impact analysis focused on law enforcement and recreation demand and costs to evaluate the need for additional fees to support these two City services. The documentation shall be reviewed and approved by the City and if additional fees must be paid, the City shall impose them as conditions of approval for the future projects either directly or through creation of a community facilities district. Alternatively, if the City imposes a Public Safety Impact Fee, this fee shall provide sufficient funding for the increased demand for these services.

Implementation of this measure can ensure that adequate law enforcement personnel are available to meet demand for law enforcement services from future TOD-related development.

c) Schools?

Less Than Significant Impact – The TOD designation includes the possibility of developing up to 752 new residential units at high density within the scope of the plans for the TOD district. Assuming average generation of 1.1 new students per unit, this would result in about 827 new students. This is a conservative value that may be less due to the type of new residential units. New residential units, office uses and commercial uses can bring new residents to the City. The state has mandated (SB 50) that payment of fees established for each new residential unit is sufficient to offset potential impacts to the affected school system(s). Based on this finding and the mandatory requirements for developers to pay fees per residential unit as well as the required development impact fees for future office and commercial development, the proposed project will not cause a significant adverse impact due to generation of new students. Thus, school impacts are considered less than significant.

d) Recreation/Parks?

Less Than Significant With Mitigation Incorporated – The proposed project may generate approximately 2,297 new residents in the City of Placentia. These residents will increase the demand for City parks and recreation facilities by some unquantifiable amount. Mitigation measure XIV-1 will provide the detailed evaluation of future TOD district project impacts on recreation and park facilities and indicate whether specific fees need to be collected to offset project-related demand for such facilities. Such fees, if justified, may be collected under the Quimby Act or as conditions of approval, particularly if future projects incorporate recreation components that may offset demand on public facilities. With implementation of measure XIV-1 impacts to recreation and park resources can be reduced to a less than significant impact.

e) Other public facilities?

No Impact – No other public facilities have been identified that might be impacted by the TOD project district.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XV. RECREATION:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?		X		
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?		X		

SUBSTANTIATION

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Less Than Significant With Mitigation Incorporated – Please refer to the discussion under issue XIV.d and mitigation measure XIV-1. Implementation of new residences under the TOD district, as well as jobs generated from the commercial and office development under the TOD district can increase the use of public recreation and park facilities to the point that substantial physical deterioration could occur or could be accelerated. Until a specific profile of the future residents is developed and an evaluation of their demand for recreation/park facilities is discussed in some detail (including private recreational facilities provided by individual developments), it is not possible to forecast specifically whether future demand related to future TOD projects will cause adverse impact on recreational resources. Implementation of measure XIV-1 can provide sufficient information for each specific project to determine whether fees may be required to offset future project-specific demand for such facilities. With implementation of measure XIV-1 potential impacts to recreation/park facilities can be reduced to a less than significant impact level.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

Less Than Significant With Mitigation Incorporated – Please refer to the discussion under issue XV.a and mitigation measures XIV-1. Consistent with the discussion under a) above, mitigation measure XIV-1 will provide specific data to allow a determination by the City of the need for additional recreation/park area(s) and the proportional fees that future TOD-related projects may need to pay to offset demand. With implementation of measure XIV-1 potential demand for additional recreation/park facilities can be reduced to a less than significant impact level.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVI. TRANSPORTATION / TRAFFIC: Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?		X		
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?		X		
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		X		
e) Result in inadequate emergency access?		X		
f) Result in inadequate parking capacity?			X	
g) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?		X		

SUBSTANTIATION

a) *Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?*

Less Than Significant Impact With Mitigation Incorporated – Under the proposed TOD designation, an expected maximum of 5,000 net daily trips are expected to be generated as a result of the project's implementation. Level of service (LOS) analyzes roadway operations and the relationship between capacity, traffic volumes, and delay resulting in LOS grades A through F (F being the lowest). The project's Traffic Impact Study prepared by Albert Grover & Associates dated August 18, 2016 and amended January 19, 2017 (provided as Appendix 5), analyzed 15 intersections within the Project Area and alternative street designs for Crowther Avenue. However, this traffic study prepared for the TOD project, is not a typical traffic study because a significant portion of the trips generated from the TOD project area are expected to be internal when buildout is achieved and will be to/from the planned Placentia Metrolink Station. Thus, under the TOD designation, a factor of 35% transit-oriented trips was used to determine the net number of trips to and from the Project Area as a maximum 5,000 trips.

The Traffic Study analyzed the LOS of 15 intersections under six scenarios for both morning and afternoon peak hours: Existing (2016) Conditions without Project Scenario; Existing (2016) Conditions with Project Scenario; Opening Day (Year 2018) Conditions without Project Scenario; Opening Day (Year 2018) Conditions with Project Scenario; Future Buildout (Year 2035) Conditions without Project Scenario; and Future Buildout (Year 2035) Conditions with Project Scenario. The City of Placentia's criteria for acceptable signalized intersections LOS is D or better, and a significant impact occurs when the signalized intersection operates at LOS E or F. All 15 intersections, at present, are currently operating within the City's "acceptable" criteria. Additionally, all signalized study intersections and unsignalized project driveway intersections operate at acceptable LOS D or better during the Existing and Opening Day Conditions with or without the project. According to the Traffic Study, the following intersections would be operating at deficient LOS of E or F by Future Buildout (2035) without the project based on the projected Citywide Future Buildout per the City of Placentia Draft General Plan Update: Chapman Avenue/SR-57 Southbound Ramps (PM); Chapman Avenue/SR-57 Northbound Ramps (AM and PM); Placentia Avenue/Crowther Avenue (PM); Orangethorpe Avenue/Placentia Avenue (PM); Orangethorpe Avenue/SR-57 Northbound Ramps (PM); and Orangethorpe Avenue/Melrose Street (PM); Kraemer Boulevard/Orangethorpe Avenue (AM and PM). For the Future Buildout "with Project" (2035) scenario, the LOS does not change at more than half of the study intersections, and most of the study intersections would operate at a deficient LOS under the "without Project" (2035) conditions and continue to remain deficient under "with Project" conditions. However, no new intersections would be impacted under the Future Buildout with Project (2035) scenario, instead several intersections would be more significantly impacted. Therefore, in order to mitigate and offset the impacts from the creation of the TOD district, the following mitigation measures will be implemented:

XVI-1 ***Each future TOD project shall pay fair share fees for the intersection improvement costs at the time of entitlement based on the percentage of trips contributed at each intersection. A high level "order of magnitude" cost estimate is also provided in subsequent mitigation identified in the Traffic Impact Study. These are rough estimate costs for engineering and construction and will need to be refined during future preliminary engineering phase. The mitigation measures should be re-evaluated for any refinement of the Draft General Plan Update and/or additional development of the TOD project over and beyond 5,000 trips. All significantly impacted intersections require mitigation prior to Future Buildout. Mitigation for each intersection and estimated costs are listed below:***

- ***Placentia/Crowther Avenue: Upgrade left turn signal phasing for all movements from permissive left turns to protected/permissive left turn phasing. Estimated Cost - $100,000;***
- ***Orangethrope Avenue/Placentia Avenue: Provide eastbound/westbound dual left-turn Lanes at Orangethorpe Avenue/Placentia Avenue. Estimated Cost - $450,000;***
- ***Orangethorpe Avenue/SR-57 Northbound Ramps: Restripe Northbound Off-Ramp middle lane as shared Left-Turn/Thru/Right-Turn Lane. Estimated Cost - $50,000;***

- ***Orangethorpe Avenue/SR-57 Northbound Ramps: The westbound right turn movement is expected to increase from 550 vehicles per hour (vph) to 800 vph during the PM period for year 2035. This movement should be closely monitored and may require additional improvements to reduce congestion and queuing. An additional improvement would be to modify the existing median on Orangethorpe Avenue to add an exclusive Westbound Right-Turn Lane. Estimated Cost - $200,000;***
- ***Orangethorpe Avenue/Melrose Street: Provide an exclusive southbound right-turn lane without overlap signal phasing and northbound dual left-turn lanes at Orangethorpe Avenue/Melrose Street. Estimated Cost - $100,000;***
- ***Kraemer Boulevard/Orangethorpe Avenue: Restripe Orangethrope Ave to provide eastbound dual left-turn lanes. Add additional north/south thru lane (three lanes each) by restriping the northbound and southbound right turn lanes to thru lanes. Consider modifying the north/south left-turn movements from protected-only left-turn phasing to protected-permissive left-turn phasing. Restripe the southbound left-turn approach to provide a positive offset for better sight distance between the north/south left turn movements. Estimated Cost - $100,000.***

With implementation of the above mitigation measure, any long-term impacts that would result from the proposed TOD project are reduce to a less than significant impact on the circulation system. The proposed project also has the potential to impact the flow of traffic during the construction phase of the TOD implementation. In order to minimize any short-term construction impacts, the developer of each project shall be subject to the following mitigation measures:

XVI-2 ***Truck access for the parcel on the southwest corner of Melrose Street and Crowther Avenue must be maintained to and from this site.***

XVI-3 ***Construction hours should be five days a week, and in accordance with the City of Placentia Municipal Code, limited to the hours of 7 AM and 7 PM on working days (Monday through Friday).***

XVI-4 ***Construction truck and worker automobile traffic will utilize the proposed driveways along Melrose Street and Crowther Avenue for access to and from the project site.***

XVI-5 ***Trucks transporting materials to and from the project site must utilize the designated truck routes along Placentia Avenue, Crowther Avenue, Melrose Street, and Orangethorpe Avenue.***

XVI-6 ***Trucks entering or exiting the construction site will need to yield to public traffic at all times.***

XVI-7 ***It is unlikely that street traffic will be impacted by on-site construction activities; however, should it be necessary for temporary lane closures and/or detour routes for utility work or other such work in the public right-of-way those temporary traffic control activities are to be conducted in compliance with the requirements and guidelines outlined in the California Manual of Uniform Traffic Control Devices (MUTCD)***

XVI-8 ***Construction staging should be conducted on-site and under no circumstances will be allowed on local or residential streets.***

XVI-9 ***Construction work within the public right-of-way needs to be in compliance with City standards and the construction site shall be posted with the name, company and a phone number of a person to call for complaints.***

XVI-10 ***The applicant will be fully responsible for the repair of damages to any public facility due to the hauling or transporting of construction related materials.***

XVI-11 ***Parking for the construction trucks and worker trucks will be on-site, away from the adjacent public roadways and existing active businesses.***

With implementation of the above mitigation measures, any impacts from construction activities as a result of developing within the TOD project area are considered less than significant. No further mitigation is required.

To further enhance the focus on TOD experience along Crowther Avenue, the City requested that the traffic consultant evaluate the possibility of configuring Crowther as a Two-Lane Facility rather than a Four-Lane Facility. Figure XVI-1 shows the two alternative configurations and the evaluation indicates that throughout the planning period will be able to handle the forecast traffic on Crowther. Towards the buildout date of 2035, the roadway will still meet or exceed the approximate 22,000 vehicles per day maximum average daily traffic. This is a design issue and if the City seeks to maintain the Two-Lane Configuration permanently, it would have to seek concurrence from the Orange County Transportation Agency (OCTA), including a possible amendment to the OCTA Master Plan of Arterial Highways (MPAH). Since this issue does not need to be resolved at this time due to low traffic volumes on Crowther, the City can address the ultimate design of Crowther and modifications to the MPAH in the future when this issue rises to a level of concern.

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

Less Than Significant Impact With Mitigation Incorporated – Please see the response under XVI.a. above. Implementation of mitigation measures XVI-1 through XVI-11 will reduce potential impacts associated with maintaining Level of Service standards to a less than significant level.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks?

No Impact – As discussed in Section VIII above, the project is not located within the vicinity of any airports. As a result, the project would not result in any changes in air traffic patterns, either at Fullerton Municipal Airport, located approximately 8 miles to the west of the project site, or John Wayne Airport, located approximately 15 miles to the south of the project site. Therefore, project implementation will not result in a change to air traffic patterns at the airport. No significant impacts are anticipated and no mitigation measures are required.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Less Than Significant Impact With Mitigation Incorporated – The proposed project is located in an area that contains existing development. The project design does not include the construction of any sharp curves or dangerous intersections along existing roadways. Future projects will not include the construction of any structure or feature that will create a substantial increase in hazards due to a design feature. All future development under the TOD designation will be reviewed by the City to ensure that no incompatible uses or hazards due to a design feature are created. Access to the site, as previously stated under issue XVI.a. above must comply with all City design standards. Mitigation measure XVI-1 will serve as sufficient mitigation to offset any future impacts under this issue. Not further impacts are anticipated, and no further mitigation is required.

e) Result in inadequate emergency access?

Less Than Significant Impact With Mitigation Incorporated – Please see the response under XVI.a. above. Implementation of mitigation measures XVI-1 through XVI-11 will reduce potential impacts associated with inadequate emergency access both during construction and once the TOD area is developed to a less than significant level.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Less Than Significant Impact With Mitigation Incorporated – The proposed project will increase the availability of public transit, as the purpose of the project is to create a Transit-Oriented Development within the City to serve the residents by developing a TOD district (multi-use, higher density development) around the City's future Metrolink Station. According to the Traffic Study, pedestrian sidewalks surround the site, and the adjacent streets are sufficient width to accommodate bicycle traffic. Thus, the project is not expected to have a negative impact on any alternative modes of transportation. However, the TOD area is not currently served by OCTA bus routes, and as part of the creation of the TOD district, the City will need to confer with OCTA to discuss and plan future bus routes that will serve the future Metrolink Station. With implementation of mitigation, future TOD project will not directly conflict with any adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities, and therefore any impacts under this issue are considered less than significant.

XVI-12 The City shall coordinate with OCTA to ensure that one or more bus routes to the future Placentia Metrolink Station will serve the TOD project area.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVII. UTILITIES AND SERVICE SYSTEMS – Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?			X	
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?		X		
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?		X		
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?		X		
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?		X		
f) Be served by a landfill(s) with sufficient permitted capacity to accommodate the project's solid waste disposal needs?			X	
g) Comply with federal, state, and local statutes and regulations related to solid waste?			X	

SUBSTANTIATION

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

Less Than Significant Impact – The issue of water quality and Regional Board treatment requirements is addressed in the Hydrology Section under issue IX.a). The proposed project will deliver wastewater generated from the residences to the regional wastewater reclamation plant operated by Orange County. Residential and commercial wastewater rarely contains constituents that would cause a wastewater treatment plant to exceed Regional Board requirements as established in Waste Discharge Requirements (WDR). No adverse impact from generation of wastewater onsite is forecast to result from project implementation. Although not considered "wastewater" the Regional Board through the regional MS-4 permit requires management of stormwater runoff to prevent indirect source (non-point source) contamination of surface runoff in the Santa Ana River Basin. As described in Section IX.a), the proposed project is implementing storm water quality controls that will meet the current requirements of the Regional Board. Based on these findings, the proposed project will not cause a violation of wastewater treatment requirements of the Regional Board.

b) *Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?*

Less Than Significant With Mitigation Incorporated – Although the proposed project will increase the intensity of use within the TOD area, it will add only minimal outdoor (landscape) water demand and based on past experience, multi-family residences use much less water than new single-family residences. Future residential and commercial projects will also generate additional municipal wastewater above that currently being generated. The scope of these changes in the existing water consumption and wastewater generation will, to a large extent, depend on the efficiency of the fixtures incorporated into the design of new facilities when compared to the water consumption of existing development. Because of this issue is currently open ended, the following mitigation measure will be implemented to ensure that neither the water or wastewater utility systems serving the TOD project area will be subject to a significant impact that would require new water or wastewater to expand in a manner that could cause significant environmental effects.

XVII-1 ***Future projects implemented under the TOD district shall submit a detailed evaluation of water demand and wastewater generation based on the fixtures that will be installed. This information shall be compared to the current demand by existing development and a net impact determination made. This net impact shall be compared to available water supply capacity and wastewater treatment capacity of the serving utility systems. If the demand/generation exceeds the capacity of either utility system, the modifications to the system(s) shall be evaluated and a determination of indirect impact reached in a second tier environmental document. The documentation shall be reviewed and approved by the City and if specific measures must be implemented, the City shall impose them as conditions of approval for the future projects. In no instance shall a project be approved that would cause significant environmental effects on either the water or wastewater system, including adequacy of water supplies and treatment capacity. Mitigation in the form of offsets, such as funding water conservation or wastewater generation reductions at other location, shall be implemented where deemed necessary.***

c) *Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?*

Less Than Significant With Mitigation Incorporated – As described in Section IX, the TOD area is essentially 100% impervious due to previous urban development. The existing drainage system has been designed to accommodate runoff from the project area. Although it is unlikely that additional runoff will be generated by the proposed project, future TOD development shall document that runoff will not be increased. This shall be done in accordance with the following mitigation measure.

XVII-2 ***Future projects implemented under the TOD district shall submit a detailed evaluation of stormwater drainage from the new project relative to the existing development. If the future project will generate stormwater runoff that exceeds the existing volume or time of accumulation, onsite stormwater detention shall be installed as part of the site development of offset any increase that would exceed the capacity of the existing stormwater collection and transport systems. In no instance shall a project be approved that would cause significant environmental effects on either the existing drainage***

system, unless the system incremental stormwater increase is detained onsite or the drainage system altered to accommodate any change.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Less Than Significant With Mitigation Incorporated – As noted under issue XVII.b, adequacy of water supply cannot be effectively determined until an evaluation of the difference between current consumption and future consumption is defined. Mitigation measure XVII-1 will provide this information to ensure that future development does not cause significant impact to water demand/supply issues.

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Less Than Significant With Mitigation Incorporated – As noted under issue XVII.b, adequacy of wastewater treatment capacity cannot be effectively determined until an evaluation of the difference between current generation and future generation is defined. Mitigation measure XVII-1 will provide this information to ensure that future development does not cause significant impact to existing facilities operated by the area's wastewater treatment provider.

f) Be served by a landfill(s) with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Less Than Significant Impact – The City of Placentia is primarily served by the Olinda Landfill, operated by Orange County and located in Brea, California. This facility is permitted to operate through 2030. Due to the large available daily and long-term capacity at this landfill, the proposed project is not forecast to cause any adverse impact on the continued operation because it has sufficient permitted capacity to accept the project's solid waste disposal needs.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

Less Than Significant Impact – The proposed project is subject to Assembly Bill 1327, Chapter 18, Solid Waste Reuse and Recycling Access Act of 1991 (Act). The Act requires that adequate areas be provided for collecting and loading recyclable materials such as paper products, glass, and other recyclables. The project must conform to the City's requirements to ensure compliance with the Act. Based on these factors, it is anticipated that the project will have a less than significant impact related to compliance with statutes and regulations.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact or Does Not Apply
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE:				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?			**X**	
b) Does the project have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals?			**X**	
c) Does the project have impacts that are individually limited, but cumulatively con-siderable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?		**X**		
d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		**X**		

SUBSTANTIATION

The analysis in this Initial Study and the findings reached indicate that the proposed TOD GPA and Zone Change, including Development Standards, can be implemented without causing any new project specific or cumulatively considerable unavoidable significant adverse environmental impacts. Mitigation is required to control potential environmental impacts of the proposed project to a less than significant impact level. The following findings are based on the detailed analysis in the Initial Study of all environmental topics and the implementation of the mitigation measures identified in the previous text and summarized following this section.

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Less Than Significant Impact – The Project has no potential to adversely impact any biological resources. No mitigation was required or identified. The project has been identified as having no potential to degrade the quality of the natural environment, substantially reduce habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal. The Project site is in an urban area with developed structures and infrastructure surrounding the property and no natural biological habitat exists within the APE. Based on the historic disturbance of the site, and its current disturbed condition, the potential for impacting archaeological is low, but mitigation is required to address the potential for historic resources due to the age of many of the structures within the TOD project area. Please see biological and cultural sections of this Initial Study.

b) *Does the project have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals?*

Less Than Significant Impact – The proposed project reflects the City and applicant's objective of creating a Transit-Oriented Development (TOD) land use district in conjunction with the future Metrolink Passenger Station. The creation of such a district meets a regional goal of higher density residential development associated with mixed commercial and service uses. Thus, based on the project's objectives and the lack of any significant adverse environmental impacts, this project meets both the short- and long-term environmental goals of the City of Placentia, with no identifiable disadvantage for either circumstance.

c) *Does the project have impacts that are individually limited, but cumulatively considerable? "Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?*

Less Than Significant With Mitigation Incorporated – Based on the analysis in this Initial Study, the proposed TOD land use district has been evaluated as not having the potential to cause impacts that are individually or cumulatively considerable. There are no other projects in the project vicinity to which this project would contribute to a cumulatively considerable impact. The issues of Aesthetics, Air Quality/GHG, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Noise, Public Services, Recreation, Transportation and Utilities require the implementation of mitigation measures to reduce impacts to a less than significant level and ensure that cumulative effects do not rise to a level of cumulatively considerable. All other environmental issues were found to have no significant impacts without implementation of mitigation. The potential cumulative environmental effects of implementing the proposed project have been determined to be less than considerable and thus, less than significant impacts.

d) *Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?*

Less Than Significant With Mitigation Incorporated – The proposed project includes activities that have a potential to cause direct substantial adverse effects on humans. The issues of Aesthetics, Air Quality/GHG, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Noise, Public Services, Recreation, Transportation and Utilities require the implementation of mitigation measures to reduce human impacts to a less than significant level. All other environmental issues were found to have no significant impacts on humans without implementation of mitigation. The potential for direct human effects from implementing the proposed project have been determined to be less than significant.

<u>Conclusion</u>

This document evaluated all CEQA issues contained in the latest Initial Study Checklist form. The evaluation determined that either no impact or less than significant impacts would be associated with the issues of agricultural and forestry resources, biological resources, land use and planning, mineral resources, and population/housing. The issues of Aesthetics, Air Quality/GHG, Cultural Resources

Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Noise, Public Services, Recreation, Transportation and Utilities require the implementation of mitigation measures to reduce impacts to a less than significant level. The required mitigation has been proposed in this Initial Study to reduce impacts for these issues to a less than significant impact.

Based on the findings in this Initial Study, the City of Placentia proposes to adopt a Mitigated Negative Declaration (MND) for the TOD GPA and Zone Change Project, including the proposed Development Standards. A Notice of Intent to Adopt a Mitigated Negative Declaration (NOI) will be issued for this project by the City of Placentia. The Initial Study and NOI will be circulated for 30 days of public comment because this project appears to involve future interactions with Caltrans as either a responsible or trustee agency. At the end of the 30-day review period, a final MND package will be prepared and it will be reviewed by the City of Placentia for possible adoption at a future City Council meeting, the date for which has yet to be determined. If you or your agency comments on the MND/NOI for this project, you will be notified about the meeting date in accordance with the requirements in Section 21092.5 of CEQA (statute).

SUMMARY OF MITIGATION MEASURES

Aesthetics

I-1 Prior to approval of any new TOD facilities within the project area, the applicant shall submit an evaluation of the scenic value of structures that will be replaced by the new TOD facility. Based on the findings, the following actions may be required: no further action if no resource; recordation of the scenic values of a structure if merited; and integration of existing building scenic elements into the new building design. Implementation of these measures will avoid loss of any scenic resource values due to future TOD-related development within the project area.

I-2 Future developers shall submit an analysis of potential glare from lighting or sunlight that may impact vehicles on adjacent roadways or structures. This analysis shall demonstrate that due to building orientation or exterior treatment of windows, no significant light or glare impacts may be caused that could adversely impact driver safety on the adjacent roadways or occupied structures in the vicinity of the new development. This analysis shall be submitted to the City for review and approval prior to issuance of the final building permit(s) for new structures within the TOD area.

I-3 Future developers shall submit an analysis that potential lighting from new structures does not create an adverse light impact on adjacent structures. This analysis shall demonstrate that based on an approved lighting plan for new structures, adjacent structures or areas are not exposed to intrusive or harmful amounts of light. This analysis shall be submitted to the City for review and approval prior to issuance of the final building permit(s) for new structures within the TOD area.

Air Quality

III-1 For each future project implemented within the TOD project area, the development shall identify project construction related emissions and specific best available control measures (BACMs) identified in Rule 403 required to ensure that fugitive dust or construction equipment exhaust emissions will not exceed SCAQMD construction thresholds of significance or emission concentrations at the nearest receptors identified by local significance thresholds. The specific BACMs identified shall be made conditions of approval to ensure implementation.

III-2 Only “Low-Volatile Organic Compounds” paints (no more than 100 gram/liter of VOC) and/or High Pressure Low Volume (HPLV) applications consistent with South Coast Air Quality Management District Rule 1113 shall be used.

III-3 As individual projects are submitted for entitlements in the future, the City will maintain a record of each individual project’s forecast trip generation and net area source emissions. When total trip generation (including the 1,247 existing trips) approaches 4,500, the City will not consider additional project entitlements within the TOD area, unless actual field monitoring of trips and area source verifies that actual trip generation is measured as being less than the SCAQMD thresholds when the verification is calculated. Field monitoring can consist of measuring trips and area source emissions from individual developments or monitoring trips on the local roadways entering and leaving the TOD area. Other verifiable measures may also be used to verify total trips, including interviews with residents or owners of businesses and verification of actual area source emissions. If the data indicate that the 5,000 trip ADT will be exceeded, the City will perform a new environmental evaluation in compliance with CEQA to assess whether continued development within the TOD area will exceed the emission significance thresholds in place at the time of measurement.

III-4 For each future project implemented within the TOD project area that can generate offensive odors, the development shall identify project-specific best available control measures (BACMs) for the specific odors that ensure adjacent sensitive receptors will not be exposed to odor concentrations that would conflict with residential uses. The specific BACMs identified for odor control shall be made conditions of approval to ensure implementation.

Cultural Resources

V-1 Prior to demolition of any structure greater than 50 years in age in support of a TOD facility, the City will require a comprehensive historical resource evaluation of the structure. If it is determined that the structure has significant historical value, specific management actions will be defined to reduce impacts to a less than significant impact level. If mitigation to a less than significant historical impact level cannot be achieved, the City will require the preparation of a second tier environmental document, most probably EIR, prior to allowing the TOD project to proceed.

Geology and Soils

VI-1 Prior to approval of specific development projects within the TOD area in the future, the City will require comprehensive documentation of the erosion control and water quality best management practices (BMPs) that will be implemented by a proposed site specific project. This documentation shall demonstrate that erosion, sedimentation and discharge of storm water from the site during construction and after development will not cause degradation of storm water runoff from the project site that could cause or contribute to a violation of the beneficial uses and water quality standards downstream from the project site.

VI-2 Concurrent with accepting an application for a residential structures within the TOD area, the developer shall submit a professionally prepared geotechnical report that includes geotechnical design specifications for the proposed structure at the project site. These design specifications shall demonstrate that any site specific sources of instability can be controlled to a less than significant impact level and these requirements shall be implemented through a condition of approval imposed by the City on the proposed structure.

Greenhouse Gas Emissions

VII-1 As individual projects are submitted for review in the future, the City will require a GHG emission forecast for proposed construction activities. If construction-related GHG emissions exceed regionally accepted thresholds, the City will require mitigation to offset such emissions. Mitigation may be in the form of GHG emission offsets or credits obtained from other projects or mitigation banks. If the data indicate that the construction GHG emissions will exceed thresholds of significance in place at the time of construction after application of mitigation, the City will perform a new environmental evaluation in compliance with CEQA to assess whether continued development will exceed the emission significance thresholds in place at the time of measurement.

VII-2 As individual projects are submitted for entitlements in the future, the City will require a GHG evaluation on each project and ensure that project-related GHG emissions do not exceed the 3,000 MTCO2(e) threshold. Where this threshold will be exceeded, the City will require the developer to provide project-related GHG emission reductions (such as higher energy conservation), use of recycled water or other GHG reduction measures. The City will also accept verifiable GHG emission offsets from projects. However, if the data indicate that the project specific GHG threshold will be exceeded, the City will perform a new environmental evaluation in compliance with CEQA to assess whether the development within the TOD area will exceed the emission significance thresholds.

Hazards and Hazardous Materials

VIII-1 All spills or leakage of petroleum products or other hazardous materials during construction activities will be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately licensed disposal or treatment facility. This measure will be incorporated into the SWPPP or erosion control plan prepared for site specific development within the project area.

VIII-2 Prior to approval of any project under the TOD designation, a Phase I and/or Phase II Environmental Site Assessment shall be prepared to document the potential for any residual contamination at a site being developed within the TOD area. Any identified residual contamination shall be remediated to a level that will permit residential use prior to approval of any project proposed under the TOD designation.

Hydrology and Water Quality

IX-1 Concurrent with individual project applications in the future, the applicant for a project in the TOD area shall submit a review of existing water consumption on the property, and a forecast of future water consumption by the proposed development. If water consumption by the new project is less than currently occurs on the property, no further action is required. If water consumption is forecast to increase by more 25% than current water demand or 5,000 gallons per day per acre, the project applicant shall fund sufficient water conservation measures within the project area (including the proposed project) to offset the increase in demand on the local water purveyor. Specific conservation measures that can by funded include, but are not limited to: use of recycled water for exterior landscaping, ultra low flush toilets; interior water fixtures that reduce water consumption, such as on-demand water heaters; replacement of existing high water demand landscaping with xeric landscaping; installation of smart landscape/irrigation management/control systems (such as drip systems); and use of onsite low water demand landscaping. To verify adequate water demand offset, the City shall consult with the local water purveyor and verify the adequacy of the offset.

Noise

XII-1 The City shall require a noise study for each future specific project that will identify whether noise attenuation features (such as dual-paned windows with specific sound transmission features, mechanical ventilation, balcony buffers, or street level buffers) must be installed to meet the City's noise standards as identified in Table XII-2. This noise study shall be submitted with the project design and noise attenuation features shall be incorporated and identified on design plans submitted to the City for review and approval. Specific measures shall be implemented that demonstrate compliance with City noise standards, or a follow-on CEQA environmental document must be prepared for a project that cannot meet the standards.

XII-2 The City shall require a vibration study for each future specific project that will identify whether noise attenuation features (such as dual-paned windows, spread footings, or other vibration features) must be installed to meet the 72 VdB vibration threshold recommended for the volume of train traffic. This vibration study shall be submitted with the project design and vibration attenuation features shall be incorporated and identified on design plans submitted to the City for review and approval. Specific measures shall be implemented that demonstrate compliance with the 72 VdB threshold, or a follow-on CEQA environmental document must be prepared for a project that cannot meet the standards.

XII-3 Future projects that may adversely impact noise sensitive uses shall use noise reducing barriers and other devices to reduce exterior noise levels at the nearest sensitive receptor to 65 CNEL or less during the daytime construction hours. This shall include installation of a temporary construction barrier around the source of construction noise.

XII-4 No construction activities shall occur during the hours of 7 PM through 7 AM, Monday through Saturday and at no time shall construction activities occur on Sundays or holidays, unless a declared emergency exists. Stated differently, construction activities shall be limited to 7 AM to 7 PM on weekdays; and no construction activities on Sunday or federal holidays.

XII-5 Stationary construction equipment that generates noise above the 65 dB threshold at the nearest sensitive receptor shall be placed behind a temporary noise construction barrier while in use.

XII-6 The project developer shall establish a noise complaint response program and shall respond to any noise complaints received for future specific project by measuring noise levels at the affected receptor site. If the noise level exceeds an CNEL of 60 dBA exterior or an CNEL of 45 dBA interior at the sensitive receptor, the applicant will implement adequate measures (which may include portable sound attenuation walls, use of quieter equipment, shift of construction schedule to avoid the presence of sensitive receptors, etc.) to reduce noise levels to the greatest extent feasible.

XII-7 Project developer will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.

XII-8 Equipment not in use for five minutes shall be shut off.

XII-9 Equipment shall be maintained and operated such that loads are secured from rattling or banging.

XII-10 Where available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.

XII-11 Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unnecessary revving of equipment.

XII-12 No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.

XII-13 Public notice shall be given 10 days prior to initiating construction. This notice shall be provided to all property owners and residents within 300 feet of the project site and shall be provided to property owners/residents at least one week prior to initiating construction. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the project. The public notice shall encourage the adjacent residents to contact the supervisor in the case of a complaint. Resident's would be informed if there is a change in the construction schedule. The supervisor shall be available 24/7 throughout construction by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove or attenuate the sound source causing the complaint.

Public Services

XIV-1 Future projects implemented under the TOD district shall submit a fiscal impact analysis focused on law enforcement and recreation demand and costs to evaluate the need for additional fees to support these two City services. The documentation shall be reviewed and approved by the City and if additional fees must be paid, the City shall impose them as conditions of approval for the future projects either directly or through creation of a community facilities district. Alternatively, if the City imposes a Public Safety Impact Fee, this fee shall provide sufficient funding for the increased demand for these services.

Transportation / Traffic

XVI-1 Each future TOD project shall pay fair share fees for the intersection improvement costs at the time of entitlement based on the percentage of trips contributed at each intersection. A high level “order of magnitude” cost estimate is also provided in subsequent mitigation identified in the Traffic Impact Study. These are rough estimate costs for engineering and construction and will need to be refined during future preliminary engineering phase. The mitigation measures should be re-evaluated for any refinement of the Draft General Plan Update and/or additional development of the TOD project over and beyond 5,000 trips. All significantly impacted intersections require mitigation prior to Future Buildout. Mitigation for each intersection and estimated costs are listed below:

- Placentia/Crowther Avenue: Upgrade left turn signal phasing for all movements from permissive left turns to protected/permissive left turn phasing. Estimated Cost - $100,000;
- Orangethrope Avenue/Placentia Avenue: Provide eastbound/westbound dual left-turn Lanes at Orangethorpe Avenue/Placentia Avenue. Estimated Cost - $450,000;
- Orangethorpe Avenue/SR-57 Northbound Ramps: Restripe Northbound Off-Ramp middle lane as shared Left-Turn/Thru/Right-Turn Lane. Estimated Cost - $50,000;
- Orangethorpe Avenue/SR-57 Northbound Ramps: The westbound right turn movement is expected to increase from 550 vehicles per hour (vph) to 800 vph during the PM period for year 2035. This movement should be closely monitored and may require additional improvements to reduce congestion and queuing. An additional improvement would be to modify the existing median on Orangethorpe Avenue to add an exclusive Westbound Right-Turn Lane. Estimated Cost - $200,000;
- Orangethorpe Avenue/Melrose Street: Provide an exclusive southbound right-turn lane without overlap signal phasing and northbound dual left-turn lanes at Orangethorpe Avenue/Melrose Street. Estimated Cost - $100,000;
- Kraemer Boulevard/Orangethorpe Avenue: Restripe Orangethrope Avenue to provide eastbound dual left-turn lanes. Add additional north/south thru lane (three lanes each) by restriping the northbound and southbound right turn lanes to thru lanes. Consider modifying the north/south left-turn movements from protected-only left-turn phasing to protected- permissive left-turn phasing. Restripe the southbound left-turn approach to provide a positive offset for better sight distance between the north/south left turn movements. Estimated Cost - $100,000.

XVI-2 Truck access for the parcel on the southwest corner of Melrose Street and Crowther Avenue must be maintained to and from this site.

XVI-3 Construction hours should be five days a week, and in accordance with the City of Placentia Municipal Code, limited to the hours of 7 AM and 7 PM on working days (Monday through Friday).

XVI-4 Construction truck and worker automobile traffic will utilize the proposed driveways along Melrose Street and Crowther Avenue for access to and from the project site.

XVI-5 Trucks transporting materials to and from the project site must utilize the designated truck routes along Placentia Avenue, Crowther Avenue, Melrose Street, and Orangethorpe Avenue.

XVI-6 Trucks entering or exiting the construction site will need to yield to public traffic at all times.

XVI-7 It is unlikely that street traffic will be impacted by on-site construction activities; however, should it be necessary for temporary lane closures and/or detour routes for utility work or other such work in the public right-of-way those temporary traffic control activities are to be conducted in compliance with the requirements and guidelines outlined in the California Manual of Uniform Traffic Control Devices (MUTCD)

XVI-8 Construction staging should be conducted on-site and under no circumstances will be allowed on local or residential streets.

XVI-9 Construction work within the public right-of-way needs to be in compliance with City standards and the construction site shall be posted with the name, company and a phone number of a person to call for complaints.

XVI-10 The applicant will be fully responsible for the repair of damages to any public facility due to the hauling or transporting of construction related materials.

XVI-11 Parking for the construction trucks and worker trucks will be on-site, away from the adjacent public roadways and existing active businesses.

XVI-12 The City shall coordinate with OCTA to ensure that one or more bus routes to the future Placentia Metrolink Station will serve the TOD project area.

Utilities and Service Systems

XVII-1 Future projects implemented under the TOD district shall submit a detailed evaluation of water demand and wastewater generation based on the fixtures that will be installed. This information shall be compared to the current demand by existing development and a net impact determination made. This net impact shall be compared to available water supply capacity and wastewater treatment capacity of the serving utility systems. If the demand/generation exceeds the capacity of either utility system, the modifications to the system(s) shall be evaluated and a determination of indirect impact reached in a second tier environmental document. The documentation shall be reviewed and approved by the City and if specific measures must be implemented, the City shall impose them as conditions of approval for the future projects. In no instance shall a project be approved that would cause significant environmental effects on either the water or wastewater system, including adequacy of water supplies and treatment capacity. Mitigation in the form of offsets, such as funding water conservation or wastewater generation reductions at other location, shall be implemented where deemed necessary.

XVII-2 Future projects implemented under the TOD district shall submit a detailed evaluation of stormwater drainage from the new project relative to the existing development. If the future project will generate stormwater runoff that exceeds the existing volume or time of accumulation, onsite stormwater detention shall be installed as part of the site development of offset any increase that would exceed the capacity of the existing stormwater collection and transport systems. In no instance shall a project be approved that would cause significant environmental effects on either the existing drainage system, unless the system incremental stormwater increase is detained onsite or the drainage system altered to accommodate any change.

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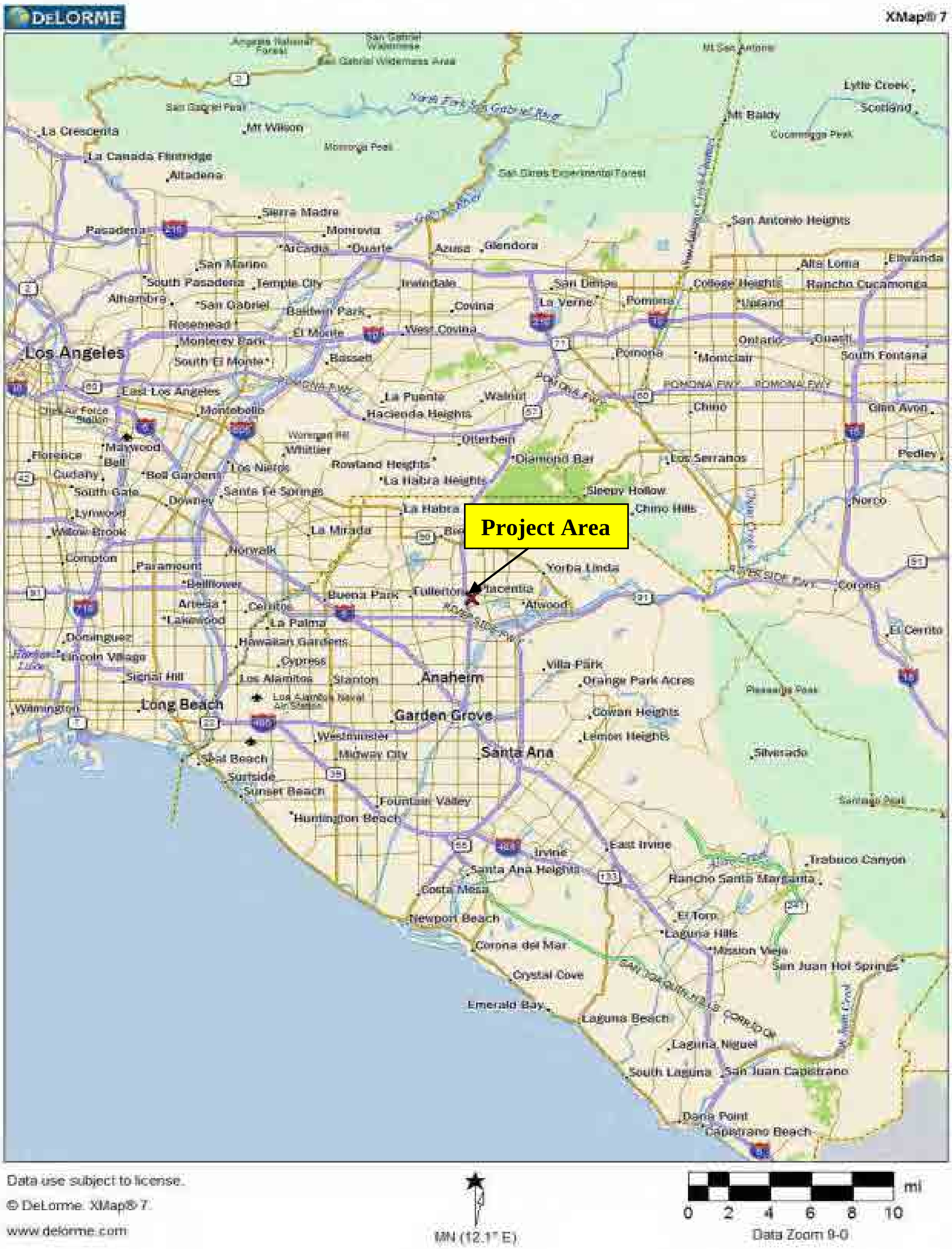
https://soilseries.sc.egov.usda.gov/OSD_Docs/M/MYFORD.html

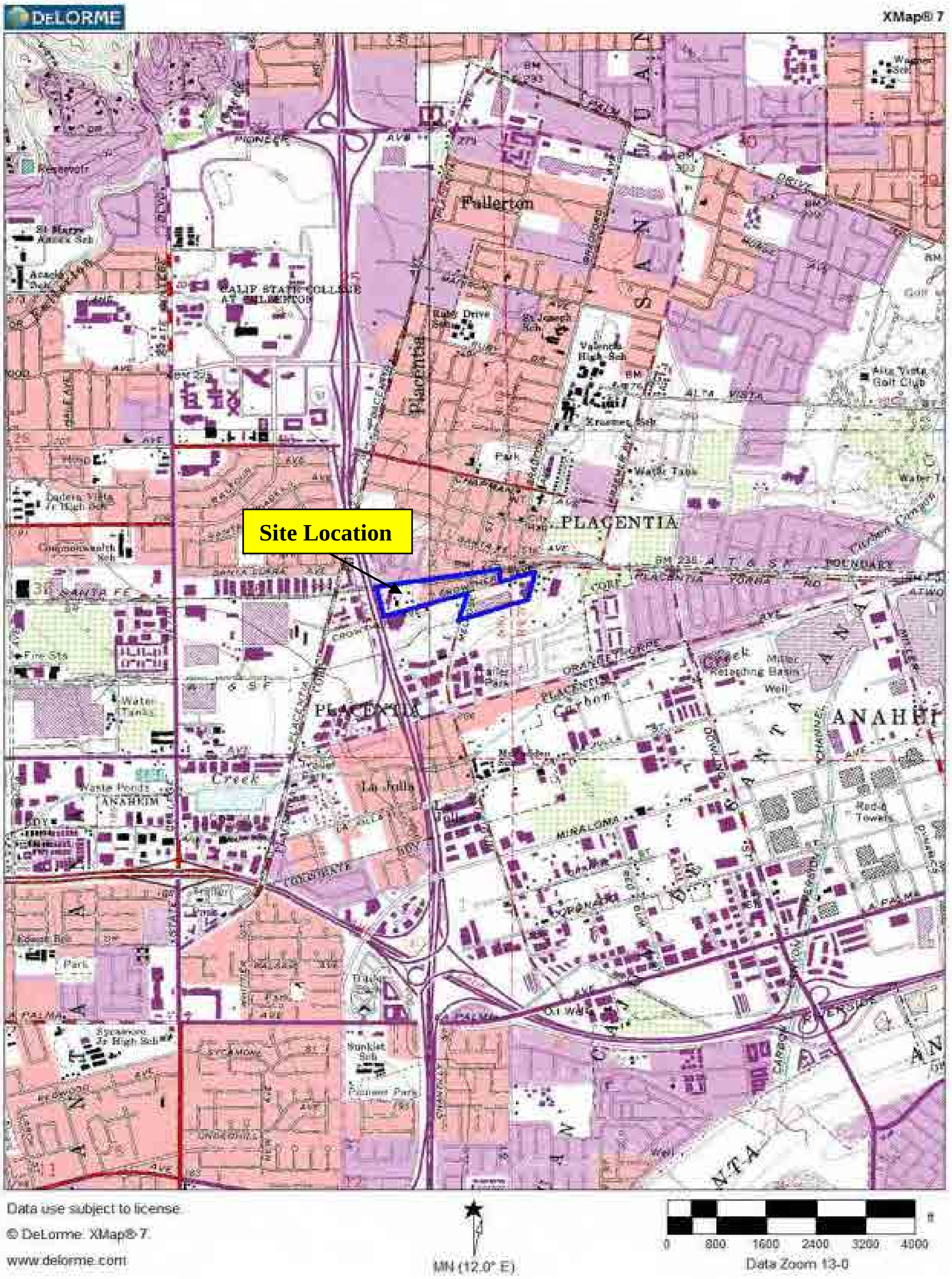
FIGURES

FIGURE 1
Regional Location



Tom Dodson & Associates
Environmental Consultants

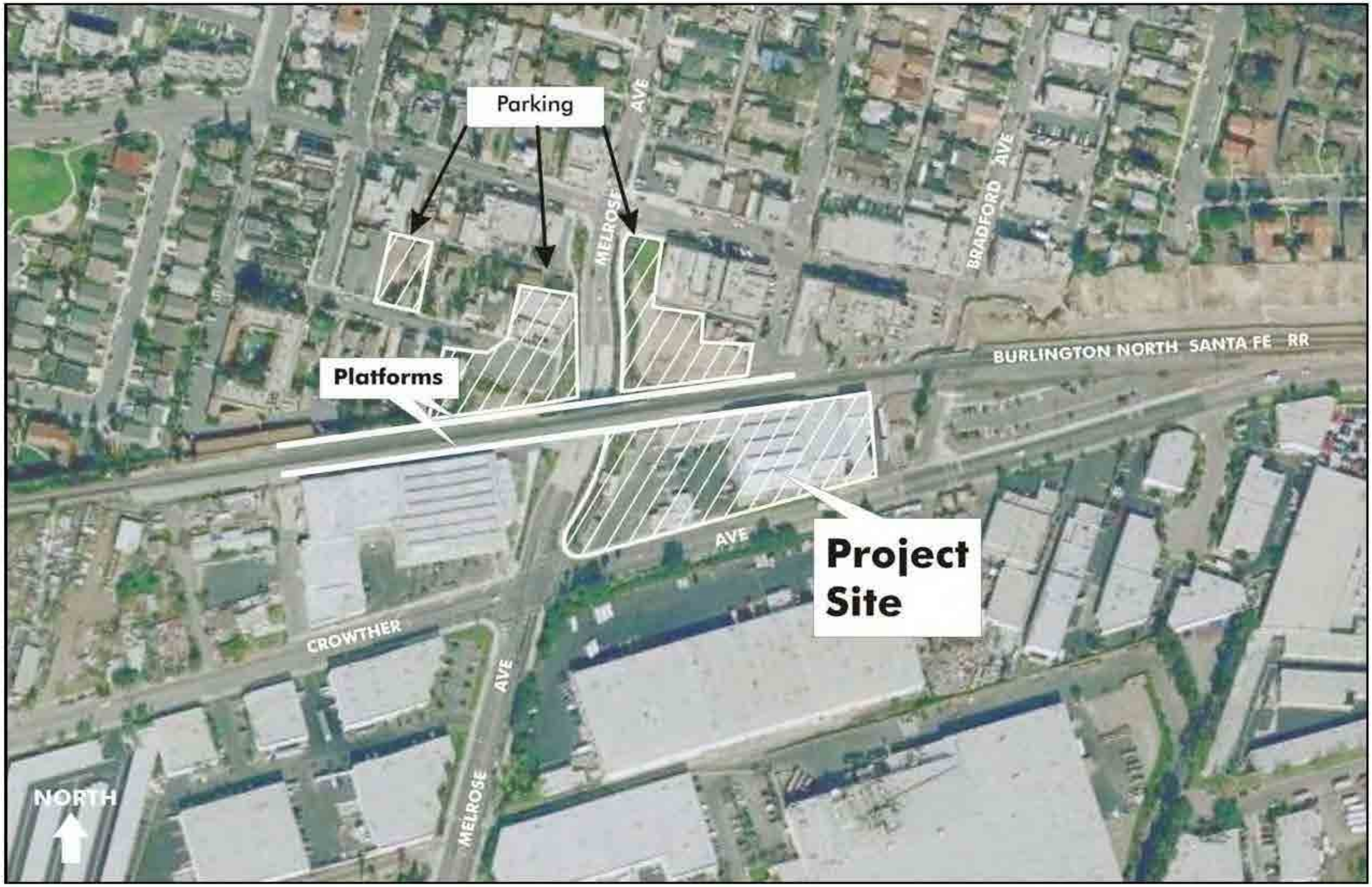
FIGURE 2
Site Location



Tom Dodson & Associates
Environmental Consultants

FIGURE 3
Aerial Photo of Area Encompassed by TOD Overlay Area

FIGURE 4
Proposed Location of New Metrolink Passenger Platform



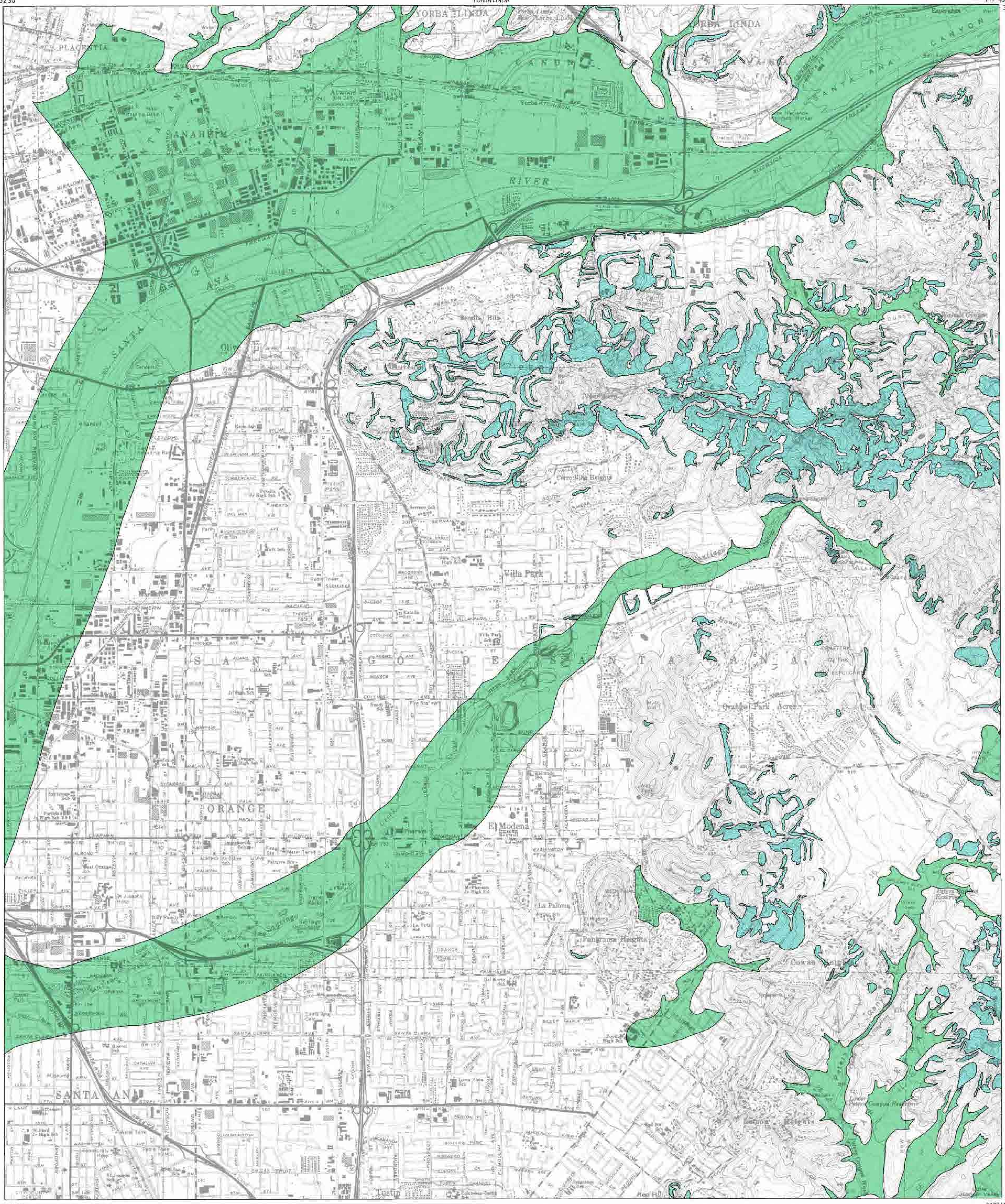
Source: City of Placentia Westlake Metrolink Station, Draft EIR (March 7, 2007)

FIGURE VI-1
USGS Fault Map

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA - PETE WILSON, GOVERNOR
THE RESOURCES AGENCY - DOUGLAS P. WHEELER, SECRETARY
DEPARTMENT OF CONSERVATION - LAWRENCE J. GOLDZBAND, DIRECTOR

SEISMIC HAZARDS ZONES MAP
Orange Quadrangle



Base Map prepared by U.S. Geological Survey, 1964, photorevised 1981

SCALE 1:24,000

PURPOSE OF MAP

This map will assist cities and counties in fulfilling their responsibilities for protecting the public safety from the effects of earthquake-triggered ground failure as required by the Seismic Hazards Mapping Act (Public Resources Code Sections 2690-2699.6).

For information regarding the scope and recommended methods to be used in conducting the required site investigations, see DMG Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California.

For a general description of the Seismic Hazards Mapping Program, the Seismic Hazards Mapping Act and regulations, and related information, please refer to the draft User's Guide (see http://www.consrv.ca.gov/dmg/shezp/userguid.html).

Production of this map was funded by the Federal Emergency Management Agency's Hazard Mitigation Program and the Department of Conservation in cooperation with the Governor's Office of Emergency Services.

IMPORTANT - PLEASE NOTE

1) This map may not show all areas that have the potential for liquefaction, landsliding, strong earthquake ground shaking or other earthquake and geologic hazards. Also, a single earthquake capable of causing liquefaction or triggering landslide failure will not uniformly affect the entire area zoned.

2) Liquefaction zones may also contain areas susceptible to the effects of earthquake-induced landslides. This situation typically exists at or near the toe of existing landslides, downslope from rockfall or debris flow source areas, or adjacent to steep stream banks.

3) This map does not show Alquist-Priolo earthquake fault zones, if any, that may exist in this area. Please refer to the latest official map of earthquake fault zones for disclosures and other actions that are required by the Alquist-Priolo Earthquake Fault Zoning Act. For more information on this subject and and index to available maps, see DMG Special Publication 42.

4) Landslide zones on this map were determined, in part, by adapting methods first developed by the U.S. Geological Survey (USGS). A new generation of landslide hazard maps being prepared by the USGS (Jibson and Harp, in preparation) uses an experimental approach designed to explore new methods to assess earthquake-induced landslide hazards. Although aspects of this new methodology may be incorporated in future seismic hazard zone maps, the experimental USGS maps should not be used as substitutes for these official earthquake-induced landslide zone maps.

5) U.S. Geological Survey base map standards provide that 90 percent of cultural features be located within 40 feet (horizontal accuracy) at the scale of this map. The identification and location of liquefaction and earthquake-induced landslide zones are based on available data. However, the quality of data used is varied. The zone boundaries depicted have been drawn as accurately as possible at this scale.

6) Information on this map is not sufficient to serve as a substitute for the geologic and geotechnical site investigations required under Chapters 7.5 and 7.8 of Division 2 of the Public Resources Code.

7) DISCLAIMER: The State of California and the Department of Conservation make no representations or warranties regarding the accuracy of the data from which these maps were derived. Neither the State nor the Department shall be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.

STATE OF CALIFORNIA
SEISMIC HAZARD ZONES

Delineated in compliance with
Chapter 7.8, Division 2 of the California Public Resources Code
(Seismic Hazards Mapping Act)

ORANGE QUADRANGLE

OFFICIAL MAP

Released: April 15, 1998

STATE GEOLOGIST

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

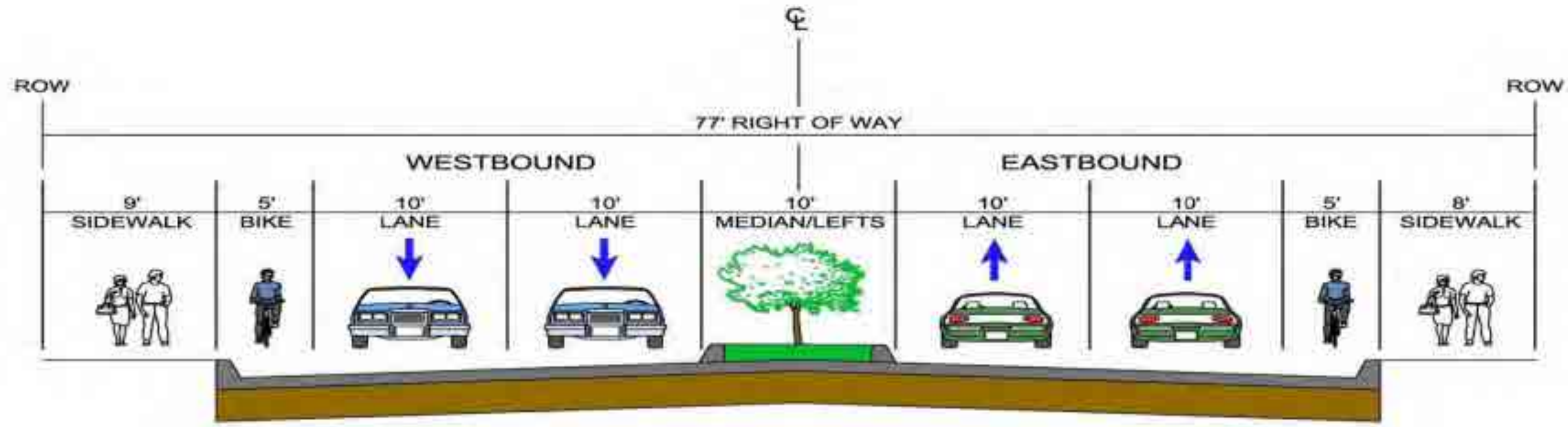
DATA AND METHODOLOGY USED TO DEVELOP THIS MAP ARE PRESENTED IN THE FOLLOWING:

Seismic Hazard Evaluation of the Orange 7.5-minute quadrangle, Los Angeles County, California: California Department of Conservation Division of Mines and Geology Open-File Report 97-19.

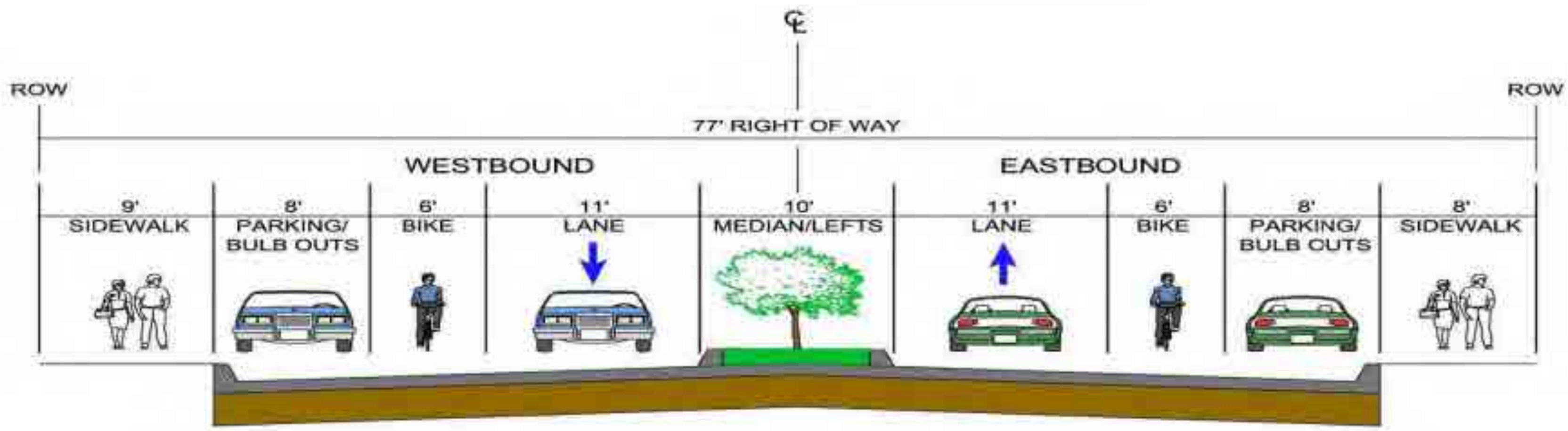
For additional information on seismic hazards in this map area, the rationale used for zoning, and additional references consulted, refer to DMG's World Wide Web site (http://www.consrv.ca.gov/dmg/).

FIGURE VI-2

FIGURE XVI-1
Crowther Avenue Alternative Design Configurations



Crowther Avenue as a Four-Lane Facility



Crowther Avenue as a Two-Lane Facility

Source: Addendum to Traffic Impact Study prepared by Albert Gover & Associates, January 2017

APPENDIX 1

PLACENTIA
Rich Heritage, Bright Future

January 26, 2017
Final Working Draft

Transit Oriented Development
Packing House District

Development Standards

Lilley Planning Group
for the City of Placentia

City of Placentia ◆ 401 E. Chapman Avenue ◆ Placentia, CA 92870 ◆ (714) 993-8117

TRANSIT ORIENTED DEVELOPMENT PACKING HOUSE DISTRICT
DEVELOPMENT STANDARDS

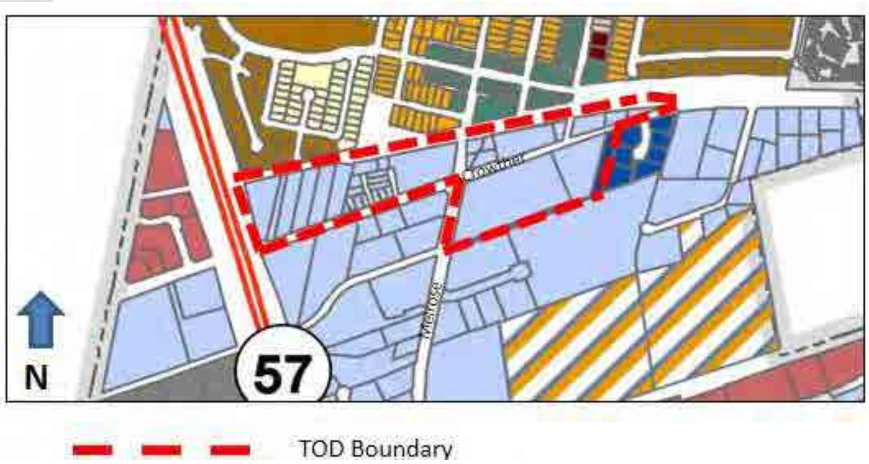
23.111.010 Purpose and Intent

The following provides detailed regulations for development of land uses within the Transit Oriented Development Packing House District (TOD Packing House District or "District"). The purpose of the TOD Packing House District is to encourage an appropriate mixture and density of activity around the Metrolink station to increase ridership and promote alternative modes of transportation to the automobile. The consequent intent is to decrease auto-dependency, and mitigate the effects of congestion and pollution. The development standards seek to achieve this by providing a pedestrian, bicycle, and transit-supportive environment configured in a compact pattern and a complementary mix of land uses all within a comfortable walking distance of the station. The specific objectives of this District are to:

A. Encourage mixed-use and transit oriented development;
B. Encourage people to walk, ride a bicycle or use transit;
C. Encourage an active, pedestrian oriented streetscape with outdoor dining and other amenities;
D. Promote public art and creative public places;
E. Allow for a complementary mix of land uses to create an environment that engages people at the pedestrian level;
F. Achieve a compact pattern of development that is more conducive to walking and bicycling;
G. Provide sufficient density of employees, residents and recreational users to support transit;
H. Provide a high level of amenities that create a comfortable environment for pedestrians, bicyclists, and other users;
I. Create a physical connection with Old Town Placentia by activating the station area with a plaza and ground floor shops and restaurants in the TOD Packing House District;
J. Promote affordable housing and provide housing for all economic segments of the community consistent with the City's housing goals;
K. Maintain an adequate level of parking and access for automobiles;
L. Require high-quality, finely detailed architecture and urban form that provides interest and complexity at the level of the pedestrian and bicyclist;
M. Generate a relatively high percentage of trips serviceable by transit;
N. Encourage integrated development, including the consolidation of parcels; and
O. Encourage lot and building orientation on Crowther Avenue and parcels extending from Crowther to the Railroad right-of-way, to create an active streetscape.

23.111.020 Applicability and General Provisions

The City of Placentia's TOD Packing House District shall apply to lands delineated as such on the City's official zoning map. All land uses and development within the District shall be located and developed in accordance with the following provisions. The standards of the TOD Packing House District shall not apply to development for which approvals were granted prior to the adoption of these regulations and which entitlements are still valid and for development which has current, valid building permits.



23.111.030 Land Use and Permit Requirements

This section identifies the land use types allowed by the City in the TOD Packing House District.

A. **Allowable Land Uses.** A parcel or building within the District shall be occupied by only the land uses allowed by Table 1. Each land use in the table is defined in the glossary of this Ordinance or in the Placentia Municipal Code (PMC) (Definitions, Chapter 23.04).
   1. **Multiple Uses.** Any one or more land use identified by Table 1 as being allowable within the District may be established on any parcel, subject to the planning permit requirement listed in the table, and in compliance with all applicable requirements of this Code.
   2. **Mixed Use Development**. All new developments with parcels of 20,000 square feet or more, within the TOD zone must be mixed use development as defined in the definitions section in Chapter 23.04 of Municipal Code, except for the catalyst site as defined in the definitions section in Chapter 23.04 of Municipal Code,.
   3. **Unlisted Uses.** The Development Services Director may determine an unlisted use is similar to another allowable permitted or conditionally permitted use and if all of the following findings can be made:
      i. The use is no greater in density or intensity than other uses allowed, or conditionally allowed in the zone;
      ii. The use is compatible with permitted or conditionally permitted uses in the zone;
      iii. The use will meet the purpose of the zone;
      iv. The use is consistent with the goals and policies of the General Plan; and
      v. The use will not be detrimental to the public health, safety or welfare.

      Applicants may appeal this decision using the Use Conformity Determination process, outlined in Section 23.39.035 of the PMC.

B. **Permit Requirements.** Table 1 provides for land uses that are:
   1. **Permitted.** These uses are permitted subject to compliance with all applicable provisions of this Chapter and require a Development Plan Review or Site Plan Review in compliance with Chapter 23.75 of the PMC. These uses are shown as "P" uses in Table 1. All new construction projects as defined in Chapter 23.04 of Municipal Code, and in this Zone must be reviewed by the Planning and Development Ad Hoc Committee.
   2. **Conditionally Permitted Uses**. These uses are allowed subject to the approval of a Use Permit and require a public hearing in compliance with Chapter23.87 of the PMC. These uses are shown as a "UP" in Table 1.
   3. **Not Permitted.** These uses are not permitted, and shown as "NP" in Table 1.A land use that is not listed in Table 1 is not allowed within the District, except as otherwise provided in Section 23.11.030 (A.3). Uses that are expressly listed as not permitted are prohibited.

C. **Standards for Specific Land Uses.** Where the last column in Table 1 (Specific Use Regulations) includes a section number, the regulations in the referenced section of this chapter and/or the PMC apply to the use. Provisions in other sections of this chapter may also apply.

Table 1: Allowed Land Uses and Permit Requirements

LAND USE TYPE	PERMIT REQUIREMENT P-permitted UP – use permit NP – not permitted	SPECIFIC USE REGULATIONS
D. Mixed Use Requirement. All new developments fronting Crowther Avenue within the TOD zone must be mixed use development, except for the "catalyst site" or those sites containing less than 20,000 square feet. **E. Frontage on Crowther:** 75% of frontage must be designed and constructed for potential commercial with a minimum 15' floor to ceiling height, 75% of building façade to have street level, transparent windows, and ground floor to be constructed with exhaust and grease trap systems for potential restaurant uses.		
Recreation, Education, Public Assembly Uses		
1. Commercial recreation facility – indoor	NP	
2. Conference/Convention Facility	NP	
3. Health/Fitness Facility, including stand alone or roving fitness classes	NP	
4. Library, Museum	P	Permitted only in the historic Packing House Building[1]
5. Park, Playground	P	Only permitted when integrated into the overall development of a site.
6. School – specialized Education, training	NP	
7. Studio – art, dance, martial arts, music, cooking, fitness (such as yoga, Pilates, spin, etc.)	P	Permitted only above the ground floor within a mixed use development or above the ground floor of the Packing House building. Only one studio per development.
8. Theatre (live performing arts)	P	Movie Cinemas not permitted
Residential Uses		
9. Emergency/Transitional shelter	NP	
10. Home Occupation	P	PMC Section 23.81.020. No additional parking shall be permitted for those units with home occupation.
11. Live Work, in Packing House building	P	
12. Live Work	UP	
13. Mixed use project with residential	P	Maximum of 3 bedrooms per unit; 15% of all units may be up to 3 bedrooms

[1] The Packing House building is located at 341 S. Melrose Street.

LAND USE TYPE	PERMIT REQUIREMENT P-permitted UP – use permit NP – not permitted	SPECIFIC USE REGULATIONS
		The design and construction of multi-family residential developments as courtyard housing projects is encouraged. Ground floors in mixed use projects must be plumbed/planned restaurant infrastructure including exhaust and grease control device.
14. Multi-Family Residential, Catalyst Site	UP	Maximum of 3 bedrooms per unit; 15% of all units may be up to 3 bedrooms. Project with only multi-family residential are permitted only on the "catalyst site." See definition of "catalyst site."
15. Non Mixed Use Project with a parcel size under 20,000 square feet	UP	Must be commercial on ground floor. May also include commercial, residential or office above ground floor. Must meet all other development standards. Must meet the Intent and Purpose of this chapter.
16. Residential Only	NP, except as permitted as a catalyst site as described in definitions.	
Retail/Commercial Uses		
17. Accessory Retail or services	P	Only permitted when primary commercial use is established. Must be incorporated into mixed-use or within Packing House; cannot stand alone.
18. Adult Entertainment Facility or Business	NP Pursuant to PMC Chapter 23.89	

LAND USE TYPE	PERMIT REQUIREMENT P-permitted UP – use permit NP – not permitted	SPECIFIC USE REGULATIONS
19. Alcoholic beverage sales (not associated with bar, brewery, distillery, restaurant, or neighborhood market or grocery)	NP	
20. Antique or collectible store	P	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
21. Artisan Shop	P	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
22. Auto repair or auto parts sales	NP	
23. Bar, tavern, brewery, distillery, tasting rooms, wine cellar	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
24. Neighborhood Market (without alcohol beverage sales)	P	With alcohol sales, a use permit is required.
25. Drive-through (any uses)	NP	
26. Furniture, furnishings and appliance store	NP	
27. General retail – less than 5,000 sf	P	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
28. General retail –5,000 sf to 20,000 sf	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
29. General retail – more than 20,000 sf (max 60,000 sf)	NP	
30. Groceries, specialty foods – 10,000 sf or less	P	With alcohol sales, a use permit is required.
31. Groceries, specialty foods – more than 10,000 sf	UP	
32. Medical Marijuana Facilities	NP Pursuant to PMC Chapter 23.46	
33. Nightclub (including comedy clubs)	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone. "Hostess" clubs are not permitted.
34. Outdoor Dining	P	Permitted in public right-of-way with an encroachment permit. Pursuant to ABC requirements as well as

LAND USE TYPE	**PERMIT REQUIREMENT** P-permitted UP – use permit NP – not permitted	**SPECIFIC USE REGULATIONS**
		the Outdoor Dining Permit and Guidelines.
35. Outdoor display and sales	NP	May be permitted with a Special Event Permit as part of a coordinated event, pursuant to PMC Section 23.81.015. No more than 4 a year.
37. Restaurant with alcohol sales	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
38. Restaurant	P	Must be incorporated into mixed-use or within Packing House; cannot stand alone.
39. Secondhand/Thrift/Pawnshop/Charity store	NP	
40. Service Station	NP	
41. Tobacco Sales, including electronic smoking devices	UP	
Services – Business, Financial, Professional		
42. ATM	P	Must be integrated into building façade. Stand along kiosks not permitted.
43. Bank, over 2,000 sf	NP	Small banks of 2,000 sf or less are permitted.
44. Medical services	UP	See definition. May only be permitted on 2nd story of mixed-use development.
45. Office	P	Upper floors; or in conjunction with live/work. Must be incorporated into mixed-use or within Packing House; cannot stand alone. May only be permitted on 2nd story of mixed-use development.
Services – General		
46. Adult daycare	NP	
47. Commercial daycare center	NP	Large family daycare facilities not permitted. All child care facilities

LAND USE TYPE	PERMIT REQUIREMENT P-permitted UP – use permit NP – not permitted	SPECIFIC USE REGULATIONS
		shall be integrated into the over development.
48. Lodging – Bed and Breakfast	UP	Maximum of 10 beds allowed. Are not required to contain residential units or uses.
49. Lodging – Hotel	UP	Are not required to contain residential units or uses. Permitted within 250 feet (verify) of freeway right of way. 1st floor must include 25-50% of floor area as retail or restaurant or conference area. Retail/restaurant uses must be consistent with mixed use standards. Must include conference center.
50. Massage Establishments	UP Pursuant to PMC Section 23.30.030	
51.Personal services	P	Must be incorporated into mixed-use or within Packing House; cannot consist of a stand-alone use or building. May only be permitted on 2nd story of mixed-use development or Packing House.
52. Public Safety Facility	NP	Except that City Police Department satellite stations are permitted. Satellite stations may not be stand alone facilities.
53. Spa Services	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone. May only be permitted on 2nd story of mixed-

LAND USE TYPE	PERMIT REQUIREMENT P-permitted UP – use permit NP – not permitted	SPECIFIC USE REGULATIONS
		use development. Must include a full suite of services.
54. Spa Services with alcohol	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone. May only be permitted on 2nd story of mixed-use development. Must include a full suite of services.
55. Cigar or Hookah Lounge	UP	
56. Meeting Halls, Banquet Centers (Stand alone)	NP	
57. Tattoo Parlors/Body Modification	UP	
58. Hostess Bars	NP	
Transportation, Communications & Infrastructure		
59. Broadcasting or Recording Studio	UP	Must be incorporated into mixed-use or within Packing House; cannot stand alone. May only be permitted on 2nd story of mixed-use development.
60. Public Parking Structure	P	
61. Transit Station or terminal	P	
62. Telecommunication Cell Tower	Pursuant to PMC Chapter23.82	
Historic Packing House Building		
63. Adaptive Re-use of Packing House Building. The building and property located at 341 S Melrose Street is a local historic building and is listed on the California Register. As an historic building, it is eligible for adaptive re-use in order to preserve the historic elements and quality of the building and property.	UP, subject to an adaptive re-use plan prepared by a qualified preservation expert as deemed appropriate by the City.	Adaptive re-use plan may be reviewed for comment by the local Historical Committee. The adaptive re-use of this building is not subject to any development standards contained in this Chapter, however a finding must be made that the reuse plan meets and is consistent with the Intent and Purpose of this Chapter.

23.111.040 Development Standards

Table 2 identifies the development standards required for new land uses in new or modified buildings in the TOD Packing House District.

Parking Standards. On-site parking requirements for unlisted but similar uses shall be based on the parking requirements of similar uses found in this chapter and shall be at the discretion of the Development Services Director. The Development Services Director may require the preparation of a parking demand study by a qualified, licensed traffic engineer approved by the City to determine the parking requirement for unlisted but similar uses.

Parking Calculations. Parking standards are based on gross floor area.

Table 2. Development Standards

A. Architectural Review	**Standard**	**Notes**
	High quality, 360 degree, architectural and urban design is required. All new projects will require architectural review by a third party expert, selected by the City.	Third party review costs are the responsibility of the applicant.
B. Building Placement Regulations	**Standards**	**Notes**
1. **Density**	**65 dwelling unit/acre minimum and 95 dwelling units/acre maximum**	Density shall be calculated using gross lot size, prior to any required right-of-way dedications. Dedications shall be required along Crowther Avenue.
2. **Block Length and Lot Size Requirements.** Each project along Crowther Avenue shall create an active and inviting environment for pedestrians.		
a. Maximum building length without breaks in building massing	350 ft.	Breaks in building massing mean courtyards, plazas, outdoor dining, etc. These should be open from ground to sky and constitute a true break in the building massing.
b. Lot Depth	No minimum lot depth	Integrated developments and lot consolidations are encouraged with lot orientation fronting on Crowther Avenue, and where possible, with parcels extending from Crowther to the railroad right-of-way.
c. Minimum Lot Size	20,000 square feet	

3. **Setbacks.** Minimum setbacks required and, where noted, maximum setbacks established, except where a frontage type standard allows exceptions or establishes different requirements. Setbacks are measured from property line after any required dedications. Fire Department requirements supersede any setback listed below.		
a. Setback From Railroad Track	0 feet	10' from rear ROW preferred by BNSF for above ground structures. Applicants should consider access to rear portion of new development.
b. Front Yard Setback	5 ft min./15 ft. max.	
c. Side Yard Setback	0 feet, or 10' when adjacent to a property containing residential uses	
d. Rear Yard Setback	10 ft	
e. Street Side Yard Setback	5 ft min./15 ft. max	
4. **Projections and Encroachments**		
a. **Allowable Setback Projections** i. Ground Floor: • Awnings and canopies over windows: 60 inches; • Outdoor dining; • Barriers for defining outdoor dining areas such as fences, railings, planter boxes: as needed to encompass outdoor dining area; • Sun Shade Structures: 15 feet; • Bay Windows: 60 inches (not wider than 10 feet); • Cornices, belt courses, and similar architectural features: 12 inches; • Eaves, roof overhangs: 30 inches; and • Uncovered porches, decks and landings (may be covered by arbors or trellises): 10 feet. ii. Above Ground Floor - Awnings, galleries, balconies, bay windows: 48 inches iii. Art, as determined by the approval of the public art component of the project. iv. For signs, see Sign Regulations, 23.110.050. v. All projections must maintain a minimum of 8' vertical height from ground. b. **Public Right-of-Way Encroachments require approval of an encroachment permit.**		
5. **Building Height, Rooftop Amenities, Frontages, and Ground Floor**		
a. Building Height	3 stories minimum, 35' minimum, 5 stories maximum, not to exceed 68'.	
b. Frontage Requirements. In order to support the pedestrian environment, building frontages onto streets and open spaces shall be maximized. No visible parking is permitted along frontages. A minimum of 75% of the site frontage shall be occupied as building frontage. A section of blank wall shall not exceed 20 linear feet without being interrupted by a window or entry or other façade treatment.		
c. Ground Floors shall contain commercial uses and have a minimum 15' floor to ceiling.		
6. **Provision of Common Open Space (Residential Only)**	**Standards**	**Notes**
a. Amount per residential use	50 sf/unit for residential units; 50 sf/unit for 5 or more Live Work Units	
b. Types of Common Open Space Permitted	• Common open space can be active or passive but must be accessible to	

	all non-residential tenants (i.e. employees and employers) and residential residents. • Required setbacks may not be counted as common open space, except that rear yards counted as meeting the requirement for live/work units. • Common open space shall be fully landscaped and requires an approved landscape plan. • Examples may include: courtyards, clubhouses with accompanying landscaped areas, swimming pools, plazas, greens, parks, playgrounds, picnic areas, outdoor seating.	
c. Rooftop Amenities	• Rooftop amenities are permitted if they provide additional recreational or common open space activities for the residents of the building. • 50% of the rooftop amenities (structures and active recreation amenities) may count towards the square footage requirement for either private or common open space. • Rooftop Amenities, such as and not limited to, clubhouses, swimming pools, tennis courts, open space areas, fitness centers, are permitted to project 16' above the maximum height limit if integrated into the overall design of the project and the maximum rooftop building coverage is limited to 30% of the rooftop floor area. • Roof top amenities shall be setback from the building edge such that no more than 20% of the rooftop structure can be visible from the primary public right of way at centerline of the street. • Rooftop Amenities are intended for the use of building residents.	
d. Courtyard Common Open Space Requirements	• Courtyards shall be designed as a central courtyard or as partial, multiple, separated or interconnected courtyards. • Minimum courtyard dimension shall be 40 feet when the long axis of the courtyard is oriented EW and 30 feet for a NS orientation. The	

	courtyard proportion is 1:1 between its width and height for at least 2/3 of the court's perimeter. As long as total open space requirement is met, this ratio could be modified by up to 10%. • When there are two or more courtyards, they shall be connected to each other. • The area required for first level patios shall not be deducted from the overall courtyard area.	
7. **Provision of Private Open Space (Residential Only)**		
a. Live Work	64 sf/unit	6 feet min in any direction; the total of 64 sq. ft. must be provided as one private open space area, not broken up into smaller sizes.
b. Residential-Attached & Multi-Family	64 sf/unit	6 feet min in any direction; the total of 64 sq. ft. must be provided as one private open space area, not broken up into smaller sizes.
8. **Parking**	**Standards**	**Applicable Land Uses**
a. Retail – spaces per 1,000 sf	2 min./4 max.	Accessory retail, Antique, Artisan, General retail, Grocery, Retail complex, Personal services
b. Eating and Drinking Establishments– spaces per 1,000 sf	5 min./10 max.	Bar/Tavern, Restaurant, Brewery, etc.
c. Outdoor Dining	0 (Pursuant to PMC 23.81.165)	• Outdoor dining is encouraged and shall be incorporated as part of the overall design of the building or project. • Outdoor dining may project into required setbacks. • No parking is required for outdoor dining unless the total outdoor dining square footage is greater than the total interior dining area. In this circumstance, project must provide parking for the amount over the interior square footage.

d. Specialty Goods & Foods– spaces per 1,000 sf	2 min./4 max.	
e. Entertainment & Recreation– spaces per 1,000 sf	6 min./10 max.	Health/Fitness, Playgrounds, Studios, Theatres cannot be stand alone
f. Commercial Goods– spaces per 1,000 sf	2 min./4 max.	
g. Civic & Cultural, including Libraries and Museums – spaces per 1,000 sf	3 min./no max.	
h. Office Professional – spaces per 1,000 sf	2 min./4 max.	
i. Personal Services	3 min./no max.	
j. Live Work	1 min./1.5 max.	
k. ATM	0	
l. Lodging – B&B	1 per sleeping room	No assembly space permitted.
m. Lodging – Hotel	1 per sleeping room, plus 1 space for every 75 sf of assembly area.	
Residential		
n. Spaces per studio unit	1 min./1 max.	
o. Spaces per 1 bed unit	1 min./1.5 max.	
p. Spaces per 2 bed unit	1.5 min./2 max.	
q. Spaces per 3 bed unit	2 min./ 2.5 max.	
r. Guest spaces per 10 units	2 min./3 max.	
s. Mixed Use	Parking shall meet the requirements for individual land uses. Residential parking shall be separated from non-residential parking and easily accessible through a controlled mechanism.	Reduced parking may be permitted through a parking study
Other		
t. Bike Parking – Short Term	Residential: One (1) resident bicycle parking space for every five (5) residential units, or portion thereof Non-Residential: One (1) bicycle parking space for every 5,000 square feet, or portion thereof, of non-residential floor area.	
u. Bike Parking – Long Term	Residential: Two (2) bicycle storage units for every five (5) dwelling units for the first 20, and one (1) for every five (5) additional units, or portion thereof; Non-Residential: Any establishment with a parking structure and a minimum of 10,000 square of non-residential space shall provide long-term bicycle parking at a minimum ratio of one (1) space per 20 vehicle spaces.	

v. Electric Vehicle Charging Stations	Minimum 10% of project's parking spaces must provide EV Level 2 charging stations. Alternatively, 5% of total spaces if installing DC Fast Charging Stations.	
w. Transit Station or terminal	As per Director of Development Services in coordination with transportation authority	
x. Telecommunication Facility	1 space to service facility.	
y. Surface Parking:	Surface parking is permitted as long as not visible from public street and is fully landscaped and screened from public view.	
z. Parking Structure	Structure parking permitted only if integrated into overall design of building and "wrapped" with the building, such that the parking area is not visible from any portion of the front, sides, rear or interior courtyards of the project.	
aa. Podium Parking	Permitted if fully integrated into a development with a "wrapped" parking structure.	
bb. Underground Parking	Permitted if fully integrated into the design of the development.	
cc. Parking Reduction	Applicants may apply for parking reduction before the Planning Commission for residential and mixed use projects up to a maximum reduction of 25% through a parking demand study or shared parking analysis. One such incentive could include a Zip car or shared car plan.	

23.111.050 Sign Regulations

A. Purpose and Intent

These sign regulations are intended to appropriately limit the placement, type, size, and number of signs allowed within the TOD area, and to require the proper maintenance of signs.

The purposes of these limitations and requirements are to:

1. Avoid traffic safety hazards to motorists, bicyclists, and pedestrians, caused by visual distractions and obstructions;
2. Promote the aesthetic and environmental values of the community by providing for signs that do not impair the attractiveness of the City as a place to live, work, and shop;
3. Provide for signs as an effective channel of communication, while ensuring that signs are aesthetically proportioned in relation to adjacent structures and the structures to which they are attached;
4. Safeguard and protect the public health, safety, and general welfare; and
5. Promote the pedestrian scale of the district.

B. Applicability

1. These sign regulations apply to all signs in this zone, except that directional/instructional signs and real estate signs shall instead comply with the requirements of the City's Zoning Code (Sign Regulations).

2. The provisions of this Chapter do not regulate the message content of a sign (sign copy), regardless of whether the message con tent is commercial or noncommercial.

3. Sign installation within the areas subject to this Code shall require sign permit approval in compliance with the City's Zoning Code (Sign Regulations), unless exempted from sign permit requirements.

4. Sign Variances and Historic Sign Designation - See the Zoning Code (Variances).

5. Definitions of the specialized terms and phrases used in this section are in the Zoning Code (Sign Regulations).

C. Prohibited Signs

All sign types and sizes not expressly allowed by this Chapter shall be prohibited. Examples of prohibited signs include, but are not limited to the following:

1. Abandoned signs (includes signs on abandoned or closed businesses);

2. Animated and moving signs, including electronic message display signs, and variable intensity, blinking, or flashing signs, or signs that emit a varying intensity of light or color, except time and temperature displays (which are not considered signs), and barber poles;

3. Exposed cabinet/raceways behind channel letters;

4. Internally illuminated cabinet (can) signs;

5. Off-site signs (e.g., billboards, and signs mounted on vehicles);

6. Obscene signs;

7. Pole signs and other freestanding signs over six feet in height;

8. Roof signs;

9. Signs that simulate in color, size, or design, any traffic control sign or signal, or that make use of words, symbols, or characters in a manner that interferes with, misleads, or confuses pedestrian or vehicular traffic;

10. A sign burned, cut, or otherwise marked on or affixed to a rock, tree, or other natural feature;

11. A sign placed within a public right-of-way, except as provided by Table 3 (Sign Standards by Use);

12. A sign painted directly on a building;

13. Permanent signs that advertise continuous sales, special prices, or include phone numbers are prohibited.

14. Temporary signs, including the following;

    a. Balloons and other inflatable devices;
    b. Flags, except official national, state, or local government, institutional or corporate flags, properly displayed; and
    c. Pennants and streamers, except in conjunction with an athletic event, carnival, circus, or fair.

D. General Requirements for All Signs

1. Sign area and height measurement

The measurement of sign area and height shall occur incompliance with the City's Zoning Code (Sign Regulations).

2. Sign location requirements

Each sign shall be located in compliance with the following requirements, and all other applicable provisions of this Chapter.

a. On-premise signs required. Each sign shall be located on the same site as the subject of the sign, except as otherwise allowed by this Chapter.
b. Setback requirements. Each sign shall comply with the setback requirements of the applicable zoning district, except for an approved projecting sign, and except for an approved freestanding sign, which shall be set back a minimum of 5 feet from the front and side street property lines.
c. Placement on a building. No sign shall be placed so as to interfere with the operation of a door or window. Signs should not be located so that they cover prominent architectural features of the building.
d. Signs within a public right-of-way. No sign shall be allowed in the public right-of-way except for the following:
    i. A projecting sign in compliance with Table 3 (Sign Standards by Use);
    ii. Public signs erected by or on behalf of a governmental agency to convey public information, identify public property, post legal notices, or direct or regulate pedestrian or vehicular traffic;
    iii. Bus stop signs installed by a public transit company;
    iv. Informational signs of a public utility regarding its lines, pipes, poles, or other facilities; or
    v. Emergency warning signs erected by a governmental agency, a public utility company, or a contractor doing authorized within the public right-of-way.

e. Any sign installed or placed within the public right-of-way other than in compliance with this Section shall be forfeited to the public and be subject to confiscation.

3. Sign design

The following design criteria shall be used in reviewing the design of individual signs. Substantial conformance with each of the following design criteria shall be required before a sign permit or Building Permit can be approved.

a. Color
   Colors on signs and structural members should be harmonious with one another and relate to the dominant colors of the buildings on the site. Contrasting colors may be utilized if the overall effect of the sign is still compatible with building colors.

b. Design and construction

i. Except for banners, flags, temporary signs, and temporary window signs conforming with the requirements of this Chapter, each sign shall be constructed of permanent materials and shall be permanently attached to the ground, a building, or another structure by direct attachment to a rigid wall, frame, or structure.
ii. Each permanent sign shall be designed by a professional (e.g., architect, building designer, landscape architect, interior designer, or others whose principal business is the design, manufacture, or sale of signs), or who are capable of producing professional results.
iii. Each permanent sign shall be constructed by persons whose principal business is building construction or a related trade including sign manufacturing and installation, or others capable of producing professional results. The intent is to ensure public safety, achieve signs of careful construction, neat and readable copy, and durability, to reduce maintenance costs and prevent dilapidation.

c. Materials and structure
i. Sign materials (including framing and supports) shall be representative of the type and scale of materials used on the site where the sign is located. Sign materials shall match those used on the buildings on the site and any other signs on the site.
ii. No sign shall include reflective material.
iii. Materials for permanent signs shall be durable and capable of withstanding weathering over the life of the sign with reasonable maintenance.
iv. The size of the structural members (e.g. columns, crossbeams, and braces) shall be proportional to the sign panel they are supporting.
v. The use of individual letters incorporated into the building design is encouraged, rather than a sign with background and framing other than the structure wall.

d. Street address
The review authority may require that a sign include the street address of the site, where it determines that public safety and emergency vehicle response would be more effectively served than if the street address were displayed solely on one or more buildings on the site.

e. Copy design guidelines
The City does not regulate the message content (copy) of signs; however, the following are principles of copy design and layout that can enhance the readability and attractiveness of signs. Copy design and layout consistent with these principles is encouraged, but not required.
i. Sign copy should relate only to the name and/or nature of the business or commercial center.
ii. Permanent signs that advertise continuous sales, special prices, or include phone numbers are prohibited.
iii. Information should be conveyed briefly or by logo, symbol, or other graphic manner. The intent should be to increase the readability of the sign and thereby enhance the identity of the business.
iv. The area of letters or symbols should not exceed 40 percent of the background area in commercial uses or 60 percent for residential uses.
v. Freestanding signs should contain the street address of the parcel or the range of addresses for a multi-tenant center.

f. Sign lighting. Sign lighting shall be designed to minimize light and glare on surrounding rights-of-way and properties.
i. External light sources shall be directed and shielded so that they do not produce glare off the site, on any object other than the sign.
ii. Sign lighting shall not blink, flash, flutter, or change light intensity, brightness, or color.
iii. Colored lights shall not be used at a location or in a manner so as to be confused or construed as traffic control devices.

iv. Neither the direct nor reflected light from primary light sources shall create hazards for pedestrians or operators of motor vehicles.

v. For energy conservation, light sources shall be hard-wired fluorescent or compact fluorescent lamps, or other lighting technology that is of equal or greater energy efficiency. Incandescent lamps are prohibited.

4. Sign maintenance.

a. Each sign and supporting hardware, including temporary signs and awning signs, shall be maintained in good repair and functioning properly at all times. Any damage to a sign or its illumination, including the failure of illumination shall be repaired within a maximum of 14 days from the date of damage or failure.

b. A repair to a sign shall be of materials and design of equal or better quality as the original sign.

c. A sign that is not properly maintained and is dilapidated shall be deemed a public nuisance, and may be abated in compliance with the City's Zoning Code.

d. When an existing sign is removed or replaced, all brackets, poles, and other supports that are no longer required shall be removed, and any/all damage to the exterior of the building shall be repaired/repainted to the satisfaction of the Development Services Director or his/her designee.

5. Sign Standards by Use

Each sign shall comply with the standards provided by this Section and comply with the requirements in the following Table 3, except as permitted by the approval of a Creative Sign Permit described below.

6. Master Sign Program

All mixed use projects shall require a Master Sign Program, which is reviewed and approved by the decision-making body in each case. Master sign plan" means a coordinated program of signage for new or existing commercial, office or residential which contain more than one business establishment or tenant. The Master Sign Program can permit signs that meet the intent and standards of the Sign Code and ensure that the all signs are integrated thoughtfully into the design of the structures, creating a unified architectural statement. The Master Sign Program provides a means for defining common sign regulations for multi-tenant projects, to encourage maximum incentive and latitude in the design and display of multiple signs, and to achieve, not circumvent, the intent of this chapter.

a. Application Requirements Revisions to Master Sign Programs. A sign permit application for a master sign program shall include all information and materials required by the department, and the filing fee set by the city's Fee Resolution. Revisions to a master sign program may be approved by the Director with a standard sign permit if the intent of the original approval is not affected. Revisions that would substantially deviate from the original approval shall require the approval of a new master sign program.

b. Standards. A master sign program shall comply with the following standards:

i. The program shall comply with the purpose of this chapter.

ii. The signs shall enhance the overall development, be in harmony with, and relate visually to other signs included in the master sign program, to the structures or developments they identify, and to surrounding development;

iii. The program shall accommodate future revisions that may be required because of changes in use or tenants; and

iv. The program shall comply with the standards of this chapter, except that flexibility is allowed with regard to sign area, number, location, or height to the extent that the master sign program will enhance the overall development and will more fully accomplish the purposes of this chapter.

7. Creative Sign Permit

a. *Definition Creative Sign Permit.* Applicants may apply for a Creative Sign Permit for those signs which are not listed or which exceed the provisions of this Chapter. The Creative Sign Permit is intended for signs that meet the intent and standards of the Sign Code, but may not necessarily meet the standards shown in Table 3. An applicant may request approval of a creative sign permit to authorize on-site signs that employ standards that differ from the other provisions of this chapter but comply with the intent of this Chapter.

b. *Purpose.* To encourage signs of unique design, and that exhibit a high degree of thoughtfulness, branding, imagination, inventiveness, and spirit; and to provide a process for the application of sign regulations in ways that will allow creatively designed signs that make a positive visual contribution to the overall image of the city, while mitigating the impacts of large or unusually designed signs.

c. *Application and Procedure Requirements.* A sign permit application for a creative sign shall include all information and materials required by the department, and the filing fee set by the city's Fee Resolution. A sign permit application for a creative sign shall be subject to review and approval by the Director of Development Services when the proposed sign is fifty square feet or less, and by the Commission when the sign is larger than fifty square feet. Notification for a sign permit for a creative sign shall be given in the same manner specified by this Zoning Ordinance for Director-approved development permits in Chapter 19.48.

d. *Design Criteria.* In approving an application for a creative sign, the review authority shall ensure that a proposed sign meets the following design criteria.

i. *Design Quality Criteria.* The sign shall 1) constitute a substantial aesthetic improvement to the site and shall have a positive visual impact on the surrounding area; 2) be of unique design, and exhibit a high degree of thoughtfulness, imagination, inventiveness, and spirit; and 3) provide strong graphic character through the imaginative use of graphics, color, texture, quality materials, scale, and proportion.

ii. *Contextual Criteria.* The sign shall contain at least one of the following elements: 1) classic historic design style; 2) creative image reflecting current or historic character of the city; 3) symbols or imagery relating to the citrus packing industry; or 4) inventive representation of the use, name, or logo of the structure or business.

iii. *Architectural Criteria.* The sign shall: 1) utilize or enhance the architectural elements of the building; and 2) be placed in a logical location in relation to the overall composition of the building's façade and not cover any key architectural features and details of the façade.

iv. *Neighborhood Impacts.* The sign shall be located and designed not to cause light and glare impacts on neighboring residential uses.

Table 3. Sign Standards by Use

a. SIGN STANDARDS MULTI-FAMILY RESIDENTIAL USE			
Allowed Sign	Maximum Sign Height	Maximum No. of Signs Allowed per Parcel	Maximum Sign Area Allowed per Parcel
i. Wall or Freestanding	Wall signs: below edge of roof. Freestanding: 48 inches	1 wall sign or freestanding sign per entrance or street frontage	12 sf each per face area; 24 sf maximum total sf for all signs.

b. SIGN STANDARDS NON-RESIDENTIAL USE/MIXED USE		
Allowed Sign	Placement Standards	Maximum Number and Sign Area
i. Awning	Shall be entirely on awning valence; lettering max 66% of valence height; valence height max: 18 inches.	50% of the area of the valence front. 1 sign max per each separate awning valence.
ii. Marquee	To be established during project review. Allowed only for the entrance of a theatre or playhouse.	To be established during project review. 1 sign max
iii. Monument	5 ft including base structure. Allowed only on a site with more than 100 ft. of continuous street frontage.	36 sf
iv. Projecting or suspended	16 inches from face of building and bottom of sign shall be no closer than 8 ft above sidewalk surface below.	6 sf. No dimension greater than 3 ft. Sign shall be redwood sandblasted, hand carved or architecturally designed.
v. Wall	2 ft below parapet or eave. Individual letters 18 inches. Mounting 1-story: above 1st floor windows. Mounting multi-story: between windows.	1 sf. per linear foot primary business. 1 sign allowed per business frontage with pedestrian entrance. Side street or rear entrance wall sign max 50% of the primary sign area.
vi. Window Permanent	Within window area	15% of total window area max.
vii. Window Temporary	Within window area	25% of total window area. Allowed for display a maximum of 15 days at 1 time, up to 3 times in a 12 month period.
viii. A-boards and other portable sidewalk signs are permitted	May not impede pedestrian flow.	1 per business. Signs may only be permitted while the business is open. Requires an encroachment permit if in the public right-of-way
ix. Building Wall Facing RR ROW	Businesses may have signage equal to or less than the allowable projecting or wall sign standards.	Building or parcel must front along Crowther Avenue and the Railroad ROW
x. Directional Signage on private property		

7. Legal Nonconforming Signs

A legal nonconforming sign is any permanent or temporary sign that was legally established and maintained in compliance with the provisions of all applicable laws in effect at the time of original installation but that does not now comply with the provisions of this specific plan.

a. General requirements. A legal nonconforming sign shall not be:
   i. Changed to another nonconforming sign;
   ii. Structurally altered to extend its useful life;
   iii. Enlarged;
   iv. Re-established after a business is discontinued for 60 days or more, subject to the amortization clause below; or
   v. Re-established after damage or destruction to 50 percent or more of the value of the sign, or its components, as determined by the Building Official and subject to the amortization clause below.

b. Maintenance and changes.

Sign copy and face changes, nonstructural modifications, and nonstructural maintenance (e.g., painting, rust removal) are allowed without a sign permit up to a maximum of 25 percent of the existing total area of the sign. Face changes not including copy, and any nonstructural modifications exceeding 25 percent of the existing total area of the sign, and any structural changes shall comply with all applicable standards of this Chapter.

23.111.60 Amortization and Existing Uses

A. In order to preserve private property rights, all legal uses, buildings or structures in existence immediately preceding the effective date of this Chapter, may be continued to operate as a legal nonconforming use, building or structure. Additionally, said uses may be expanded, transferred or assigned for five (5) years from the effective date of this ordinance.

B. Five (5) years after the effective date of this ordinance, the property may be sold or transferred and the legally nonconforming use, building, or structure may continue in the following circumstances:
   i. The business/property is transferred from a Parent to his/her Child, from a Child to his/her Parent as defined in Chapter 23.04 of Municipal Code.
   ii. The business/property is transferred from an owner to his/her employee(s) such that the Ownership does not change as defined in Chapter 23.04 of Municipal Code.

C. Notwithstanding the foregoing, five (5) years after the effective date of this ordinance, the exception set forth in subsection (B) shall only apply if:
   i. The same use in existence as of five years from effective date of this ordinance will continue to operate. If the primary use of the business/property (not accessory uses), remains unchanged, then the secondary uses may change. Secondary uses are defined in the definitions section of this chapter. Secondary uses may also be "accessory uses" as defined in Section 23.04.030 of the PMC and which means "a use incidental, appropriate, subordinate and devoted exclusively to the main use of the lot or building"; and
   ii. The building or structure is not modified or expanded; and

The use, building or structure is not abandoned or discontinued for twelve (12) months or more.

The provisions of this section shall not apply to the Packing House, located at 341 S. Melrose Street, identified in the California Register of Historical Resources as eligible for designation as a historic resource. Due to its historical significance and the additional costs associated with bringing a historic resource that requires adaptive reuse into compliance with the TOD standards, the Packing House is exempt from amortization requirements as set forth herein.

E. The City shall give notice to all property owners of properties within the TOD regarding this ordinance in the following manner:

i. Within 180 days of adoption of this ordinance;
ii. Within 3 years after adoption of this ordinance; and
iii. At least 4 years after adoption of this ordinance.

Failure to provide any of the notices above shall not prevent the City from enforcing the requirements of this chapter.

23.111.070 Public Art/Public Plazas

Applicability:
Public Art and Public Plazas are encouraged in every development. Public art or plazas may be required as part of a development agreement for those developments that include 20 or more units or which are over 20,000 square feet. Public art is encouraged in construction and remodel/rehabilitation of existing structures. Public art is encouraged to reflect the history of the Packing House District and citrus growing industry.

Generally, the plans for proposed plazas or public art shall be part of the entitlement package submitted. The plazas may be located on the project site or at another location set forth in a development agreement, but must be located within the TOD project area.

23.111.080 TOD Development Impact Fee Program

In addition to City baseline impact fees, the TOD zone will require additional public realm improvements and projects are subject to a TOD Impact Fee that ensures all public sector infrastructure improvements can be provided. In addition to the TOD Impact Fee, all projects will be required to install public infrastructure and streetscape elements up to the curb face of the public street immediately adjacent to the project, in accordance with the Public Realm Development Standards.

Definitions: *to be added to Chapter 23.04 of Municipal Code.*

Term	Definitions
Adaptive Reuse Plan	Adaptive reuse refers to a detailed plan for reusing an old site or building for a purpose other than which it was originally designed for. Adaptive reuse seeks to preserve existing buildings by retrofitting spaces for new uses while retaining much of the original features of the structure, and making use of existing infrastructure and transportation networks. Adaptive reuse plans are prepared by preservation professionals.
Bed & Breakfast	A guest house or small hotel offering sleeping accommodations and a morning meal. This does not include owners of single family homes renting individual rooms.
Bike Parking – Long Term	A volume of space that can accommodate locked storage of one or more bicycles or an area located inside a building where bicycles can be stored. Generally for longer term storage of bicycles.
Bike Parking – Short Term	A fixture to which one or more bicycles can be securely locked. Generally for 2 hours or less.

Catalyst Site	The catalyst site is defined as the first entitled project within the TOD zone and has the following characteristics: 1. The catalyst site shall be a minimum of one acre and shall contain no less than 65 dwelling units per acre; 2. This site is permitted to be all residential, acting as a catalyst to further development in the zone. The catalyst site is permitted to be all residential (not mixed use) but is not required to be all residential; and 3. Should the first entitled project be withdrawn after entitlement, the next entitled project may be all residential only if there have been no other large scale projects entitled or developed in the zone. As a residential only project, the catalyst site may be exempt from the following development standards: i. Wrapped parking structure (23.111.040.A.8.z), however any proposed parking structure shall include design and landscape features to mitigate the visual impacts of the parking structure; ii. 15' Ground floor to ceiling height (Sections 23.11.030.E and 23.111.040.5.d); however no less than 10'; and iii. Commercial at ground floor (Section 12.11.030.E.15), however any proposed first floor residential shall include architectural features designed to create consistency with the TOD first floor commercial streetscape.
Child/Parent	"Child" and "Parent" shall have the same meaning as defined in California Probate Code Sections 26 and 54, respectively. In the event of any renumbering or repeal of Sections 26 and/or 54, the successor definition(s) provided pursuant to the provision shall apply.
Courtyard	An open space created by a minimum of 3 sides of a courtyard building and used for private recreation in residential developments.
Courtyard Housing	Building type consisting of residences that can be arranged in several possible configurations: townhouses, townhouses over apartments, apartment over apartments, where an apartment occupies a single floor.
Electric Vehicle Charging Stations	Level 2: 240-volt: Level 2 requires charging equipment to be purchased and installed and provides about 10-20 miles of range per hour of charge. From empty, a full size battery electric car takes about 4-7 hours to recharge. DC Fast Charging: 440-volt: DC fast charging provides up to an 80% charge in about 30 minutes.
Entitled Project	Entitled project shall mean a project that has obtained final approval of all necessary planning and other land use approvals.
General Retail	A business or person who sells goods to an individual consumer as opposed to a wholesaler or supplier, who normally sell their goods to another business. Any retail transaction, which has a good sold, is taxable by the State Board of Equalization.
Green	Available for informal active and passive recreation. A green may be spatially defined by ground plan landscape and informal trees and/or buildings.
Hostess Bar	Hostess clubs are nightclubs where staff cater to and/or engage with customers seeking drinks and/or attentive conversation. Typically the staff will be scantily clad. These are also called "bikini bars," "bee clubs," and other similar descriptions.
Live/Work	Integrated residence and working space, occupied and utilized by a single household in a structure that has been designed or structurally modified to accommodate joint residential occupancy and work activity. However, such residential use shall only be allowed on the second floor or above of said live/work space. The interior residential portion shall be clearly separated and not be visible from the commercial space.
Medical Offices/	An office or health facility providing health services including, without limitation,

Services	preventative and rehabilitation treatment, diagnostic services, testing and analysis. This use includes offices providing medical, dental, surgical, rehabilitation, podiatric, optometric, chiropractic and psychiatric services, and medical or dental laboratories incidental to these offices, but exclude inpatient services and overnight accommodation.
Mixed Use	The combination of non-residential and residential uses in the same structure or on the same site, where the residential component is located either above (vertical mixed-use) or behind or next to (horizontal mixed-use) the non-residential component.
Neighborhood Market	A retail store specializing in fresh produce and staples including bread, cereal, dairy products, and may include a deli counter. More than 75% of floor plan shall be devoted to food sales.
New Construction	New construction means any new ground up building, or any additions/renovations of more than 50% of existing ground floor building square footage, or any major remodel projects of buildings that are over 10,000 square feet and or any major remodel of the Packing House building as part of an adaptive reuse plan.
Nightclub	Any bar, cocktail lounge, discotheque, or similar establishment which provides live entertainment (music and/or dancing, comedy, etc.) in conjunction with alcoholic beverage sales. Includes bars, taverns, pubs, karaoke bars, and similar establishments where any food service is subordinate to the sale of alcoholic beverages.
Office Use	A place of business providing administrative business professional services such as insurance agencies, real estate offices, law offices, architectural or design offices, accounting services, travel agencies, etc. This includes government offices, and postal facilities and businesses engaged in the production of intellectual property such as advertising agencies, computer software production and programming services, educational, scientific and research organizations, media post production services, photography and commercial art studios, and writers and artists offices. This definition does not include "banks and financial Services."
Ownership	Ownership shall mean the ownership of 51% or more interest of a business or real property, including all land, structures, and other interest in the property.
Personal Services	Personal services are any businesses where services are provided or performed through direct physical contact between patron and employee. These include but are not limited to: barbers, beauticians, aestheticians, cosmetologists, nail salons, tanning salons, massage therapists, and tattoo parlors/body modification studios. They do not include doctors, dentists, chiropractors, or other state-licensed medical professionals.
Plaza	An open area usually located near buildings and often featuring walkways, trees and shrubs, places to sit, and sometimes shops
Primary Use	Five (5) years from the effective date of this Ordinance, Primary Use shall mean the main use which occupancies at least 70% or more of the total building area.
Retail and/or Commercial Uses	Uses as listed as Retail/Commercial Uses in Table 1 herein.
Secondary Use	Secondary uses are uses located in the same building as the primary use but which take up less than 30% of the total building area. Secondary uses may also be "accessory uses" as defined in Section 23.04.030 of the PMC and which means "a use incidental, appropriate, subordinate and devoted exclusively to the main use of the lot or building."
Studio	A place for the study or practice of an art, skill or specific fitness activity (such as dancing, singing, acting, cooking, yoga, palates, spinning, etc.). Typically this is one room devoted to the activity and where there is a limited number of teachers, all teaching the same skill or activity.
Telecommunication Cell Tower	A cell tower not including building used for telecommunication businesses.

Transit Oriented Development (TOD)	Transit-oriented development, or TOD, is a type of community development that includes a mixture of housing, office, retail and/or other amenities integrated into a walkable neighborhood and located within a half-mile of quality public transportation.
Wrapped Parking	A building parking design that completely conceals on all sides a parking garage that is designed for occupancy by retail, service, office, and/or residential uses, or for an all residential development.

APPENDIX 2a

Used CalEEMod 2016.3.1

752 Apartments, 3,753 trips per day

Operational year 2018

Daily Operational Air Pollutant Emissions Year 2018

Source	Operational Emissions[1]						
	ROG	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Mobile	8.2	39.6	111.4	0.3	27.6	7.7	36,031.1
SCAQMD Threshold	55	55	550	150	150	55	--
Exceeds Threshold (Yes/No)	No	No	No	No	No	No	--

[1]Emissions are expressed in pounds per day
SOURCE: Giroux & Associates (January 2017)

Operational GHG Emissions Metric Tons CO_2(e)

Consumption Source	Year 2018 $MTCO_2$(e)
Mobile Source	5,717.9
Significance Threshold	3,000

Placentia TOD

South Coast Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Mid Rise	752.00	Dwelling Unit	19.79	752,000.00	2151

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	8			**Operational Year**	2019
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Operational Emissions Only

Off-road Equipment -

Off-road Equipment - Operational Emissions

Trips and VMT - No construction

Vehicle Trips - 3753 trips per traffic report

Architectural Coating - No construction

Area Mitigation -

Placentia TOD - South Coast Air Basin, Summer

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Residential_Exterior	507,600.00	0.00
tblArchitecturalCoating	ConstArea_Residential_Interior	1,522,800.00	0.00
tblConstructionPhase	NumDays	20.00	1.00
tblConstructionPhase	PhaseEndDate	1/9/2017	1/10/2017
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblProjectCharacteristics	OperationalYear	2018	2019
tblTripsAndVMT	WorkerTripNumber	108.00	0.00
tblVehicleTrips	ST_TR	6.39	4.99
tblVehicleTrips	SU_TR	5.86	4.99
tblVehicleTrips	WD_TR	6.65	4.99

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	215.1384	16.3249	444.7792	0.9789		57.7857	57.7857		57.7857	57.7857	7,043.9226	13,647.7113	20,691.6340	21.1160	0.4781	21,362.0050
Energy	0.3121	2.6669	1.1349	0.0170		0.2156	0.2156		0.2156	0.2156		3,404.6027	3,404.6027	0.0653	0.0624	3,424.8346
Mobile	8.1961	39.6150	111.3515	0.3547	27.2541	0.3954	27.6495	7.2923	0.3720	7.6643		35,984.3932	35,984.3932	1.8692		36,031.1231
Total	**223.6465**	**58.6068**	**557.2656**	**1.3506**	**27.2541**	**58.3966**	**85.6508**	**7.2923**	**58.3732**	**65.6656**	**7,043.9226**	**53,036.7073**	**60,080.6299**	**23.0504**	**0.5405**	**60,817.9627**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	19.4011	11.9491	67.1256	0.0749		1.2493	1.2493		1.2493	1.2493	0.0000	14,443.9466	14,443.9466	0.3844	0.2628	14,531.8573
Energy	0.3121	2.6669	1.1349	0.0170		0.2156	0.2156		0.2156	0.2156		3,404.6027	3,404.6027	0.0653	0.0624	3,424.8346
Mobile	8.1961	39.6150	111.3515	0.3547	27.2541	0.3954	27.6495	7.2923	0.3720	7.6643		35,984.3932	35,984.3932	1.8692		36,031.1231
Total	**27.9093**	**54.2310**	**179.6120**	**0.4466**	**27.2541**	**1.8603**	**29.1145**	**7.2923**	**1.8369**	**9.1293**	**0.0000**	**53,832.9426**	**53,832.9426**	**2.3188**	**0.3252**	**53,987.8150**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	87.52	7.47	67.77	66.93	0.00	96.81	66.01	0.00	96.85	86.10	100.00	-1.50	10.40	89.94	39.84	11.23

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	1/10/2017	1/10/2017	5	1	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	0	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	0	0.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.2 Architectural Coating - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	8.1961	39.6150	111.3515	0.3547	27.2541	0.3954	27.6495	7.2923	0.3720	7.6643		35,984.3932	35,984.3932	1.8692		36,031.1231
Unmitigated	8.1961	39.6150	111.3515	0.3547	27.2541	0.3954	27.6495	7.2923	0.3720	7.6643		35,984.3932	35,984.3932	1.8692		36,031.1231

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	3,752.48	3,752.48	3752.48	12,822,794	12,822,794
Total	3,752.48	3,752.48	3,752.48	12,822,794	12,822,794

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Mid Rise	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.548893	0.044275	0.199565	0.124385	0.017503	0.005874	0.020174	0.028962	0.001990	0.002015	0.004673	0.000702	0.000989

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.3121	2.6669	1.1349	0.0170		0.2156	0.2156		0.2156	0.2156		3,404.6027	3,404.6027	0.0653	0.0624	3,424.8346
NaturalGas Unmitigated	0.3121	2.6669	1.1349	0.0170		0.2156	0.2156		0.2156	0.2156		3,404.6027	3,404.6027	0.0653	0.0624	3,424.8346

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Apartments Mid Rise	28939.1	0.3121	2.6669	1.1349	0.0170		0.2156	0.2156		0.2156	0.2156		3,404.6027	3,404.6027	0.0653	0.0624	3,424.8346
Total		**0.3121**	**2.6669**	**1.1349**	**0.0170**		**0.2156**	**0.2156**		**0.2156**	**0.2156**		**3,404.6027**	**3,404.6027**	**0.0653**	**0.0624**	**3,424.8346**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Apartments Mid Rise	28.9391	0.3121	2.6669	1.1349	0.0170		0.2156	0.2156		0.2156	0.2156		3,404.6027	3,404.6027	0.0653	0.0624	3,424.8346
Total		**0.3121**	**2.6669**	**1.1349**	**0.0170**		**0.2156**	**0.2156**		**0.2156**	**0.2156**		**3,404.6027**	**3,404.6027**	**0.0653**	**0.0624**	**3,424.8346**

6.0 Area Detail

6.1 Mitigation Measures Area

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	19.4011	11.9491	67.1256	0.0749		1.2493	1.2493		1.2493	1.2493	0.0000	14,443.9466	14,443.9466	0.3844	0.2628	14,531.8573
Unmitigated	215.1384	16.3249	444.7792	0.9789		57.7857	57.7857		57.7857	57.7857	7,043.9226	13,647.7113	20,691.6340	21.1160	0.4781	21,362.0050

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.2892					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	14.8896					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	197.0511	15.6027	382.4310	0.9756		57.4440	57.4440		57.4440	57.4440	7,043.9226	13,536.0000	20,579.9226	21.0063	0.4781	21,247.5524
Landscaping	1.9085	0.7222	62.3482	3.2800e-003		0.3416	0.3416		0.3416	0.3416		111.7113	111.7113	0.1097		114.4527
Total	**215.1384**	**16.3249**	**444.7792**	**0.9789**		**57.7857**	**57.7857**		**57.7857**	**57.7857**	**7,043.9226**	**13,647.7113**	**20,691.6340**	**21.1160**	**0.4781**	**21,362.0050**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	1.2892					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	14.8896					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	1.3138	11.2269	4.7774	0.0717		0.9077	0.9077		0.9077	0.9077	0.0000	14,332.2353	14,332.2353	0.2747	0.2628	14,417.4046
Landscaping	1.9085	0.7222	62.3482	3.2800e-003		0.3416	0.3416		0.3416	0.3416		111.7113	111.7113	0.1097		114.4527
Total	**19.4011**	**11.9491**	**67.1256**	**0.0749**		**1.2493**	**1.2493**		**1.2493**	**1.2493**	**0.0000**	**14,443.9466**	**14,443.9466**	**0.3844**	**0.2628**	**14,531.8573**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Placentia TOD

South Coast Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Mid Rise	752.00	Dwelling Unit	19.79	752,000.00	2151

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	8			**Operational Year**	2019
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Operational Emissions Only

Off-road Equipment -

Off-road Equipment - Operational Emissions

Trips and VMT - No construction

Vehicle Trips - 3753 trips per traffic report

Architectural Coating - No construction

Area Mitigation -

Placentia TOD - South Coast Air Basin, Annual

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Residential_Exterior	507,600.00	0.00
tblArchitecturalCoating	ConstArea_Residential_Interior	1,522,800.00	0.00
tblConstructionPhase	NumDays	20.00	1.00
tblConstructionPhase	PhaseEndDate	1/9/2017	1/10/2017
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblProjectCharacteristics	OperationalYear	2018	2019
tblTripsAndVMT	WorkerTripNumber	108.00	0.00
tblVehicleTrips	ST_TR	6.39	4.99
tblVehicleTrips	SU_TR	5.86	4.99
tblVehicleTrips	WD_TR	6.65	4.99

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Maximum	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.6543	0.2853	12.5739	0.0126		0.7608	0.7608		0.7608	0.7608	79.8767	166.1635	246.0403	0.2506	5.4200e-003	253.9219
Energy	0.0570	0.4867	0.2071	3.1100e-003		0.0394	0.0394		0.0394	0.0394	0.0000	1,577.3072	1,577.3072	0.0527	0.0190	1,584.2831
Mobile	1.4031	7.5495	19.3808	0.0620	4.8703	0.0721	4.9423	1.3051	0.0678	1.3729	0.0000	5,710.3407	5,710.3407	0.3057	0.0000	5,717.9823
Waste						0.0000	0.0000		0.0000	0.0000	70.2186	0.0000	70.2186	4.1498	0.0000	173.9637
Water						0.0000	0.0000		0.0000	0.0000	15.5441	312.6147	328.1588	1.6094	0.0404	380.4243
Total	**7.1144**	**8.3215**	**32.1619**	**0.0777**	**4.8703**	**0.8722**	**5.7424**	**1.3051**	**0.8679**	**2.1730**	**165.6395**	**7,766.4261**	**7,932.0656**	**6.3682**	**0.0648**	**8,110.5753**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.2076	0.2306	7.8532	1.3100e-003		0.0541	0.0541		0.0541	0.0541	0.0000	175.1927	175.1927	0.0156	2.9800e-003	176.4693
Energy	0.0570	0.4867	0.2071	3.1100e-003		0.0394	0.0394		0.0394	0.0394	0.0000	1,577.3072	1,577.3072	0.0527	0.0190	1,584.2831
Mobile	1.4031	7.5495	19.3808	0.0620	4.8703	0.0721	4.9423	1.3051	0.0678	1.3729	0.0000	5,710.3407	5,710.3407	0.3057	0.0000	5,717.9823
Waste						0.0000	0.0000		0.0000	0.0000	70.2186	0.0000	70.2186	4.1498	0.0000	173.9637
Water						0.0000	0.0000		0.0000	0.0000	15.5441	312.6147	328.1588	1.6094	0.0404	380.4243
Total	**4.6677**	**8.2668**	**27.4412**	**0.0664**	**4.8703**	**0.1655**	**5.0357**	**1.3051**	**0.1612**	**1.4663**	**85.7628**	**7,775.4553**	**7,861.2180**	**6.1331**	**0.0623**	**8,033.1228**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**34.39**	**0.66**	**14.68**	**14.53**	**0.00**	**81.03**	**12.31**	**0.00**	**81.43**	**32.52**	**48.22**	**-0.12**	**0.89**	**3.69**	**3.77**	**0.95**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Architectural Coating	Architectural Coating	1/10/2017	1/10/2017	5	1	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	0	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Architectural Coating	0	0.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.2 Architectural Coating - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.4031	7.5495	19.3808	0.0620	4.8703	0.0721	4.9423	1.3051	0.0678	1.3729	0.0000	5,710.3407	5,710.3407	0.3057	0.0000	5,717.9823
Unmitigated	1.4031	7.5495	19.3808	0.0620	4.8703	0.0721	4.9423	1.3051	0.0678	1.3729	0.0000	5,710.3407	5,710.3407	0.3057	0.0000	5,717.9823

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	3,752.48	3,752.48	3752.48	12,822,794	12,822,794
Total	3,752.48	3,752.48	3,752.48	12,822,794	12,822,794

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Mid Rise	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.548893	0.044275	0.199565	0.124385	0.017503	0.005874	0.020174	0.028962	0.001990	0.002015	0.004673	0.000702	0.000989

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,013.637 0	1,013.637 0	0.0419	8.6600e-003	1,017.263 3
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	1,013.637 0	1,013.637 0	0.0419	8.6600e-003	1,017.263 3
NaturalGas Mitigated	0.0570	0.4867	0.2071	3.1100e-003		0.0394	0.0394		0.0394	0.0394	0.0000	563.6702	563.6702	0.0108	0.0103	567.0198
NaturalGas Unmitigated	0.0570	0.4867	0.2071	3.1100e-003		0.0394	0.0394		0.0394	0.0394	0.0000	563.6702	563.6702	0.0108	0.0103	567.0198

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Mid Rise	1.05628e+007	0.0570	0.4867	0.2071	3.1100e-003		0.0394	0.0394		0.0394	0.0394	0.0000	563.6702	563.6702	0.0108	0.0103	567.0198
Total		**0.0570**	**0.4867**	**0.2071**	**3.1100e-003**		**0.0394**	**0.0394**		**0.0394**	**0.0394**	**0.0000**	**563.6702**	**563.6702**	**0.0108**	**0.0103**	**567.0198**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Mid Rise	1.05628e+007	0.0570	0.4867	0.2071	3.1100e-003		0.0394	0.0394		0.0394	0.0394	0.0000	563.6702	563.6702	0.0108	0.0103	567.0198
Total		**0.0570**	**0.4867**	**0.2071**	**3.1100e-003**		**0.0394**	**0.0394**		**0.0394**	**0.0394**	**0.0000**	**563.6702**	**563.6702**	**0.0108**	**0.0103**	**567.0198**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Mid Rise	3.18132e +006	1,013.637 0	0.0419	8.6600e-003	1,017.263 3
Total		**1,013.637 0**	**0.0419**	**8.6600e-003**	**1,017.263 3**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Mid Rise	3.18132e +006	1,013.637 0	0.0419	8.6600e-003	1,017.263 3
Total		**1,013.637 0**	**0.0419**	**8.6600e-003**	**1,017.263 3**

6.0 Area Detail

6.1 Mitigation Measures Area

Use only Natural Gas Hearths

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	3.2076	0.2306	7.8532	1.3100e-003		0.0541	0.0541		0.0541	0.0541	0.0000	175.1927	175.1927	0.0156	2.9800e-003	176.4693
Unmitigated	5.6543	0.2853	12.5739	0.0126		0.7608	0.7608		0.7608	0.7608	79.8767	166.1635	246.0403	0.2506	5.4200e-003	253.9219

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.2353					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.7174					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	2.4631	0.1950	4.7804	0.0122		0.7181	0.7181		0.7181	0.7181	79.8767	153.4957	233.3724	0.2382	5.4200e-003	240.9432
Landscaping	0.2386	0.0903	7.7935	4.1000e-004		0.0427	0.0427		0.0427	0.0427	0.0000	12.6679	12.6679	0.0124	0.0000	12.9787
Total	**5.6543**	**0.2853**	**12.5739**	**0.0126**		**0.7608**	**0.7608**		**0.7608**	**0.7608**	**79.8767**	**166.1635**	**246.0403**	**0.2506**	**5.4200e-003**	**253.9219**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.2353					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	2.7174					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0164	0.1403	0.0597	9.0000e-004		0.0114	0.0114		0.0114	0.0114	0.0000	162.5248	162.5248	3.1200e-003	2.9800e-003	163.4906
Landscaping	0.2386	0.0903	7.7935	4.1000e-004		0.0427	0.0427		0.0427	0.0427	0.0000	12.6679	12.6679	0.0124	0.0000	12.9787
Total	**3.2076**	**0.2306**	**7.8533**	**1.3100e-003**		**0.0541**	**0.0541**		**0.0541**	**0.0541**	**0.0000**	**175.1927**	**175.1927**	**0.0156**	**2.9800e-003**	**176.4693**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	328.1588	1.6094	0.0404	380.4243
Unmitigated	328.1588	1.6094	0.0404	380.4243

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Mid Rise	48.9958 / 30.8887	328.1588	1.6094	0.0404	380.4243
Total		**328.1588**	**1.6094**	**0.0404**	**380.4243**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Mid Rise	48.9958 / 30.8887	328.1588	1.6094	0.0404	380.4243
Total		**328.1588**	**1.6094**	**0.0404**	**380.4243**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	70.2186	4.1498	0.0000	173.9637
Unmitigated	70.2186	4.1498	0.0000	173.9637

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Mid Rise	345.92	70.2186	4.1498	0.0000	173.9637
Total		**70.2186**	**4.1498**	**0.0000**	**173.9637**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Mid Rise	345.92	70.2186	4.1498	0.0000	173.9637
Total		**70.2186**	**4.1498**	**0.0000**	**173.9637**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX 2b

The following pages are extracted from the La Palma Village Initial Study.

November 2015 | Initial Study

LA PALMA VILLAGE

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PLACEWORKS

1.2.3 Existing Zoning and General Plan

The project site is zoned C-G (General Commercial) and I (Industrial) and designated Mixed Use and Open Space by the General Plan Land Use Map. Figures 5, *Existing Zoning*, and 6, *Existing General Plan Land Use*, show the respective land use designations for the project site.

1.3 PROJECT DESCRIPTION

1.3.1 Proposed Land Use

La Palma Village

The proposed La Palma Village project involves the demolition of all existing onsite structures and construction of a 162-unit attached residential community with 922 square feet of retail space at buildout on a 6.79-acre site (see Figure 7a, *Proposed Site Plan (Phase I),* and Figure 7b, *Proposed Site Plan (Phase II)*). The Proposed Project would require the following discretionary actions from the City:

- General Plan Amendment to change a portion of the project site's land use designation from Open Space to Mixed Use; the remainder of the project site is already designated for Mixed Use. A General Plan Amendment to revise circulation maps in the Circulation Element to reflect the new street alignment for La Palma Avenue. (GPA2015-00499)
- Reclassification of the project site to add the Mixed Use (MU) Overlay Zone to the project site's existing Commercial General (CG) and Industrial (I) zones (RCL2015-00276).
- Conditional Use Permit to allow a mixed-use project with single-family attached residential units and modification of development standards (CUP2015-05780).
- Tentative Tract Map No. 17846 to establish a single residential lot with 152 condominium units.
- Tentative Tract Map No. 17992 to establish a single residential lot with 10 condominium units.

Demolition

A total of 67,052 square feet of onsite buildings and ancillary structures—such as a wash rack, storage containers, and shade structures—would be demolished. All surface parking, driveways, and onsite ornamental trees, including 35 palm trees and other vegetation, would also be removed.

La Palma Village Construction

The project site would be developed with 162 attached residential units totaling 287,633 square feet, which includes 922 square feet of retail space (see Figure 7a, *Proposed Site Plan (Phase I) and Figure 7b, Proposed Site Plan (Phase II)*). It should be noted that the Proposed Project would be constructed in two phases as shown in the respective site plans. Phase I development would include 152 units and Phase II development would include 10 units plus 922 square feet of retail space. The proposed development would generally be comprised of three product types: 1) townhomes (TH) totaling 104 units; 2) one corner product with 922 square feet of retail space and 4 townhome units; and 3) 27 duplexes totaling 54 units. Figures 8 through 11 show sample

1. Introduction

building elevations for 5-, 6-, 8-, and 9-plex TH product types that could be used for the Proposed Project. All TH products would be three stories high and 40 feet from the ground to the top of ridge. There are four different floor plans for the TH products with two to three bedrooms, and some have an extra den or office space. Figures 12 and 13 show the elevations and perspective views of the corner unit, with 922 square feet retail space with corner flat unit type. As shown, the corner product would be approximately 51 feet tall to the top of ridge. Twenty-seven duplex products would be three stories high and would not directly face the public streets. The duplex units would have three architectural styles, Traditional, Cape Cod, and Colonial (see Figures 14 to 16, *Duplex Building Elevations*). The Proposed Project would also include a 484-square-foot recreation center and a 20 foot x 40 foot swimming pool (see Figure 17, *Recreation Center Elevation*). Though no specific tenant has been identified, the proposed retail use would comply with Anaheim Municipal Code Section 18.32.30.030, "Mixed Use (MU) Overlay Zone, Compatibility Standards for Mixed Use Development."

Table 2, *La Palma Village Building Summary at Buildout*, describes proposed building products, number of units, and total building area.

Table 2 La Palma Village Building Summary at Buildout

Plan Type	Building SF	Bedrooms	Garage	Total Units	Total SF	Parking per Unit Type
Town Homes						
Phase I						
Plan 1	1,450	2	2 - Tandem	24	34,800	48
Plan 2	1495	2 + Den	2 - Standard	24	35,880	48
Plan 3	1,688	3 + Den	2 - Standard	21	35,448	42
Plan 4	1,774	3 + Den	2 - Standard	29	51,446	58
			Phase I Town Home Subtotal	98	157,574	196
Phase II						
Plan 1	1,450	2	2 - Tandem	2	2,900	4
Plan 2	1495	2 + Den	2 - Standard	2	2,990	4
Plan 3	1,688	3 + Den	2 - Standard	1	1,688	2
Plan 4	1,774	3 + Den	2 - Standard	1	1,774	2
			Phase II Town Home Subtotal	6	9,352	12
			Town Homes Subtotal	104	166,926	208
Duplexes (Phase I)						
Plan 1	1,900	3 + Office	2 - Standard	18	34,200	36
Plan 2	2,198	3 + Den	2 - Standard	22	48,356	44
Plan 3	2,307	3 + Den	2 - Standard	5	11,535	10
Plan 3X	2,307	3 + Den	3 - Standard	9	20,763	27
			Subtotal	54	114,854	117
Corner Flats (Phase II)						
Town A	1,620 922 (retail)	2	2 - Tandem	1	2,542	2
Corner B	1,415	2	2 - Tandem	1	1,415	2
Corner C	1,942	3	2 - Tandem	1	1,942	2
Corner D	1,954	3	2 - Tandem	1	1,954	2
			Subtotal	4	7,853	8
Residential Unit Total				162	289,633	
Recreation Center	484			n/a	484	
			Total	162	290,117	

Access and Parking

La Palma Village would be accessed via two driveways, one from La Palma Avenue and one from Anaheim Boulevard. The La Palma Avenue driveway would generally align with Anaheim Boulevard at the southeast corner of the project site, and the Anaheim Boulevard driveway would be at the northwest corner of the project site. Phase I development would provide 313 garage spaces (standard and tandem) and 110 uncovered guest parking spaces for a total of 423 parking spaces. Phase II development would provide 20 garage spaces (standard and tandem) and 10 uncovered guest parking spaces, including a loading space for the retail use, for a total of 30 parking spaces.

Right-of-Way Modification

Implementation of the Proposed Project would require right-of-way modification of La Palma Avenue and Anaheim Boulevard. La Palma Avenue right-of-way adjacent to the project site would be improved with a multi-use trail, a parkway, two right turn lanes, and a traffic lane. Anaheim Boulevard right-of-way adjacent to the project site would be improved with a sidewalk, a parkway, a bike lane, and two traffic lanes. Anaheim Boulevard would also be widened, and custom sign bridges would be provided to alert drivers of lane configurations and truck lanes as additional design treatment to facilitate vehicle tracking. Figure 18, *Modified Street Sections*, shows preliminary section views of the proposed right-of-way modifications. The actual layout of the street modifications and appropriate striping plan would be drafted under the direction of the Anaheim Public Works Department, Engineering Division, and would require review and approval by the City.

1.3.2 Project Phasing

The Proposed Project is tentatively scheduled to start in Winter 2015 and be completed by Spring 2019.

- Demolition (2 months)
- Site Preparation (1 month)
- Rough and Fine Grading (3 months)
- Building Construction (28 months)

1.4 EXISTING ZONING AND GENERAL PLAN

The project site is zoned C-G (General Commercial) and I (Industrial) and designated Mixed Use and Open Space by the General Plan Land Use Map.

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

No Impact. The project site is urban, built-up land with various industrial and commercial uses and would not result in the conversion of farmland to nonagricultural or forest land to non-forest use. No impact would occur, and no mitigation measures are required.

3.3 AIR QUALITY

The Air Quality section addresses the impacts of the Proposed Project on ambient air quality and the exposure of people, especially sensitive individuals, to unhealthful pollutant concentrations. A background discussion on the air quality regulatory setting, meteorological conditions, existing ambient air quality in the vicinity of the project site, and air quality modeling can be found in Appendix A.

The primary air pollutants of concern for which ambient air quality standards (AAQS) have been established are ozone (O_3), carbon monoxide (CO), coarse inhalable particulate matter (PM_{10}), fine inhalable particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxides (NO_2), and lead (Pb). Areas are classified under the federal and California Clean Air Act as either in attainment or nonattainment for each criteria pollutant based on whether the AAQS have been achieved. The South Coast Air Basin (SoCAB), which is managed by the South Coast Air Quality Management District (SCAQMD), is designated nonattainment for O_3, and $PM_{2.5}$ under the California and National AAQS, nonattainment for PM_{10} under the California AAQS, and nonattainment for lead (Los Angeles County only) under the National AAQS (CARB 2014a).

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?

Less Than Significant Impact. A consistency determination plays an important role in local agency project review by linking local planning and individual projects to the Air Quality Management Plan (AQMP). It fulfills the CEQA goal of informing decision makers of the environmental effects of the project under consideration at an early enough stage to ensure that air quality concerns are fully addressed. It also provides the local agency with ongoing information as to whether they are contributing to clean air goals in the AQMP. The most recent comprehensive plan is the 2012 AQMP, adopted on December 7, 2012 (see Appendix A for a description of the 2012 AQMP).

Regional growth projections are used by SCAQMD to forecast future emission levels in the SoCAB. For Southern California, these regional growth projections are provided by the Southern California Association of Governments (SCAG) and are partially based on land use designations in city/county general plans. An amendment to the Anaheim General Plan would be required to redesignate a portion of the project site to a mixed-use designation, and thus the Proposed Project would not be wholly consistent with the existing land use designation. However, only large, regionally significant projects typically have the potential to affect the regional growth projections. The Proposed Project is not considered a regionally significant project that would warrant Intergovernmental Review by SCAG under CEQA Guidelines Section 15206. Thus, it would not have the potential to substantially affect the regional growth projections. Additionally, the regional emissions generated by construction and operation of the Proposed Project would be less than the SCAQMD emissions thresholds with incorporation of MM AQ-1 (see the discussion in Section 3.3(b) below), and SCAQMD would not consider the project a substantial source of air pollutant emissions that would have the potential to affect the attainment designations in the SoCAB. Therefore, the project would not affect the regional emissions inventory or conflict with strategies in the AQMP. Impacts are less than significant and no mitigation measures are required.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Less Than Significant Impact With Mitigation Incorporated. The following describes project-related impacts from short-term construction activities and long-term operation of the Proposed Project.

Short-Term Air Quality Impacts

Construction activities would result in the generation of air pollutants. These emissions would primarily be 1) exhaust emissions from off-road diesel-powered construction equipment; 2) dust generated by demolition, grading, earthmoving, and other construction activities; 3) exhaust emissions from on-road vehicles; and 4) off-gas emissions of volatile organic compounds (VOCs) from application of asphalt, paints, and coatings.

Construction would involve building and asphalt demolition, site preparation, site grading, utility trenching, building construction, paving, and architectural coating. Construction is anticipated to commence in the latter half of 2015 with an anticipated completion year of 2019. Construction emissions were estimated using the California Emissions Estimator Model (CalEEMod), Version 2013.2.2, based on the project's preliminary construction schedule, phasing, and equipment list provided by the Applicant. The construction schedule and equipment mix is based on preliminary engineering and is subject to changes during final design and as dictated by field conditions. Except for nitrogen oxide (NO_X), results of the construction emission modeling in Table 3, *Maximum Daily Regional Construction Emissions*, show that air pollutant emissions from construction-related activities would be less than their respective SCAQMD regional significance threshold values. Without implementation of mitigation, construction-related NO_X generated during the overlap of building and asphalt demolition activities and associated hauling activities would exceed SCAQMD regional emissions threshold for NO_X. However, as shown in Table 4, *Maximum Daily Regional Construction Emissions with Mitigation During Demolition*, implementation of Mitigation Measure AQ-1, which would require use of construction equipment with Tier 3 rated engines during demolition, would reduce NO_X emission to below the SCAQMD significance threshold. Therefore, air quality impacts from project-related construction activities would be less than significant with the incorporation of mitigation.

3. Environmental Analysis

Table 3 Maximum Daily Regional Construction Emissions

Source	Criteria Air Pollutants (lbs/day)[1,2]					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Year 2015						
Building Demolition + Haul and Asphalt Demolition + Haul	10	103	79	<1	7	5
Year 2016						
Site Preparation	5	55	43	<1	11	7
Rough Grading + Haul and Utility Trenching	6	66	50	<1	7	4
Utility Trenching and Building Construction	4	36	31	<1	4	2
Year 2017						
Utility Trenching and Building Construction	4	33	30	<1	3	2
Building Construction and Fine Grading	7	65	53	<1	8	5
Building Construction, Fine Grading, and Architectural Coating	11	67	56	<1	9	6
Building Construction, Architectural Coating, and Asphalt Paving	10	51	45	<1	5	3
Building Construction, Architectural Coating, and Finishing/Landscaping	7	32	31	<1	4	2
Year 2018						
Building Construction, Architectural Coating, and Finishing/Landscaping	7	29	29	<1	3	2
Year 2019						
Building Construction, Architectural Coating, and Finishing/Landscaping	7	26	28	<1	3	2
Maximum Daily Emissions	11	103	79	<1	11	7
SCAQMD Regional Threshold	75	100	550	150	150	55
Exceeds Regional Threshold?	No	Yes	No	No	No	No

Source: CalEEMod, version 2013.2.2.
Notes: Totals may not equal 100 percent due to rounding.

1 Construction phasing is based on the preliminary information provided by the Applicant. Where specific information regarding project-related construction activities was not available, construction assumptions were based on CalEEMod defaults, which are based on construction surveys conducted by SCAQMD of construction equipment and phasing for comparable projects.

2 Includes implementation of fugitive dust control measures required by SCAQMD under Rule 403, including watering disturbed areas a minimum of two times per day, reducing speed limit to 15 miles per hour on unpaved surfaces, replacing ground cover quickly, and street sweeping with Rule 1186–compliant sweepers. Modeling also assumes a VOC of 50 g/L for interior paints and 100 g/L for exterior paints for residential building and a VOC of 75 g/L for interior paints and 150 g/L for exterior paints for non-residential buildings based on construction information provided by the Applicant.

Table 4 Maximum Daily Regional Construction Emissions With Mitigation During Demolition

Source	Criteria Air Pollutants (lbs/day)[1,2]					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Year 2015						
Building Demolition + Haul and Asphalt Demolition + Haul[3]	2	44	58	<1	4	2
Maximum Daily Emissions	11	67	58	<1	11	7
SCAQMD Regional Threshold	75	100	550	150	150	55
Exceeds Regional Threshold?	No	No	No	No	No	No

Source: CalEEMod, version 2013.2.2.
Notes: Totals may not equal 100 percent due to rounding.

1 Construction phasing is based on the preliminary information provided by the Applicant. Where specific information regarding project-related construction activities was not available, construction assumptions were based on CalEEMod defaults, which are based on construction surveys conducted by SCAQMD of construction equipment and phasing for comparable projects.

2 Includes implementation of fugitive dust control measures required by SCAQMD under Rule 403, including watering disturbed areas a minimum of two times per day, reducing speed limit to 15 miles per hour on unpaved surfaces, replacing ground cover quickly, and street sweeping with Rule 1186–compliant sweepers. Modeling also assumes a VOC of 50 g/L for interior paints and 100 g/L for exterior paints for residential building and a VOC of 75 g/L for interior paints and 150 g/L for exterior paints for non-residential buildings based on construction information provided by the Applicant.

3 Includes reductions from incorporation of Mitigation Measure AQ-1, which requires use of Tier 3 rated engines for construction equipment greater than 50 horsepower.

Long-Term Operation-Related Air Quality Impact

Long-term air pollutant emissions generated by the project would be generated by area sources (e.g., landscape fuel use, aerosols, and architectural coatings), mobile sources from vehicle trips, water and wastewater generation, solid waste generation, and energy use (natural gas) associated with the proposed residences. Criteria air pollutant emissions for the Proposed Project were modeled using CalEEMod. Table 5, *Maximum Daily Regional Operational Phase Emissions*, identifies criteria air pollutant emissions from the existing land uses and the Proposed Project. For purposes of this analysis, the existing land uses are assumed to not generate mobile-source emissions, which would yield a conservative net change in overall emissions with the Proposed Project.

As shown in the table, the net change in project-related air pollutant emissions from area sources, mobile sources, and energy (i.e., natural gas) use would be nominal and would not exceed the SCAQMD's regional emissions thresholds for operational activities. Therefore, long-term operation-related impacts to air quality would be less than significant and no mitigation measures are required.

3. Environmental Analysis

Table 5 Net Maximum Daily Regional Operational Phase Emissions

Source	Criteria Air Pollutants (lbs/day)					
	VOC	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Existing[1]						
Area	2	<1	<1	0	<1	<1
Energy	<1	<1	<1	<1	<1	<1
Subtotal	2	<1	<1	<1	<1	<1
Proposed Project						
Area	7	<1	13	<1	<1	<1
Energy	<1	1	<1	<1	<1	<1
Mobile	3	3	31	<1	8	2
Subtotal	10	4	45	<1	9	3
Net Change						
Area	6	<1	14	<1	<1	<1
Energy	<1	<1	<1	<1	<1	<1
Mobile	3	3	31	<1	8	2
Total Emissions	8	4	45	<1	9	3
SCAQMD Regional Threshold	55	55	550	150	150	55
Exceeds Regional Threshold?	No	No	No	No	No	No

Source: CalEEMod Version 2013.2.2.
Note: Highest winter or summer emissions are reported. Totals may not total to 100 percent due to rounding.
1 Assumes no mobile source emissions for existing land uses, which yields a conservative net change.

Mitigation Measure

Short-Term Construction

AQ-1 The construction contractor(s) shall use equipment that meets the United States Environmental Protection Agency (EPA) Certified Tier 3 off-road emissions standards for off-road diesel-powered construction equipment greater than 50 horsepower utilized for demolition activities. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine, as defined by California Air Resources Board (CARB) regulations. Prior to construction, the project engineer shall ensure that all construction management plans clearly show the requirement for EPA Tier 3 or higher emissions standards for construction equipment over 50 horsepower used for demolition activities. During construction, the construction contractor shall maintain a list of all operating equipment in use on the project site for verification by the Building Division Official or their designee. The construction equipment list shall state the makes, models, and numbers of construction equipment onsite. Equipment shall be properly serviced and maintained in accordance with the manufacturer's recommendations. Construction contractors shall also ensure that all nonessential idling of all construction equipment is restricted to five minutes or less, in compliance with CARB's Rule 2449.

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Less Than Significant Impact. The SoCAB is designated nonattainment for O_3 and $PM_{2.5}$ under the California and National AAQS, nonattainment for PM_{10} under the California AAQS, and nonattainment for lead under the National AAQS (CARB 2014a). According to SCAQMD methodology, any project that does not exceed or can be mitigated to less than the daily threshold values would not add significantly to a cumulative impact (SCAQMD 1993). Operational activities would not result in emissions that would exceed SCAQMD's significance thresholds. With incorporation of MM AQ-1, construction activities would also not result in emissions in excess of SCAQMD's significant thresholds. Therefore, the project would not result in a cumulatively considerable net increase in criteria pollutants, and impacts would be less than significant. No mitigation measures are required.

d) Expose sensitive receptors to substantial pollutant concentrations?

Less Than Significant Impact. The Proposed Project could expose sensitive receptors to elevated pollutant concentrations if it would cause or contribute significantly to elevated pollutant concentration levels. Unlike regional emissions, localized emissions are typically evaluated in terms of air concentration rather than mass so they can be more readily correlated to potential health effects.

Construction LSTs

Localized significance thresholds (LSTs) are based on the California AAQS, which are the most stringent AAQS that have been established by CARB to provide a margin of safety in the protection of public health and welfare. They are designated to protect sensitive receptors most susceptible to further respiratory distress, such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and people engaged in strenuous work or exercise. Construction LSTs are based on the size of the project site, distance to the nearest sensitive receptor, and Source Receptor Area. . The nearest sensitive receptors proximate to the project site include the adjacent commercial uses directly to the north and east and the residential uses approximately 170 feet to the south across La Palma Avenue.

Air pollutant emissions generated by construction activities are anticipated to cause temporary increases in air pollutant concentrations. Table 6, *Localized Construction Emissions*, shows the maximum daily construction emissions (pounds per day) generated during onsite construction activities compared with the SCAQMD's LSTs. As shown in the table, construction activities would not exceed the LSTs. Therefore, localized impacts would be less than significant, and no mitigation measures are required.

3. Environmental Analysis

Table 6 Localized Construction Emissions

Source	Pollutants(lbs/day)[1,2]			
	NO_X	CO	PM_{10}	$PM_{2.5}$
Year 2016 Utility Trenching and Building Construction	33	22	2	2
Year 2017 Utility Trenching and Building Construction	30	22	2	2
Year 2017 Building Construction, Architectural Coating, and Asphalt Paving	49	34	3	3
Year 2017 Building Construction, Architectural Coating, and Finishing/Landscaping	30	21	2	2
Year 2018 Building Construction, Architectural Coating, and Finishing/Landscaping	26	21	2	2
Year 2019 Building Construction, Architectural Coating, and Finishing/Landscaping	24	20	1	1
SCAQMD 1.31-acre LST	117	597	13	5
Exceeds LST?	No	No	No	No
Year 2015 Building Demolition + Haul and Asphalt Demolition + Haul	100	75	7	5
SCAQMD 2.00-acre LST	147	762	18	6
Exceeds LST?	No	No	No	No
Year 2016 Rough Grading + Haul and Utility Trenching	43	30	5	4
SCAQMD 2.50-acre LST	159	853	20	7
Exceeds LST?	No	No	No	No
Year 2017 Building Construction and Fine Grading	62	44	7	5
Year 2017 Building Construction, Fine Grading, and Architectural Coating	65	45	7	5
SCAQMD 3.31-acre LST	179	1,002	25	8
Exceeds LST?	No	No	No	No
Year 2016 Site Preparation	55	41	11	7
SCAQMD 3.50-acre LST	178	1,387	26	8
Exceeds LST?	No	No	No	No

Source: CalEEMod Version 2013.2.2; SCAQMD 2006, Appendix A: Localized Significance Methodology.

Notes: In accordance with SCAQMD methodology, only onsite stationary sources and mobile equipment occurring on the proposed project site are included in the analysis. LSTs for NO_X and CO are based on receptors within 82 feet (25 meters) of the proposed project site in Source Receptor Area (SRA) 16. LSTs for PM_{10} and $PM_{2.5}$ are based on receptors within 170 feet (52 meters) of the proposed project site in SRA 16.

1 Construction phasing is based on the preliminary information provided by the Applicant. Where specific information regarding project-related construction activities was not available, construction assumptions were based on CalEEMod defaults, which are based on construction surveys conducted by SCAQMD of construction equipment and phasing for comparable projects.

2 Includes implementation of fugitive dust control measures required by SCAQMD under Rule 403, including watering disturbed areas a minimum of two times per day, reducing speed limit to 15 miles per hour on unpaved surfaces, replacing ground cover quickly, and street sweeping with Rule 1186–compliant sweepers.

Operation LSTs

Operation of the Proposed Project would not generate substantial quantities of emission from onsite stationary sources. Land uses with the potential to generate substantial emissions that would require a permit from SCAQMD include industrial land uses, such as chemical processing, and warehousing operations, where substantial truck idling could occur on site. The Proposed Project does not fall within these categories of uses. While operation of the Proposed Project would result in the use of standard onsite mechanical equipment such as heating, ventilation, and air conditioning units, in addition to the occasional use of landscaping equipment for project site maintenance, air pollutant emissions generated from these activities would be nominal (see Table 5). Therefore, localized air quality impacts related to stationary-source emissions would be less than significant and no mitigation measures are required.

Carbon Monoxide Hotspots

Areas of vehicle congestion have the potential to create pockets of CO called hotspots. These pockets have the potential to exceed the state one-hour standard of 20 parts per million (ppm) or the eight-hour standard of 9.0 ppm. Because CO is produced in greatest quantities from vehicle combustion and does not readily disperse into the atmosphere, adherence to ambient air quality standards is typically demonstrated through an analysis of localized CO concentrations. Hotspots are typically produced at intersections, where traffic congestion is highest because vehicles queue for longer periods and are subject to reduced speeds.

The SoCAB has been designated in attainment under both the National and California AAQS for CO. Under existing and future vehicle emission rates, a project would have to increase traffic volumes at a single intersection by more than 44,000 vehicles per hour—or 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited—in order to generate a significant CO impact (BAAQMD 2011).[2] The Proposed Project would result in up to 111 daily peak hour trips and would not have the potential to substantially increase CO hotspots at intersections in the vicinity of the project site. Localized air quality impacts related to mobile-source emissions would be less than significant, and no mitigation measures are required.

Health Risk Assessment

SCAQMD currently does not require health risk assessments to be conducted for short-term emissions from construction equipment. Emissions from construction equipment primarily consist of diesel particulate matter (DPM). The Office of Environmental Health Hazards Assessment (OEHHA) adopted new guidance for the preparation of health risk assessments in March, 2015. OEHHA has developed a cancer risk factor and non-cancer chronic reference exposure level for DPM, based on continuous exposure over a long time frame (e.g., 30 years for residents and 25 years for workers). No acute (short-term) or 8-hour reference exposure levels (RELs) have been developed for DPM. The Proposed Project would be constructed in approximately 3.5 years, which would limit the exposure of offsite receptors to construction related DPM. SCAQMD currently does not require the evaluation of long-term excess cancer risk or chronic health impacts for a short-term project. In addition, construction activities would not exceed LST significance thresholds. For the reasons stated above, it is anticipated that construction emissions would not pose a threat to offsite receptors in close proximity to the project site. Therefore, project-related construction health impacts would be less than significant, and no mitigation measures are required.

[2] Vertical mixing is the dispersion of air pollutants as warm air rises through and over the cooler air above. Horizontal mixing is the dispersion of air pollutants propagated by wind patterns.

3. Environmental Analysis

Operation of the Proposed Project would expose sensitive receptors to elevated pollutant concentrations if it would place the project in an area with pollutant concentrations above ambient concentrations in the SoCAB. Recent air pollution studies have shown an association between proximity to major air pollution sources and a variety of health effects attributed to a high concentration of air pollutants. Guidance from the CARB and the California Air Pollutant Control Officer's Association (CAPCOA) recommends the evaluation of various emission sources within 1,000 feet of sensitive land uses (i.e., residences, schools, daycare centers, and hospitals). The Proposed Project involves siting residential land uses within 500 feet of two truck distribution centers, and several SCAQMD-permitted facilities are within a 1,000 foot radius. Therefore, health risks from diesel-fueled trucks and stationary sources were evaluated and included as Appendix B to this Initial Study. The health risk assessment (HRA) evaluated carcinogenic and non-carcinogenic health risks and risks from toxic air contaminants.

Carcinogenic Health Risks

Health risks associated with exposure to carcinogenic compounds at the project site can be defined in terms of the probability of developing cancer as a result of exposure to a chemical at a given concentration. The Proposed Project would result in housing persons in proximity to two truck distribution centers and several SCAQMD-permitted facilities. Diesel-fueled truck engines emit substantial amounts of DPM, among other pollutants. The evaluated permitted facilities emit various amounts of VOCs from natural gas combustion engines, automotive refinishing, and chemical blending operations. These pollutants could be linked to a risk of developing cancer and is an issue that requires examination with regard to the Proposed Project. The State of California has established that a project would result in a significant impact with regard to increasing exposure to carcinogens regulated under Proposition 65 if the project increases cancer risk by one in 100,000 (1.0×10^{-5}) or more. SCAQMD has established a maximum incremental cancer risk of 10 in a million (1.0×10^{-5}) for projects evaluated under CEQA.

Results of the HRA indicate that the estimated incremental cancer risk for a 30-year exposure of project residents to truck activity and stationary sources is 2.1 in a million (0.21E-05; see Table 7, which shows the potential cancer and non-cancer risk for the project site). This is below the threshold level of 10 in a million (1.0E-05). Therefore, cancer risk impacts to future residents would be less than significant, and no mitigation measures are required.

Table 7 Health Risk Assessment Results

Sources	Cancer Risk (per million)[1]	Chronic Hazard Index	Acute Hazard Index
All Emission Sources	2.1	0.005	0.007
SCAQMD Threshold	10	1.0	1.0
Exceeds Threshold?	No	No	No

Source: Lakes AERMOD View, 8.8.1; OEHHA 2015.
[1] The cancer risk impact determination was based on the recommended 30-year exposure duration for residences (OEHHA, 2015). For informational purposes, the cancer risks using the 70-year and 9-year exposure durations were also determined. The 70-year duration represents the maximum lifetime residential cancer risk, and the 9-year duration represents the central tendency or average residence time. The calculated 70-year cancer risk was 2.4 in a million, and the 9-year cancer risk was 1.7 in a million. Both the 70-year and 9-year cancer risks, as well as the 30-year risk, are below the SCAQMD's threshold of 10 in a million.

Non-carcinogenic Health Risks

Health risks associated with exposure to non-carcinogenic compounds can be defined in terms of the developing an adverse health effect resulting from chronic (i.e., long-term) or acute (i.e., short-term) exposure to a substance. Examples of non-carcinogenic adverse health effects could be a skin rash, bronchitis, or other bodily irritation. To quantify non-carcinogenic impacts, the hazard index approach was used. The hazard index assumes that chronic and acute exposures adversely affect a specific organ or organ system (toxicological endpoint). To calculate the hazard index, each chemical concentration or dose is divided by the appropriate toxicity value. For compounds affecting the same toxicological endpoint, this ratio is summed. Where the total equals or exceeds one, a health hazard is presumed to exist. SCAQMD has established a hazard index significance threshold of one for projects evaluated under CEQA.

The HRA performed for the Proposed Project indicates that the hazard index identified for each toxicological endpoint totaled less than one (see Table 7, *Health Risk Assessment Results*) for both chronic and acute hazards. Therefore, non-carcinogenic impacts to future would be residents of the Proposed Project would be less than significant and no mitigation measures are required.

e) Create objectionable odors affecting a substantial number of people?

Less Than Significant Impact. The Proposed Project would not result in objectionable odors. The threshold for odor is if a project creates an odor nuisance pursuant to SCAQMD Rule 402, Nuisance, which states:

> A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property. The provisions of this rule shall not apply to odors emanating from agricultural operations necessary for the growing of crops or the raising of fowl or animals.

The type of facilities that are considered to have objectionable odors include wastewater treatments plants, compost facilities, landfills, solid waste transfer stations, fiberglass manufacturing facilities, paint/coating operations (e.g., auto body shops), dairy farms, petroleum refineries, asphalt batch plants, chemical manufacturing, and food manufacturing facilities. The residential and retail land uses proposed by the project do not fall within the aforementioned land uses. Emissions from construction equipment, such as diesel exhaust and VOCs from architectural coatings, may generate odors. However, these odors would be low in concentration, temporary, and are not expected to affect a substantial number of people. Therefore, implementation of the Proposed Project would result in less than significant odor impacts, and no mitigation measures are required.

APPENDIX 3

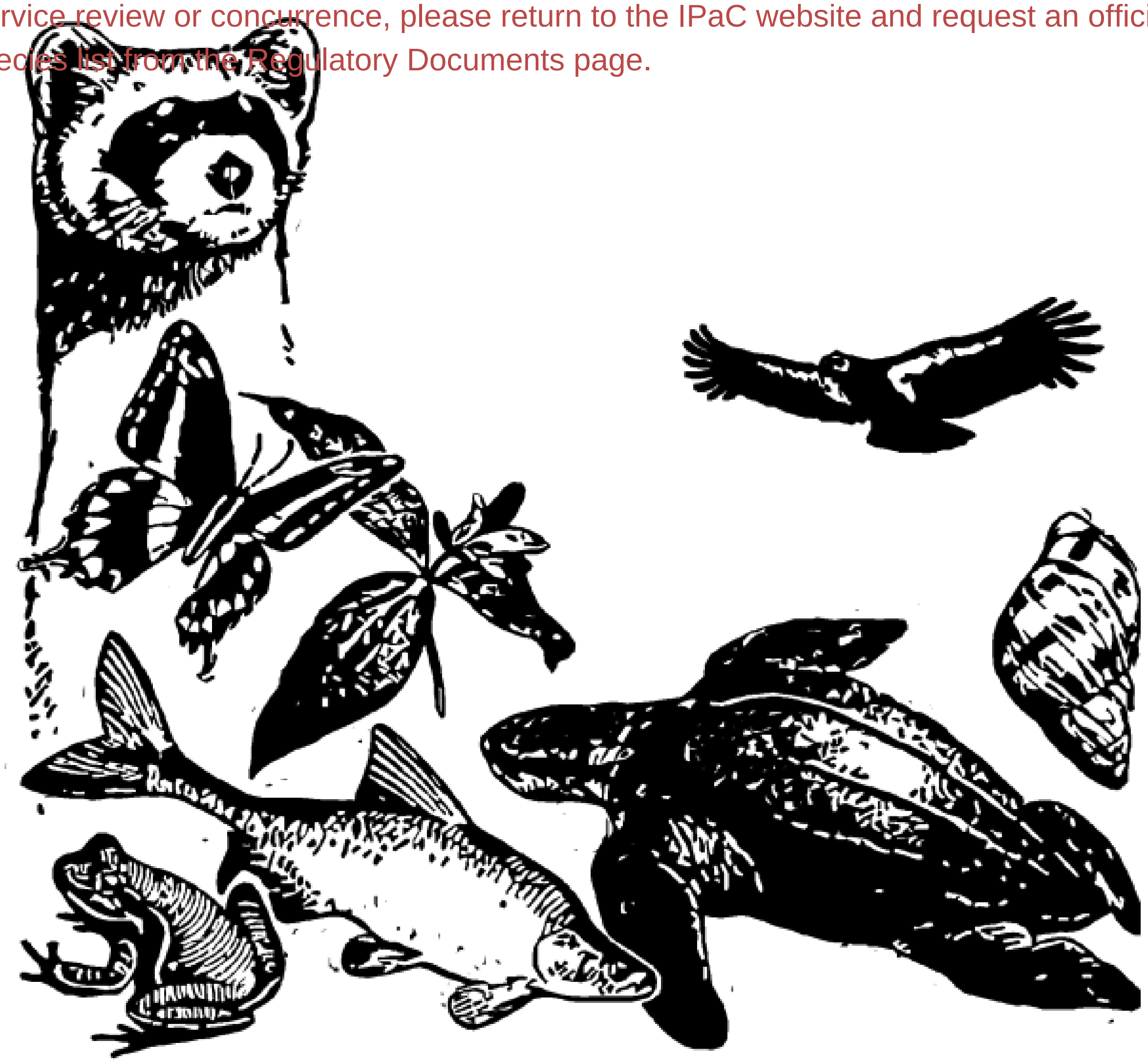
U.S. Fish & Wildlife Service

PACKING HOUSE DISTRICT TRANSIT ORIENTED DEVELOPMENT

IPaC Trust Resources Report

Generated October 12, 2016 02:37 PM MDT, IPaC v3.0.9

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.



IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

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U.S. Fish & Wildlife Service

IPaC Trust Resources Report

NAME

PACKING HOUSE DISTRICT TRANSIT ORIENTED DEVELOPMENT

LOCATION

Orange County, California

IPAC LINK

https://ecos.fws.gov/ipac/project/3DF25-HXQGR-ERHO3-5LVU4-FXZL7E

U.S. Fish & Wildlife Service Contact Information

Trust resources in this location are managed by:

Carlsbad Fish And Wildlife Office
2177 Salk Avenue - Suite 250
Carlsbad, CA 92008-7385
(760) 431-9440

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Birds

Coastal California Gnatcatcher Polioptila californica californica — Threatened

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B08X

Least Bell's Vireo Vireo bellii pusillus — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B067

Fishes

Santa Ana Sucker Catostomus santaanae — Threatened

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E07W

Flowering Plants

Ventura Marsh Milk-vetch Astragalus pycnostachyus var. lanosissimus Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=Q076

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity that results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish & Wildlife Service.[1] There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

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1. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The following species of migratory birds could potentially be affected by activities in this location:

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Bell's Vireo Vireo bellii — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JX

Brewer's Sparrow Spizella breweri — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HA

Burrowing Owl Athene cunicularia — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0NC

Cactus Wren Campylorhynchus brunneicapillus — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FZ

Costa's Hummingbird Calypte costae — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JE

Fox Sparrow Passerella iliaca — Bird of conservation concern
Season: Wintering

Green-tailed Towhee Pipilo chlorurus — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0IO

Lawrence's Goldfinch Carduelis lawrencei — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0J8

Least Bittern Ixobrychus exilis
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B092

Lesser Yellowlegs Tringa flavipes — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MD

Lewis's Woodpecker Melanerpes lewis — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HQ

Long-billed Curlew Numenius americanus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06S

Marbled Godwit Limosa fedoa — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JL

Mountain Plover Charadrius montanus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B078

Nuttall's Woodpecker Picoides nuttallii — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HT

Oak Titmouse Baeolophus inornatus — Bird of conservation concern
Season: Year-round
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MJ

Olive-sided Flycatcher Contopus cooperi — Bird of conservation concern

Season: Breeding

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0AN

Peregrine Falcon Falco peregrinus — Bird of conservation concern

Season: Wintering

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Red-crowned Parrot Amazona viridigenalis — Bird of conservation concern

Season: Year-round

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0GO

Rufous-crowned Sparrow Aimophila ruficeps — Bird of conservation concern

Season: Year-round

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0MX

Short-eared Owl Asio flammeus — Bird of conservation concern

Season: Wintering

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Snowy Plover Charadrius alexandrinus — Bird of conservation concern

Season: Breeding

Tricolored Blackbird Agelaius tricolor — Bird of conservation concern

Season: Year-round

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06P

Western Grebe aechmophorus occidentalis — Bird of conservation concern

Season: Wintering

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EA

Red Knot Calidris canutus ssp. roselaari — Bird of conservation concern

Season: Wintering

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0G6

Wildlife refuges and fish hatcheries

There are no refuges or fish hatcheries in this location

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

There are no wetlands in this location

APPENDIX 4a

Placentia TOD
Traffic Noise Impact Analysis
(dBA CNEL at 50 feet from centerline)

Segment		Existing No Project	Existing With Project	2018 No Project	2018 With Project	2035 No Project	2035 With Project
Chapman Ave/	W of Placentia	69.4	69.4	69.5	69.5	70.3	70.4
	E of Placentia	68.2	68.2	68.2	68.2	69.5	69.5
	W of Kraemer	67.3	67.3	67.6	67.6	68.3	68.3
	E of Kreamer	65.9	65.9	66.1	66.1	67.3	67.3
Crowther Ave/	W of Placentia	63.3	63.3	63.4	63.4	64.6	64.6
	E of Placentia	62.1	63.1	62.0	63.2	68.0	68.3
	W of Melrose	63.4	64.5	63.5	64.7	69.2	69.4
	E of Melrose	62.3	64.1	63.0	64.6	67.9	68.3
	W of Kraemer	63.7	64.3	64.2	64.8	67.4	67.6
	E of Kreamer	61.1	61.5	61.7	62.1	66.8	66.9
Orangethrope/	W of Placentia	69.6	69.8	69.7	70.3	71.8	71.8
	E of Placentia	70.1	70.1	70.2	70.6	72.5	72.5
	W of Melrose	71.3	71.4	71.5	71.6	72.9	73.0
	E of Melrose	69.9	69.9	69.9	69.9	71.6	71.6
	W of Kraemer	69.8	69.8	69.8	69.8	71.6	71.6
	E of Kreamer	67.7	67.7	67.8	67.8	69.5	69.5
Placentia Ave/	N of Chapman	69.3	69.4	69.4	69.5	70.6	70.6
	S of Chapman	69.5	69.6	69.6	69.7	70.8	70.8
	N of Crowther	69.0	69.0	69.1	69.1	70.5	70.6
	S of Crowther	69.0	69.2	69.1	69.3	70.9	71.0
	N of Orangethrope	68.4	68.6	68.5	68.7	71.1	71.2
	S of Orangethrope	66.2	66.4	66.3	66.5	70.3	70.4
Melrose/	N of Crowther	65.1	65.3	66.0	66.1	68.6	68.6
	S of Crowther	66.1	66.6	66.6	67.1	69.0	69.2
	N of Orangethrope	67.4	67.8	67.8	68.1	69.2	69.4
	S of Orangethrope	68.0	68.1	68.2	68.3	69.8	69.9
Kraemer Blvd/	N of Chapman	70.5	70.5	70.6	70.7	71.5	71.5
	S of Chapman	71.0	71.1	71.1	71.2	71.8	71.8
	N of Crowther	70.5	71.0	71.1	71.1	72.1	72.1
	S of Crowther	70.8	70.9	71.0	71.0	71.4	71.4
	N of Orangethrope	70.4	70.5	70.6	70.6	71.4	71.5
	S of Orangethrope	70.6	70.6	70.7	70.7	71.5	71.6

Project Impact
(dBA CNEL at 50 feet from centerline)

Segment		Project Only Existing	Project Only 2018	Project Only 2035	Cumulative*
Chapman Ave/	W of Placentia	0.0	0.0	0.0	1.0
	E of Placentia	0.0	0.0	0.0	1.3
	W of Kraemer	0.0	0.0	0.0	1.0
	E of Kreamer	0.0	0.0	0.0	1.4
Crowther Ave/	W of Placentia	0.0	0.0	0.0	1.3
	E of Placentia	1.0	1.2	0.3	6.1
	W of Melrose	1.2	1.2	0.3	6.1
	E of Melrose	1.8	1.6	0.5	6.0
	W of Kraemer	0.6	0.6	0.2	3.9
	E of Kreamer	0.5	0.4	0.1	5.9
Orangethrope/	W of Placentia	0.1	0.5	0.1	2.2
	E of Placentia	0.0	0.4	0.0	2.4
	W of Melrose	0.1	0.1	0.1	1.6
	E of Melrose	0.0	0.0	0.0	1.7
	W of Kraemer	0.0	0.0	0.0	1.9
	E of Kreamer	0.0	0.0	0.0	1.9
Placentia Ave/	N of Chapman	0.1	0.1	0.0	1.3
	S of Chapman	0.1	0.1	0.1	1.3
	N of Crowther	0.0	0.1	0.1	1.6
	S of Crowther	0.2	0.2	0.1	2.0
	N of Orangethrope	0.2	0.2	0.1	2.8
	S of Orangethrope	0.1	0.1	0.0	4.1
Melrose/	N of Crowther	0.2	0.1	0.0	3.5
	S of Crowther	0.5	0.5	0.2	3.1
	N of Orangethrope	0.4	0.4	0.2	2.1
	S of Orangethrope	0.1	0.1	0.0	1.8
Kraemer Blvd/	N of Chapman	0.0	0.0	0.0	1.1
	S of Chapman	0.0	0.0	0.0	0.8
	N of Crowther	0.5	0.0	0.0	1.6
	S of Crowther	0.1	0.0	0.0	0.6
	N of Orangethrope	0.1	0.1	0.1	1.0
	S of Orangethrope	0.1	0.1	0.0	1.0

*The difference between “2035 with project” and “existing no project” traffic noise levels
Note: May be off by =/- 0.1 dB due to round off in excel

All roads analyzed at 40 mph except for Chapman which was analyzed at a traffic speed of 35 mph per the city of Placentia website (http://qcode.us/codes/placentia/?view=desktop&topic=13-13_28-13_28_010).

Project only impact is the difference between the "with" and "without" project conditions for each time frame for which there is data in the project traffic report (existing, 2018 and 2035). Project implementation does not create greater than a +1.8 dB CNEL impact at 50 feet from centerline. This impact occurs on Crowther Avenue east of Melrose. By 2035, with a larger volume of background traffic, that impact decreases to +0.5 dB CNEL. Most roadway segments demonstrate less than a +0.2 dB CNEL impact.

Cumulative impacts are defined as the difference between "build out with traffic (year 2035)" and existing "no project" conditions. As shown, several roadway segments in the project vicinity are predicted to incur more than a +3.0 dB CNEL cumulative traffic impact. However, these impacts would occur even without project implementation and are caused by area growth.

APPENDIX 4b

NOISE IMPACT ANALYSIS

VETERAN'S VILLAGE

CITY OF PLACENTIA, CALIFORNIA

Prepared for:

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2150 N. Arrowhead Avenue
San Bernardino, California 92405

Date:

November 8, 2016

Project No.: P16-059 N

ENVIRONMENTAL SETTING

CHARACTERISTICS OF SOUND

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally considered to be unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level.

The decibel (dB) scale is used to quantify sound pressure levels. Although decibels are most commonly associated with sound, "dB" is a generic descriptor that is equal to ten times the logarithmic ratio of any physical parameter versus some reference quantity. For sound, the reference level is the faintest sound detectable by a young person with good auditory acuity.

Since the human ear is not equally sensitive to all sound frequencies within the entire auditory spectrum, human response is factored into sound descriptions by weighting sounds within the range of maximum human sensitivity more heavily in a process called “A-weighting,” written as dB(A). Any further reference in this discussion to decibels written as "dB" should be understood to be A-weighted.

Time variations in noise exposure are typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called LEQ), or alternately, as a statistical description of the sound pressure level that is exceeded over some fraction of a given observation period. Finally, because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Ldn (day-night) or the Community Noise Equivalent Level (CNEL). The CNEL metric has gradually replaced the Ldn factor, but the two descriptors are essentially identical.

CNEL-based standards are generally applied to transportation-related sources because local jurisdictions are pre-empted from exercising direct noise control over vehicles on public streets, aircraft, trains, etc. The City of Placentia therefore regulates the noise exposure of the receiving property through land use controls.

For “stationary” noise sources, or noise sources emanating from private property, such as a parking structure, the City does have legal authority to establish noise performance standards designed to not adversely impact adjoining uses. These standards are typically articulated in the jurisdictional Municipal Code. These standards recognize the varying noise sensitivity of both transmitting and receiving land uses. The property line noise performance standards are normally structured according to land use and time-of-day.

PLANNING STANDARDS

The City of Placentia has developed compatibility guidelines based on the California State model for acceptable community noise levels that are based upon the CNEL rating scale to insure that noise exposure is considered in any development. As discussed, CNEL-based standards apply to noise sources whose noise generation is preempted from local control (such as from on-road vehicles, trains, airplanes, etc.) and are used to make land use decisions as to the suitability of a given site for its intended use. These CNEL-based standards are stated in the Noise Element of the General Plan. Local jurisdictions generally regulate the level of non-transportation noise that one use may impose upon another through a Noise Ordinance.

The Noise Element of the City of Placentia General Plan establishes exterior noise quality compatibility guidelines for land use categories consistent with this sensitivity criterion. The Noise Element specifies acceptable noise exposure based on noise sensitivity of the impacted land use. These exterior noise standards apply to all recreational uses within backyards, patios, balconies or decks. The General Plan states that multi-family residential uses, as a maximally sensitive land use, can experience a noise exposure of up to 60 dB CNEL without consideration of special noise abatement procedures. A noise exposure of 65 dB CNEL is considered "conditionally acceptable" for residential uses if all available mitigation has been employed and if a means to shut out the noise is provided (usually closed windows with air conditioning). Noise Exposures in excess of 75 dB CNEL for residential uses are strongly discouraged. Figure 1 shows this noise/land use compatibility matrix.

NOISE STANDARDS

Noise ordinance limits generally apply to "stationary" sources such as mechanical equipment or vehicles operating on private property. The City of Placentia noise standards are presented in Table 1. Applicable noise standards must be met at the nearest residential property line. For residential use, the noise standard is 55 dB Leq day time and 50 dB Leq night time.

The City's noise ordinance limits are stated in terms of a 30-minute limit with allowable deviations from this 50^{th} percentile standard. This noise level describes the noise that is exceeded during a certain percentage of the measurement period. For example, the L_{50} is the level exceeded 50% of the measurement period of thirty minutes in an hour. The larger the deviation, the shorter the allowed duration up to a never-to-exceed 20 dB increase above the 50^{th} percentile standard. Because residential uses are rarely a source of steady-state noise generation, noise ordinance standards are rarely an issue in terms of the project impacting the environment. In frequent load assembly, noisy animals, etc. are enforced under nuisance abatement prohibitions separate from the City's Noise Ordinance.

In accordance with Section 23.81.170 of the Placentia Municipal Code, construction related activities are except from noise regulations provided the activities take place during the hours of 7 a.m. to 7 p.m. Monday through Friday and 9:00 a.m. to 6:00 p.m. on Saturday. No construction activities are allowed on Sundays or Federal Holidays. Since the project will not likely entail noise generating operational activities, the noise standards were not used for project evaluation and are presented for informational purposes only.

FIGURE 1
NOISE AND LAND USE COMPATIBILITY MATRIX

Land Use Category	Community Noise Exposure			
	Ldn or CNEL, dB			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential-Low Density	50-60	60-65	65-75	75-85
Residential-Multiple Family	50-60	60-65	65-75	75-85
Transient Lodging-Motel, Hotels	50-65	65-70	70-80	80-85
Schools, Libraries, Churches, Hospitals, Nursing Homes	50-60	60-65	65-80	80-85
Auditoriums, Concert Halls, Amphitheaters	NA	50-65	NA	65-85
Sports Arenas, Outdoor Spectator Sports	NA	50-70	NA	70-85
Playgrounds, Neighborhood Parks	50-70	NA	70-75	75-85
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50-70	NA	70-80	80-85
Office Buildings, Business Commercial and Professional	50-67.5	67.5-75	75-85	NA
Industrial, Manufacturing, Utilities, Agriculture	50-70	70-75	75-85	NA

NOTES:

NORMALLY ACCEPTABLE
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE
New Construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE
New construction or development should generally not be undertaken.

NA: Not Applicable

Source: Modified from U.S. Department of Housing and Urban Development Guidelines and State of California Standards.

Table 1

City of Placentia Residential Noise Standards

Noise Zone	Noise Level	Time Period
Residential	55 dB(A)	7:00 a.m.--10:00 p.m.
	50 dB(A)	10:00 p.m.--7:00 a.m.
Commercial	65 dB(A)	Anytime
Industrial	70 dB(A)	Anytime

It is unlawful for any person at any location within the incorporated area of the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential, commercial, or industrial property, either incorporated or unincorporated to exceed:

(1) The noise standards for a cumulative period of time more than thirty (30) minutes in any hour; or

(2) The noise standard plus five (5) dB(A) for a cumulative period of more than fifteen (15) minutes in any hour; or

(3) The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or

(4) The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one (1) minute in any hour; or

(5) The noise standard plus twenty (20) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds any of the first four (4) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(d) In the event that the noise source and the affected property are within different noise zones, the noise standard applicable to the affected property shall apply. (Ord. 75-O-105 § 5, 1975)

BASELINE NOISE LEVELS

The primary noise source in the City of Placentia near the proposed project site is the Burlington Northern Santa Fe Railroad (BNSF) line located in the southern portion of the City. This rail-line traverses the City in an east/west direction, generally parallel to Crowther and Orangethorpe Avenues. The rail corridor, which serves the ports of Los Angeles and Long Beach, is referred to as the Orange County Gateway. An estimated 50 trains per day, or two trains per hour, travel through this corridor. Approximately 90 percent of daily rail traffic is related to freight operations. The remaining traffic is comprised of passenger operations, including MetroLink and Amtrak service.

On-site noise measurements were attempted on September 28, 2016 along the southern site boundary in order to categorize train noise. Unfortunately, the $70 million dollar Lakeview Avenue overcrossing construction project is currently in full swing. The operation of pile drivers, crushers and cement mixers precludes obtaining a meaningful noise baseline. The measurement of 61 dB Leq along the southern project fence line would suggest an existing level of 63 dB CNEL, but that reading was contaminated by a variety of sources that will disappear at the completion of the overcrossing project.

However, an Environmental Impact Report (EIR) was prepared for the Westgate Metrolink Station in Placentia, in March of 2007[1]. The noise consultant conducted noise monitoring at varying distances from the rail-line. At a distance of about 110 feet, the consultant observed a CNEL of 79 dB. The closest Placentia Veteran's Village building façade is approximately 115 feet from the rail-line. Therefore the 79 dB CNEL reference value was not adjusted for distance and has been used as a basis to analyze project impacts.

Traffic from Orangethorpe Avenue is also a consideration. According to the Noise Element of the Placentia General Plan there are approximately 21,000 vehicles per day traveling on Orangethorpe Avenue between Richfield Road to Lakeview Avenue. At build-out traffic is expected to increase to 23,000 vehicles per day. The corresponding noise levels observed in the General Plan are 68.5 dB CNEL at 100 feet from the roadway center line for existing conditions and 68.7 dB CNEL at 100 feet from centerline for build-out conditions. The proposed project has slightly more than a 200 foot setback from the Orangethorpe Avenue centerline. This would reduce noise levels by 3 dB for an existing noise level of 65.5 dB CNEL existing and 65.8 dB CNEL future at the closest Placentia Veteran's Village building façade. Because the evaluated train noise is already 79 dB CNEL, traffic noise from Orangethorpe Avenue would negligibly contribute to the noise environment and was not considered further.

[1] http://www.placentia.org/DocumentCenter/Home/View/86

NOISE IMPACTS

IMPACT SIGNIFICANCE CRITERIA

Noise impacts are considered significant if:

1. They create violations of noise standards, or,

2. They substantially worsen an already excessive noise environment, or,

3. They substantially increase an existing quiet environment even if noise standards are not violated by the proposed action.

Two characteristic noise sources are typically identified with land use intensification such as that proposed for the Placentia Veteran's Village project. Construction activities, especially heavy equipment, will create short-term noise increases near the project site. Such impacts may be important for possible nearby noise-sensitive receptors. Upon completion, project-related traffic will cause an incremental increase in area-wide noise levels throughout the project area. Traffic noise impacts are generally analyzed both to insure that the project not adversely impact the acoustic environment of the surrounding community, as well as to insure that the project site is not exposed to an unacceptable level of noise resulting from the ambient noise environment acting on the project. This project will cause an increase in area wide traffic but the increase will likely be small relative to the overall traffic volumes. It is the ambient noise level from transportation sources, particularly from the adjacent rail-line, acting on the project which is of concern for this site.

THRESHOLDS OF SIGNIFICANCE

According to the current CEQA Appendix G guidelines, noise impacts are considered potentially significant if they cause:

a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. Operational noise levels generated by project activities exceeding the City of Placentia Noise Standards would be considered significant. Similarly, exposure of project residents to roadway noise exceeding noise/land use compatibility guidelines would be a potentially significant impact.

b. Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels.

c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

CEQA Guidelines also identify potential impact significance due to aircraft noise. There are no airports within any reasonable noise impact distance from the proposed project area.

CONSTRUCTION NOISE THRESHOLDS

Construction noise is governed by ordinance limits on allowable times of equipment operations. The Placentia noise ordinance does not contain performance standards for construction equipment noise. There are therefore, no applicable local policies or standards available to judge the significance of short-term construction noise in Placentia. However, the speech interference threshold for residential users was applied as a surrogate for this project. To evaluate construction impact for adjacent sensitive uses, noise limits are defined in this analysis as speech interference during the day and sleep disturbance during the night.

- Speech Interference. Speech interference is an indicator of the effects of noise on typical daytime and evening activities. A speech interference threshold, in the context of impact duration and time of day, is used to identify substantial increases in noise resulting from temporary construction activities. For indoor noise environments, the highest noise level that permits relaxed conversation with 100 percent intelligibility throughout the room is 45 dB. Speech interference is considered to be intolerable when normal conversation is precluded at 3 feet, which occurs when background noise levels exceed 60 dB. Since a typical building can reduce noise levels by 25 dB (with closed windows), an exterior noise level of 70 dB at receptor locations would maintain an acceptable interior noise environment of 45 dB. For this analysis, a significant noise impact would occur if noise levels remained above the 70-dB speech interference threshold to preclude interference with normal daytime residential interior activities..

As indicated, the City of Placentia regulates construction noise by setting limits on allowable daytime hours of activity. Nocturnal construction, which has sleep disturbance potential, is not permitted and is therefore not examined in this analysis.

For this project the nearest sensitive receptors are the residential uses to the north, across Orangethorpe Avenue, and are more than 250 feet from the edge of the site. The homes are located behind block walls which provide protection from Orangethorpe Avenue traffic noise. In addition, as part of the project, an 8-foot noise wall will be installed at the northern project property line. These noise walls will attenuate noise by at least 5 dBA.

Table 2 presents the estimated construction noise levels that could occur at the closest residences and represent the highest noise levels that would be expected during construction. Table 2 identifies highest (L_{max}) noise levels associated with each type of equipment, then adjusts this noise level for distance to the closest sensitive receptor and the extent of equipment usage (usage factor), which is represented as L_{eq}. As indicated in this table, construction equipment noise levels would range between 51 and 55 dB (L_{eq}) at the closest residential structure. Such noise levels would not exceed the 70 dB adopted noise threshold and therefore indicates a less-than-significant impact. Since all other noise-sensitive receptors are located farther from the project site, the project's construction-related noise levels would be lower and also would be less than significant. In addition, background train traffic noise levels well over 68 dB Leq from the adjacent track would minimize any potential residual construction noise impact.

Table 2
Project-related Construction Noise Levels at the Closest Noise-sensitive Receptor

Principal Noise Sources	Reference Noise Level, Lmax in dBA at 50 feet[a]	Assumed Usage Factor	Noise Level Adjustment Factor for Usage	Noise Level Adjustment for Wall	Noise Level Adjustment Factor for Distance	L_{eq} Noise Level Adjusted for Distance and Usage
Drill Rig	79	20%	-7	-5	-14	53
Crane	81	16%	-8	-5	-14	54
Loader/Backhoe	78	40%	-4	-5	-14	55
Flat Bed Truck	74	40%	-4	-5	-14	51

NOTES:
[a] Reference noise levels and equipment usage factors are based on noise measurements collected during a roadway tunnel project (FHWA, 2011).

According to the City of Placentia Municipal Code, permissible hours of construction are 7 a.m. to 7 p.m. Monday through Friday and 9:00 a.m. to 6:00 p.m. on Saturday. Construction is not allowed on Sundays or public holidays. Adherence to this schedule reduces impacts to less-than-significant.

CONSTRUCTION ACTIVITY VIBRATION

Typical background vibration levels in residential areas are usually 50 VdB or lower, below the threshold of human perception. Perceptible vibration levels inside residences are typically attributed to the operation of heating and air conditioning systems, door slams or street traffic. Construction activities and street traffic are some of the most common external sources of vibration that can be perceptible inside residences.

Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration related problems generally occur due to resonances in the structural components of a building because structures amplify groundborne vibration. Within the "soft" sedimentary surfaces of much of Southern California, ground vibration is quickly damped out. Groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Groundborne vibrations from construction activities rarely reach levels that can damage structures. Because vibration is typically not an issue, very few jurisdictions have adopted vibration significance thresholds. Vibration thresholds have been adopted for major public works construction projects, but these relate mostly to structural protection (cracking foundations or stucco) rather than to human annoyance.

Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object. RMS velocities are expressed in units of vibration decibels. The range of vibration decibels (VdB) is as follows:

65 VdB	-	threshold of human perception
72 VdB	-	annoyance due to frequent events
80 VdB	-	annoyance due to infrequent events
94-98 VdB	-	minor cosmetic damage

To determine potential impacts of the project's construction activities, estimates of vibration levels induced by the construction equipment at various distances are presented in Table 3.

Table 3
Approximate Vibration Levels Induced by Construction Equipment

	Approximate Vibration Levels (VdB)*			
Equipment	**25 feet**	**50 feet**	**100 feet**	**250 feet**
Pile Driver	93	87	81	63
Large Bulldozer	87	81	75	67
Loaded Truck	86	80	74	66
Jackhammer	79	73	67	59
Small Bulldozer	58	52	46	38

* (FTA Transit Noise & Vibration Assessment, Chapter 12, Construction, 2006)

The nearest residential property line across Orangethorpe Avenue is more than 250 feet from the edge of the site. The on-site construction equipment that will create the maximum potential vibration is a large truck. The stated vibration source level in the FTA Handbook for such equipment is 81 VdB at 50 feet from the source. By 250 feet the vibration level dissipates to 66 VdB which would be below the annoyance threshold and much less than the damage threshold. In addition, vibration from passing trains would dominate any residual construction vibration.

ON-SITE NOISE IMPACTS

As discussed earlier in this report, a maximal 79 dB CNEL noise loading is expected at the Veteran's Village northern building façade adjacent to the rail-line. This noise loading considers both train activity and traffic noise. An 8-foot wall is planned along the shared property line with the railroad tracks and will mitigate noise for the ground level units. However, the project is expected to be 3 stories high. Upper levels will be exposed to the full noise loading and will not benefit from the proposed 8-foot wall.

The Placentia Veteran's Village structure is oriented such that all balconies and patios are on the side of the building facing away from the rail line and Orangethorpe Avenue. These balconies will be noise protected by the structure itself. In addition, almost all the decks are partially recessed (approximately half of the total depth) which would also provide noise protection. With this design strategy, project balconies and decks would be expected to achieve a 65 dB CNEL level with no mitigation.

Units adjacent to the track are designed such that only hallway corridors front the tracks. No habitable rooms will directly face the track. Bedrooms and living areas are oriented towards the front of the structure. No habitable rooms will have any windows, doors or decks with a clear line-of-sight to the rail line. Project design maximizes noise protection by providing an additional wall and air space between any living space and any noise source.

The requirement for habitable interior space is a noise level of less than 45 dB CNEL with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level will typically necessitate the use of air conditioning and/or mechanical ventilation. In modern construction structural attenuation is expected to be 25-30 dBA with closed windows (U.S. Environmental Protection Agency (EPA), 1974). However, because project design provides an extra layer of protection with no living space immediately adjacent to the railroad track, an extra 5 dBA of noise protection is afforded. Therefore, an exterior noise level of 80 dBA would maintain an interior noise standard of 45 dBA with closed windows. No mitigation is required to ensure the interior noise standard is met.

CNEL is an imperfect metric for noise nuisance from train activity. CNEL is a weighted 24-hour average that correlates well to annoyance, speech interference, or sleep disturbance for semi-continuous sources such as on-road traffic. Trains and perhaps airplanes are characterized by extended periods of essentially no sound punctuated by a sudden short period noise spike.

To the extent possible, structural noise protection should be incorporated into units closest to the tracks and over-designed beyond minimum requirements. While "standard" dual-paned windows will be adequate to meet the interior noise standard for habitable rooms (no such rooms will directly face the tracks), side windows on these buildings in living or sleeping areas should be premium dual-paned with a minimum sound transmission class (STC) rating of 33 or higher. Additionally, installation of a mechanical ventilation system affording comfort under closed window conditions is required.

Multiple family units which share common wall assemblies must have sound-rated "party" walls. The California Building Code requires that such walls have a "sound transmission class" (STC) rating of 50 or better. The STC rating and the test report documentation must be shown on building plans. Typically shared wall assemblies that meet fire retardant requirements also meet STC standards with a substantial margin of safety.

ON SITE VIBRATION IMPACTS

Railroads generate ground-borne vibration that may be perceptible at on-site uses. Construction of residential units in close proximity to railroad tracks can cause rattling windows and throbbing floors. Ground-borne vibration is generally not a problem for buildings near railroad tracks at-or above-grade, because the airborne noise from trains typically overshadows effects of vibration. Vibration noise becomes an issue in cases where airborne noise is particularly blocked, such as for buildings near tunnels. Vibration is most commonly expressed in terms of the root mean square (RMS) velocity of a vibrating object.

Train vibration depends upon a variety of factors. The weight of the train, the travel speed, the condition of the track and the character of the subsoil all affect the observed vibration level. The USDOT (US Department of Transportation) Guideline called "Transit Noise and Vibration Impact Assessment" (May, 2006) suggests a significance threshold of 80 VdB for train vibrations if there are currently approximately 30 train movements per day, 75 VdB for between 30-70 events and 72 VdB for more than 70 events per day.

The closest Veteran's Village building façade is approximately 115 feet to the track centerline. As shown in Figure 4, use of DOT data predicts vibration levels of 77 VdB at 115 feet from the track for locomotive powered passenger and freight trains traveling at 50 mph. Vibration levels from heavy rail systems depend upon train travel speed. Freight trains are restricted to a 30-35 mph speed limit in areas of at-grade crossings. The RMS vibration level at 30 mph is approximately 3 VdB less than at 50 mph. A reference vibration level of 74 VdB has therefore been assumed at the closest building façade to the tracks.

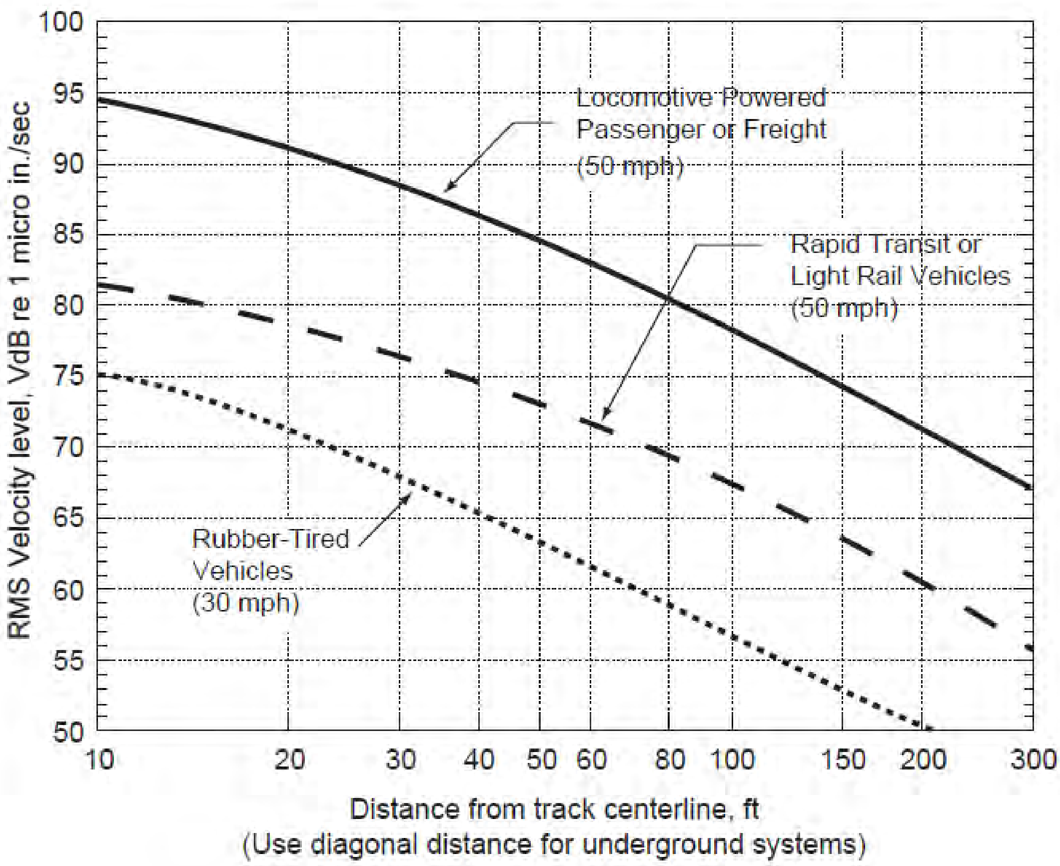
Vibration generally reduces as it propagates though a building. In addition large masonry buildings with spread footings have a low response to ground vibration. The following coupling losses are generally observed in the indicated types of construction per USDOT Guidelines:

Wood Frame	-5 VdB
1-2 Story Commercial	-7 VdB
3-4 Story Masonry	-10 VdB
Large Masonry on Piles	-10 VdB
Large Masonry on Spread Footings	-13 VdB

For this project a -10 dB coupling loss "credit" was taken per building since the proposed buildings are at three stories high. Freight train vibration levels of 74 VdB at 115 feet from the track for a locomotive-powered freight train traveling at 30 mph would marginally exceed the VdB annoyance threshold without the effects of coupling losses if there are more than 70 train movements per day.

FIGURE 4

GENERALIZE GROUND SURFACE VIBRATION CURVES



These vibration estimates are at slab level. The upstairs residential uses will not experience the full vibration level that is observed at slab level. Floor/ceiling assemblies and floor coverings (especially carpet) will absorb a portion of the vibration energy. Vibration reduction "credit" for hard floor surfaces (tile, light weight concrete, etc.) is -2 VdB at ground levels and increases by an additional -2 dB upstairs. Measurements of impact isolation show that carpets and pads reduce vibration by more than 10 VdB.

Counteracting absorption effects, the USDOT guidelines suggest a +6 VdB factor be included to account for amplification due to resonance of floors, walls and ceilings. Table 4 summarizes the appropriate credits and losses, and shows that vibration levels experienced by a person standing indoors for living space on each level. With the use of carpeted floors or hard surface flooring, the thresholds suggested for residential use of 80 VdB daytime and 72 VdB nighttime will not be exceeded. Vibration levels for hard surfaces could be close to the recommended levels, but are well below the structural damage threshold for stucco or similar materials which requires vibration levels close to 100 VdB. It should be noted that the federal vibration guidelines for infrequent events (<70 day) are 80 VdB. Neither daytime nor nocturnal train passage vibration levels will exceed the federal 80 VdB annoyance threshold on second or third story residential floors.

Additionally all units facing the railroad tracks should be equipped with dual-paned windows with upgraded seals for noise control. These more robust windows will have little tendency to rattle. Vibration effects within residential units passing through floors or windows will be less-than-significant.

Table 4
Interior Vibration Levels (VdB)
(at 115 feet to track centerline)

	1st Story Hard Floor	**1stStory Carpet & Pad**	**2nd Story Hard Floor**	**2nd Story Carpet & Pad**	**3rd Story Hard Floor**	**3rd Story Carpet & Pad**
Max. Unmitigated Vibration	74	74	74	74	74	74
Coupling Losses	-7	-7	-7	-7	-7	-7
Building Resonance	+6	+6	+6	+6	+6	+6
Floor-to-Floor Absorption	0	0	-2	-2	-4	-4
Floor Covering	-2	-10	-2	-10	-2	-10
Net Vibration	71	63	69	61	67	59

SUMMARY

Conditions for construction compliance are:

- The hours of construction operation shall be limited to be between the hours of 7 a.m. to 7 p.m. Monday through Friday and 9:00 a.m. to 6:00 p.m. on Saturday. No construction activity is allowed on Sundays and Federal holidays.
- All construction equipment shall use properly operating mufflers.
- All construction staging areas should be as far away as feasible from any surrounding existing homes.

To the extent possible, structural noise protection incorporated into units abutting the tracks should be over-designed beyond minimum requirements. While "standard" dual-paned windows will be adequate to meet the interior noise standard for habitable rooms (no such rooms will directly face the tracks), side windows on these buildings in living or sleeping areas should be premium dual-paned with a minimum sound transmission class (STC) rating of 33 or higher. Additionally, installation of a mechanical ventilation system affording comfort under closed window conditions is required.

Documentation of intra-unit sound isolation in party wall or floor/ceiling assemblies shall be included in a final acoustical report required as part of plan check.

APPENDIX 5a

TRAFFIC IMPACT STUDY
for the Proposed
PACKING HOUSE AREA REDEVELOPMENT

Submitted to

City of Placentia

August 18, 2016

Submitted By

Albert Grover & Associates

August 18, 2016

Mr. Charles Rangel
Senior Planner
City of Placentia
401 E. Chapman Avenue
Placentia, California 92870

RE: Traffic Impact Study for the Proposed Redevelopment of the Packing House Area

Dear Mr. Rangel:

Albert Grover & Associates (AGA) is pleased to present to City of Placentia this evaluation of a traffic impact analysis for the proposed redevelopment of the Packing House area in the City of Placentia. The study area encompasses the area north of Crowther Avenue, east of the SR-57 freeway, west of Melrose Street and south of the railroad tracks and the area on the southeast corner of the intersection of Melrose Street and Crowther Avenue. The proposed project is a Transit Oriented Development (TOD) which is a moderate- to high-density mixed-use development to be located within walking distance of the new Placentia Metrolink station.

The purpose of this traffic impact analysis is to evaluate any potential traffic impacts of the proposed project on the surrounding intersections, and determine if any mitigation is required at these intersections.

Should you have any questions regarding any aspects of this study, please contact me.

Respectfully submitted,

ALBERT GROVER & ASSOCIATES

[original signed by]

David L. Chen, P.E.
Design Engineer

Placentia\198-014\Letter Report Cover Letter.docx

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APPENDIX

I. INTRODUCTION

Purpose of the Traffic Impact Analysis

The City of Placentia desires to see the area south and west of the planned Metrolink Station, commonly referred to as the packing house area, redeveloped into a modern walkable, vibrant, and sustainable Transit Oriented Development (TOD) project. TOD projects are typically mixed-use residential and commercial developments designed to maximize access to public transport by incorporating features to encourage transit ridership and reduce dependency on automobile use for mobility. The purpose of this study report is to analyze and evaluate potential traffic impacts of TOD type projects in the vicinity of the Metrolink Station, and to provide decision-makers in the City of Placentia with a comprehensive assessment of the most probable traffic and transportation outcomes.

The TOD Traffic Study is not a typical traffic study per say, because unlike in a typical traffic study, a significant portion of trips generated from the TOD site will be to/from the planned Placentia Metrolink Station. These commuter trips will largely be to/from large metropolitan areas such as Downtown Los Angeles and/or Central Orange County (i.e., Santa Ana and Irvine). This TOD project will be a mixed-use residential and commercial development with the majority of commercial-use trips being internal trips. The project encompasses approximately 21 acres and could generate 5,000 or more trips. The City has determined that a maximum of 5,000 trips is a threshold that will accommodate the anticipated new development. The *Comparison of Vehicle Trip Generation Rates* section (pp. 36-40) of the Transit Cooperative Research Program (TCRP) Report 128 – "Effects of TOD on Housing, Parking, and Travel (see Appendix A) has research indicating that for projects within ¼ mile of a metrorail station an average TOD trip generation to be approximately 50% of the Institute of Transportation Engineers (ITE) average trip rates. For example, the City of Fullerton currently uses a factor of 25% transit-oriented trip reduction for the existing Fullerton Transportation Center. It should be noted that Fullerton Transportation Center, located in the heart of Downtown Fullerton, is largely commercial use with many restaurants and businesses that attract people besides just the transportation center. For the Placentia TOD in the packing house area, a factor of 35% transit-oriented trips is appropriate, because unlike the Fullerton Transportation Center, there are less restaurants and businesses that will attract outside traffic. With the expected reduced trips due to TOD, the total net trips will be approximately 5,000. The CEQA analysis conducted for this project was done based on a trip cap of 5,000 trips for the entire project area. Once the 5,000 trips has been reached by development actually constructed, then new applicants will be required to do additional CEQA analysis to determine if there are any additional traffic circulation impacts. The City will track the number of vehicle trips generated by each development. If additional development within the project site generates more than 5,000 trips, then additional analyses will be required. It is assumed that residents who choose to live here made a conscious decision to rely on Metrolink and bus as primary modes of transportation. It is very likely that a large portion of the Placentia TOD residents will be Fullerton students because rental rates will be lower here than in Fullerton. Also assumed is that these are students who do not own a car, and must rely on alternative modes of transportation. Local bus services, or shuttle, will run from the Placentia TOD to Fullerton and other work centers.

Project Location and Description

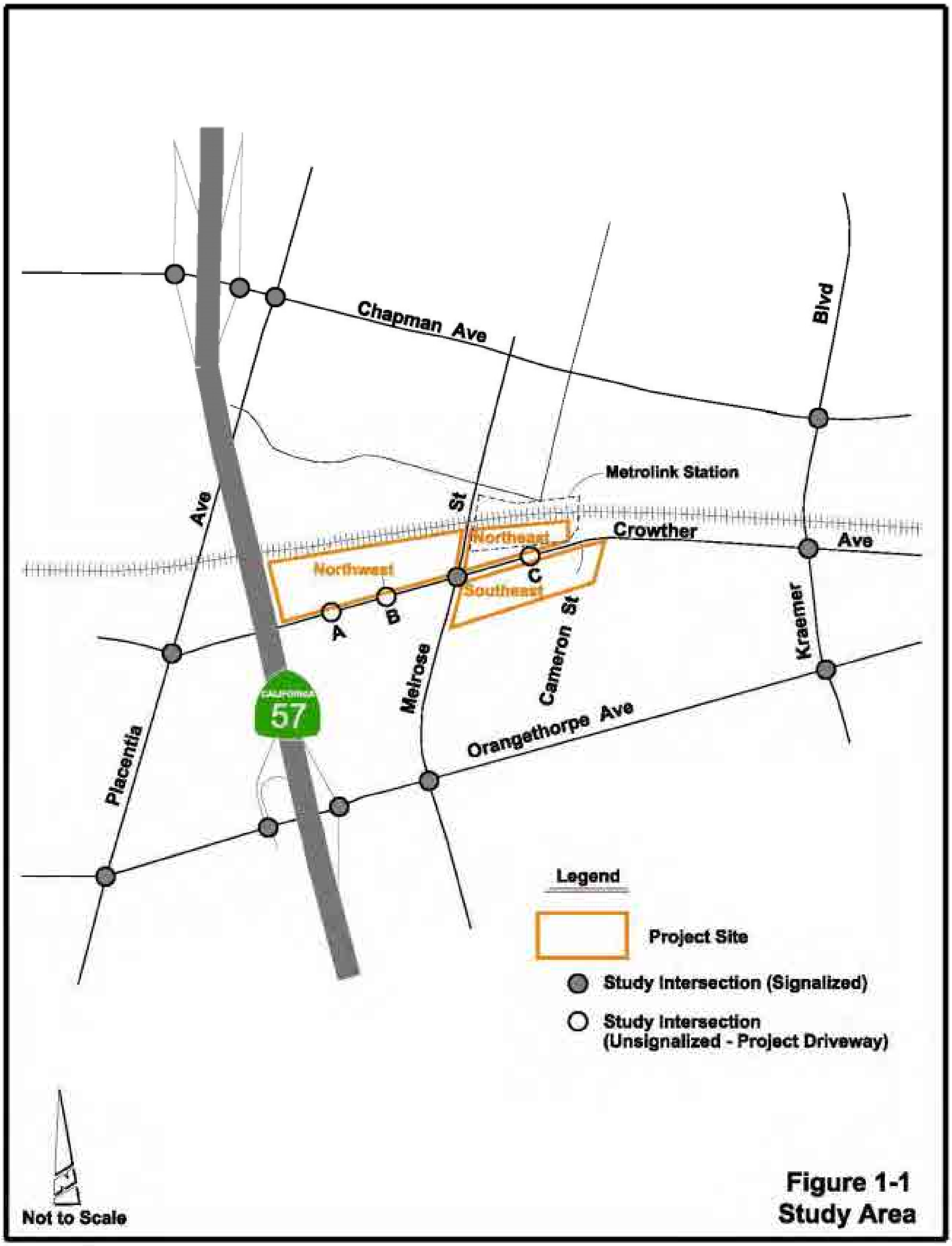
At the time of the writing of this report, there were no specific development proposals before the City for consideration. However, in anticipation of one or more future TOD projects in the southern and western vicinity of the planned Placentia Metrolink Station, the City has undertaken this proactive study effort to determine possible traffic impacts of such projects. The possible TOD projects are anticipated to be comprised of moderate to high-density residential mixed with commercial uses. The proposed project sites, as outlined in Figure 1-1, are located along Crowther Avenue, between the SR-57 freeway and Cameron Street. For the purposes of this report, the study area was divided into the following three sub-areas for evaluation centered on the intersection of Crowther Avenue and Melrose Street; the northwest corner lot, southeast corner lot, and the northeast corner lot. The northwest corner lot is approximately 9.63 acres in size and is currently occupied by a number of industrial, commercial, and residential uses. The southeast corner area is approximately 5.63 acres in size occupied by a 118,548 square foot industrial warehouse. The northeast corner area is a planned Metrolink parking lot of approximately 3.03 acres in size.

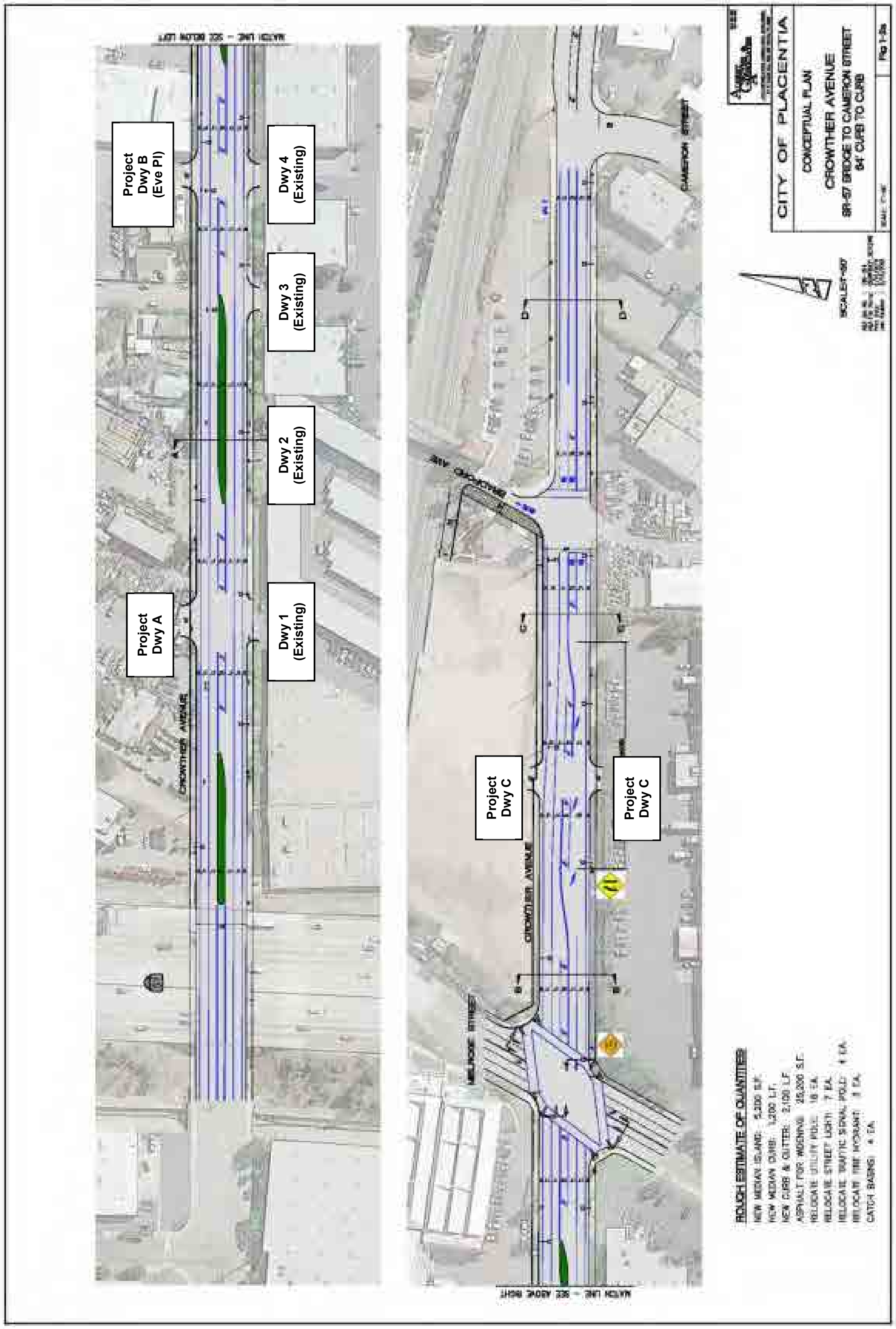
All three study sub-areas are located within a short walk of the planned Placentia Metrolink Station. With the proposed opening of the station sometime in 2017, it is anticipated that the Packing House area will become a key transportation hub and focal point for mobility in the City. The station is expected to provide quick and convenient access to commuter rail service for area residents wishing to travel to Los Angeles or Riverside for employment opportunities. In addition, it is anticipated that the station will also be a key arrival and departure point for students, faculty, and staff traveling to and from California State University Fullerton (CSUF) from distant communities in the metrorail service area. It is also anticipated that local bus service or shuttles will ultimately be provided to connect the Placentia Metrolink Station to the campus.

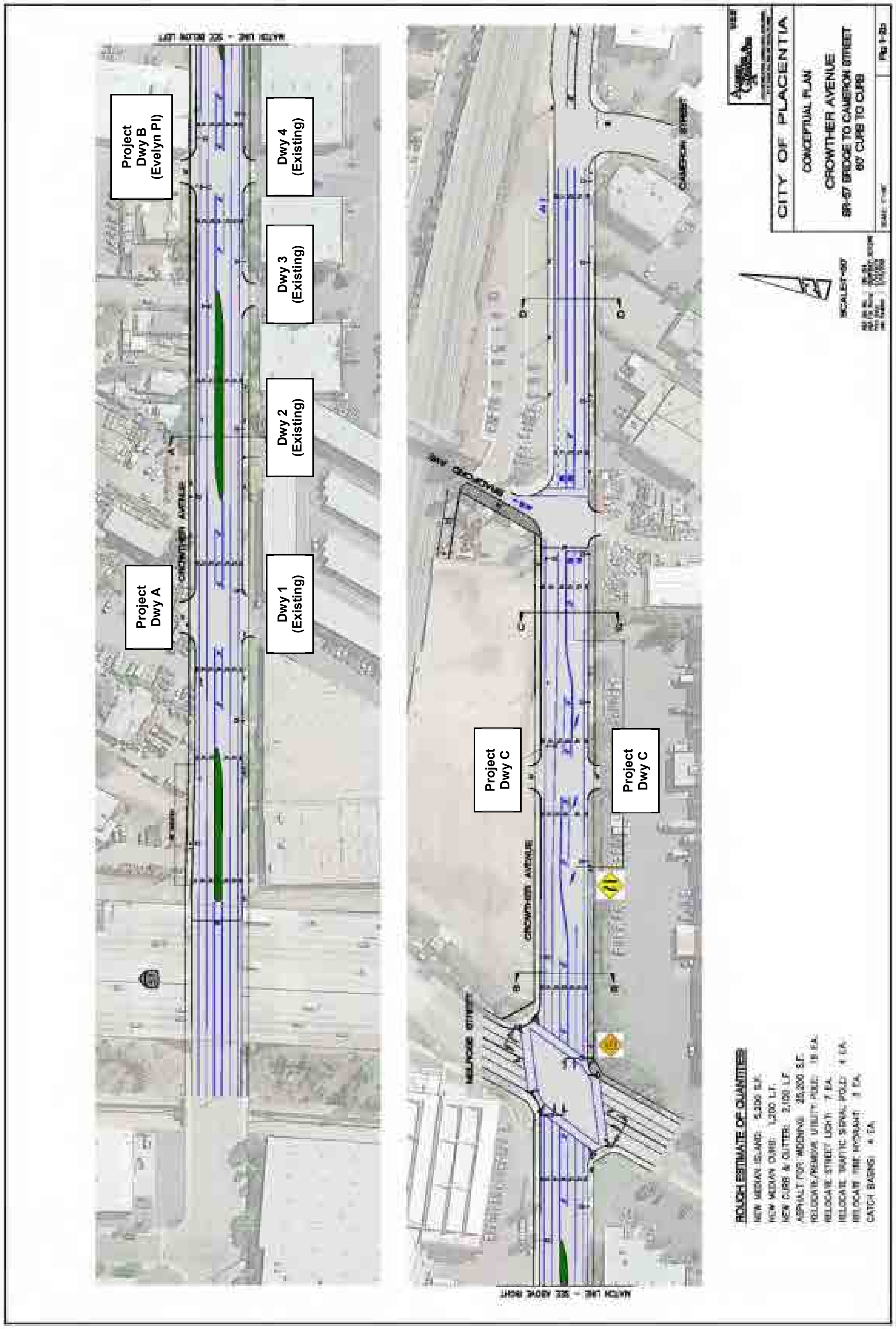
Within the study area, Crowther Avenue is classified as a four-lane, secondary arterial, and has a posted speed limit of 40 mph. Crowther Avenue is three lanes (two eastbound and one westbound) between the SR-57 Freeway and Melrose Street. East of Melrose Street, Crowther Avenue has only one lane in each direction. Crowther Avenue also has a striped two-way left-turn lane with periodic left-turn pockets throughout the study area. There is a continuous sidewalk on the south side of Crowther Avenue throughout the study area. However, the sidewalk along the north side of Crowther Avenue is discontinuous in a number of locations.

As either a public improvement project or in conjunction with the construction of the TOD projects, the City envisions an improved Crowther Avenue as an inviting place for pedestrians and bicyclists. Crowther Avenue is currently an undivided, four-lane facility that transitions to a two-lane facility east of Melrose Street. As part of the Placentia TOD Project, the City envisions Crowther Avenue to remain a four-lane street, but with a raised median and no on-street parking, west of Melrose Street. Conceptual improvement plans were developed based on two possible street widths: 64 feet and 60 feet (see Figures 1-2a and 1-2b). Both the 64 foot and 60 foot conceptual plans provide Class II bike lanes striped on both sides of the street. The difference between the two plans is that the 64 foot conceptual plan provides 11 foot lanes, whereas the 60 foot conceptual plan provides ten foot lanes. The conceptual plans were developed not only considering the proposed new TOD projects but also the vehicular and truck access needed for the existing businesses that are not a part of the three study sub-areas. Based on discussions with City staff, the preferred plan is the 60 foot conceptual plan.

Figure 1-1. Study Area




Project Dwy B (Eve Pl)
Dwy 4 (Existing)
Dwy 3 (Existing)
Dwy 2 (Existing)
Project Dwy A
Dwy 1 (Existing)
CROWTHER AVENUE
MATCH LINE - SEE BELOW LEFT
CAMERON STREET
Project Dwy C
Project Dwy C
MELROSE STREET
MATCH LINE - SEE ABOVE RIGHT
ROUGH ESTIMATE OF QUANTITIES
CITY OF PLACENTIA
CONCEPTUAL PLAN
CROWTHER AVENUE
SR-57 BRIDGE TO CAMERON STREET
84' CURB TO CURB


Project Dwy B (Evelyn Pl)
Dwy 4 (Existing)
Dwy 3 (Existing)
Dwy 2 (Existing)
Project Dwy A
Dwy 1 (Existing)
Project Dwy C
Project Dwy C
CROWTHER AVENUE
CITY OF PLACENTIA
CONCEPTUAL PLAN
CROWTHER AVENUE
SR-57 BRIDGE TO CAMERON STREET
60' CURB TO CURB
ROUGH ESTIMATE OF QUANTITIES

Since specific proposed TOD project details are not available, a traditional trip generation analysis of the new development is not possible at this time. Therefore, based on project site area and existing street network capacity, it has been determined that the three TOD project sub-areas are likely to accommodate a development intensity that would initially generate up to a total of 5,000 daily trips. The traffic study analysis contained in this report is based on projects that combined would generate no more than a total of 5,000 daily trips. Should development densities of the three sub-areas be of higher intensity and thus generate more than 5,000 daily trips, the analysis contained within this report should be augmented to assess the potential traffic impacts of the additional trips.

Study Intersections

Based on the location and configuration of the three project sub-areas and the accompanying roadway network, it was determined that twelve signalized intersections should be analyzed for potential traffic impacts. In addition, it was also decided that three probable unsignalized project driveways should also be analyzed. It is assumed that the northwest project sub-area will have two Project Driveways – A and B along Crowther Avenue located in such a manner to complement existing business access located on the south side of Crowther Avenue. It is also assumed that a single Project Driveway C along Crowther Avenue east of Melrose Street could be configured to accommodate both the northeast and southeast project sub-areas. Concentrating sub-area driveways as noted above is a conservative study approach methodology in that there may likely be additional project driveways along both Crowther Avenue and Melrose Street that could diffuse project traffic and provide for better circulation, ingress/egress, and traffic flow. Although the packing house district (project site) is close to Placentia Avenue, which straddles the border between Cities of Fullerton and Placentia, we believe that the majority of net project trips west of the project site will be to/from the SR-57 and SR-91 Freeways. The study intersections are listed below and existing lane geometrics for each of the study intersections are shown graphically in Figure 1-3.

Study Intersection	Traffic Control
1. Chapman Avenue/SR-57 Southbound Ramps	Traffic Signal
2. Chapman Avenue/SR-57 Northbound Ramps	Traffic Signal
3. Chapman Avenue/Placentia Avenue	Traffic Signal
4. Kraemer Boulevard/Chapman Avenue	Traffic Signal
5. Placentia Avenue/Crowther Avenue	Traffic Signal
6. Melrose Street/Crowther Avenue	Traffic Signal
7. Kraemer Boulevard/Crowther Avenue	Traffic Signal
8. Orangethorpe Avenue/Placentia Avenue	Traffic Signal
9. Orangethorpe Avenue/SR-57 Southbound Ramps	Traffic Signal
10. Orangethorpe Avenue/SR-57 Northbound Ramps	Traffic Signal
11. Orangethorpe Avenue/Melrose Street	Traffic Signal
12. Kraemer Boulevard/Orangethorpe Avenue	Traffic Signal
13. Crowther Avenue/Project Driveway A	Unsignalized (Future)
14. Crowther Avenue/Project Driveway B	Unsignalized (Future)
15. Crowther Avenue/Project Driveway C	Unsignalized (Future)

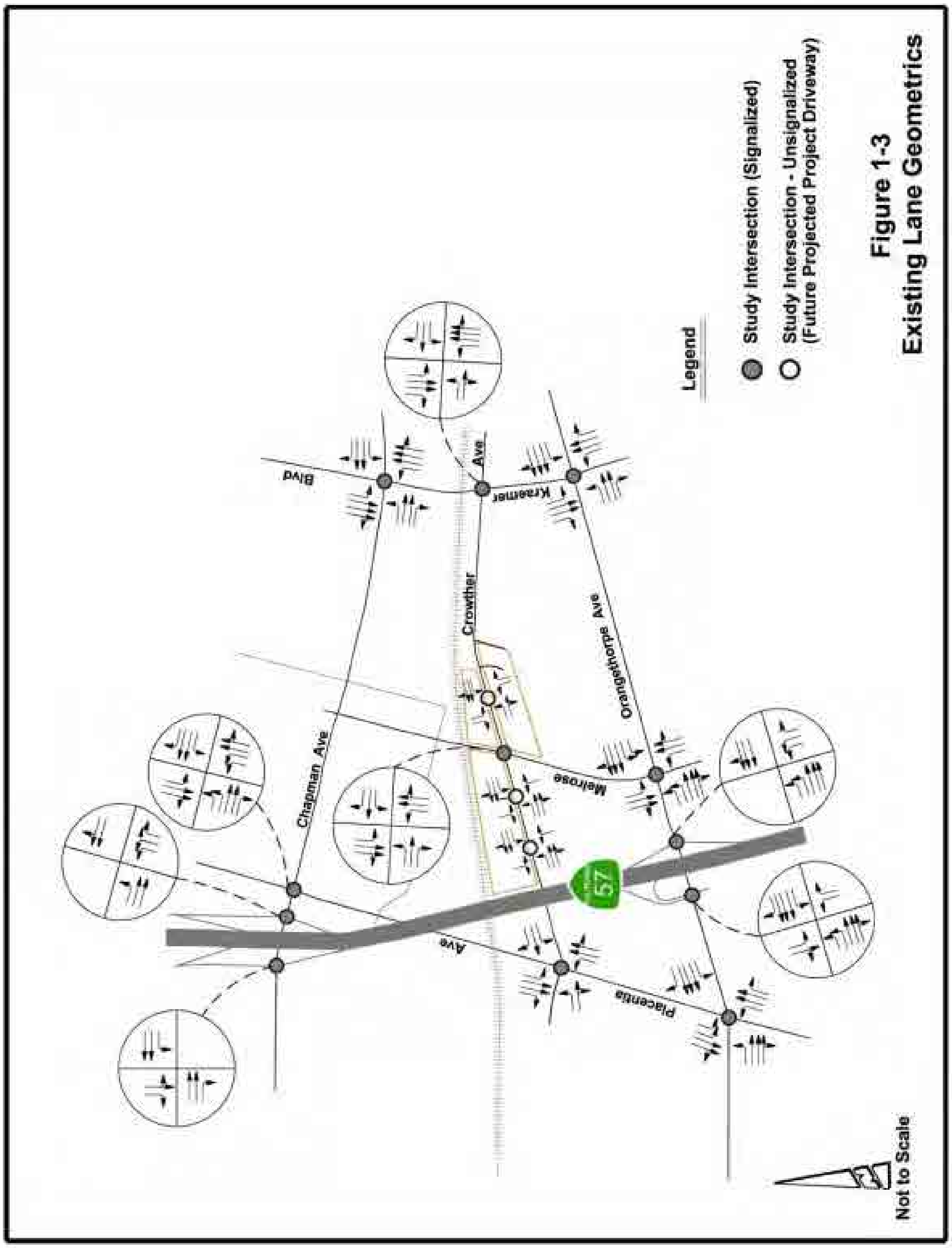


Figure 1-3
Existing Lane Geometrics

Intersection Level of Service Analysis and Methodology

In order to provide a comprehensive study of the potential traffic impacts of the future TOD projects, it was determined to analyze the traffic signal intersections using both the Intersection Capacity Utilization (ICU) methodology and the Highway Capacity Manual (HCM) methodology. The two methodologies differ in the way analysis is conducted; the ICU methodology being a simple demand over capacity assessment of critical movements, whereas the HCM methodology is a more complex assessment based on a complete operational analysis of traffic demand for all movements at the intersection.

In order to provide a clear understanding of the potential impacts of the future TOD projects, it was decided to perform intersection Level of Service (LOS) analyses for the following six scenarios for both the morning and afternoon peak-hours:

- Existing (Year 2016) Conditions
  - without Project Scenario
  - with Project Scenario
- Opening Day (Year 2018) Conditions
  - without Project Scenario
  - with Project Scenario
- Future Buildout (Year 2035) Conditions
  - without Project Scenario
  - with Project Scenario

Intersection Capacity Utilization (ICU) Methodology:

Intersection Capacity Utilization (ICU) methodology is based on the ratio of the volume of vehicles utilizing the intersection to the overall capacity of the intersection (V/C). The threshold V/C ratios to determine the Level Of Service for signalized intersections are shown below:

LOS A →	0 – 0.60	LOS D →	0.81 – 0.90
LOS B →	0.61 – 0.70	LOS E →	0.91 – 1.00
LOS C →	0.71 – 0.80	LOS F →	> 1.00

Highway Capacity Manual (HCM) Operations Methodology:

The HCM Operations Methodology uses the following LOS scale based on average per vehicle delay:

LOS A →	≤ 10.0 seconds	LOS D →	> 35.0 and ≤ 55.0 seconds
LOS B →	> 10.0 and ≤ 20.0 seconds	LOS E →	> 55.0 and ≤ 80.0 seconds
LOS C →	> 20.0 and ≤ 35.0 seconds	LOS F →	> 80.0 seconds

Highway Capacity Manual (HCM) Unsignalized Two-Way Stop-Controlled Methodology:

The HCM unsignalized methodology for two-way stop controlled study intersections also uses a similar LOS scale, but the values reflect the highest vehicle LOS and average per vehicle delay for the minor (side-street) approach. The LOS for each of the three Project Driveways – A, B, and C was analyzed using Highway Capacity Software (HCS). The LOS criteria for unsignalized intersections using control delay per vehicle (seconds) is shown below:

LOS A →	≤ 10.0 seconds	LOS D →	> 25.0 and ≤ 35.0 seconds
LOS B →	> 10.0 and ≤ 15.0 seconds	LOS E →	> 35.0 and ≤ 50.0 seconds
LOS C →	> 15.0 and ≤ 25.0 seconds	LOS F →	> 50.0 seconds

Performance Criteria/Significance Thresholds

Significant Impact analysis was evaluated for all study intersections per the guidelines from the City of Placentia and Orange County 2015 Congestion Management Program.

City of Placentia:

The City of Placentia's criteria for acceptable signalized intersection LOS is D or better. A significant impact occurs when the signalized intersection operates at LOS E or F, and the change in ICU (or V/C) value increases by 0.01 or greater.

Orange County Congestion Management Program (CMP):

The Orange County Congestion Management Program (CMP) has its own significant impact criteria and recommends that a traffic impact analysis (TIA) is required for development projects that generate more than 2,400 daily trips. The proposed Placentia TOD is assumed to generate up to 5,000 daily trips, and the net trip total after subtracting existing land use trips will still exceed 2,400 daily trips. Orange County CMP Guidelines consider LOS E or better for CMP signalized intersections and roadway segments, as acceptable LOS. A significant impact occurs when the signalized intersection or roadway segment operates at LOS E or F, and the change in ICU (or V/C) value increases by 0.10 or greater.

II. Existing (Year 2016) Level of Service Analysis

Existing without Project – Level of Service Analysis

Analyses for Existing "without Project" conditions for all of the study intersections were conducted based on morning (AM) and afternoon (PM) peak-period turning movement counts that were collected in February 2016. Due to the construction of the grade separation projects in the area and the detoured traffic, adjustments to some of the traffic volumes were conducted to reflect conditions without the construction. Traffic volumes from the Draft General Plan Update (Year 2014) were used for the movements affected by the construction and then compared against prior traffic count data (where available). Since the Draft General Plan Update utilized Year 2014 as Existing conditions, the count data from the study was increased two percent (one percent per year for two years) to develop Year 2016 volumes. Excerpts with turning-movement counts from the Draft General Plan Update are provided Appendix B-1, and detailed turning movement counts for remaining locations that were not part of the Draft General Plan Update are provided in Appendix B-2. Morning and afternoon peak-hour volumes by movement are summarized in Figures 2-1a and 2-1b. The Existing "without Project" intersection LOS is summarized for ICU analysis in Table 2-1a and for HCM analysis in Table 2-1b.

Intersection traffic counts are from two sources:

- Recent counts (2016)
- Areas impacted by construction (data from 2014 + 2%)

Table 2-1a. Existing 2016 without Project
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection	AM Peak Hour		PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]
1	Chapman Avenue/SR-57 Southbound Ramps	0.661	B	0.669	B
2	Chapman Avenue/SR-57 Northbound Ramps	0.763	C	0.748	C
3	Chapman Avenue/Placentia Avenue	0.714	C	0.670	B
4	Kraemer Boulevard/Chapman Avenue	0.660	C	0.621	B
5	Placentia Avenue/Crowther Avenue	0.414	A	0.512	A
6	Melrose Street/Crowther Avenue	0.308	A	0.289	A
7	Kraemer Boulevard/Crowther Avenue	0.592	A	0.529	A
8	Orangethorpe Avenue/Placentia Avenue	0.441	A	0.506	A
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.415	A	0.443	A
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.557	A	0.614	B
11	Orangethorpe Avenue/Melrose Street	0.600	A	0.675	B
12	Kraemer Boulevard/Orangethorpe Avenue	0.776	C	0.719	C

Notes: 1. V/C: Volume-to-Capacity Ratio
2. LOS: Level of Service

Table 2-1b. Existing 2016 without Project
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	AM Peak Hour			PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]
1	Chapman Avenue/SR-57 Southbound Ramps	0.64	10.4	B	0.67	12.5	B
2	Chapman Avenue/SR-57 Northbound Ramps	0.80	28.5	C	0.79	27.3	C
3	Chapman Avenue/Placentia Avenue	0.74	34.3	C	0.71	34.4	C
4	Kraemer Boulevard/Chapman Avenue	0.72	34.2	C	0.73	29.5	C
5	Placentia Avenue/Crowther Avenue	0.37	8.1	A	0.41	11.4	B
6	Melrose Street/Crowther Avenue	0.31	17.5	B	0.35	19.7	B
7	Kraemer Boulevard/Crowther Avenue	0.64	14.2	B	0.60	18.1	B
8	Orangethorpe Avenue/Placentia Avenue	0.43	28.6	C	0.54	32.4	C
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.41	20.3	C	0.38	21.1	C
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.53	19.5	B	0.52	16.0	B
11	Orangethorpe Avenue/Melrose Street	0.64	30.8	C	0.73	35.1	D
12	Kraemer Boulevard/Orangethorpe Avenue	0.81	51.4	D	0.82	46.3	D

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service

Under Existing "without Project" conditions, all intersections operate at acceptable LOS D or better under both traffic analysis methodologies. The LOS analysis worksheets for Existing "without Project" conditions are provided in Appendices C-1 and C-2.

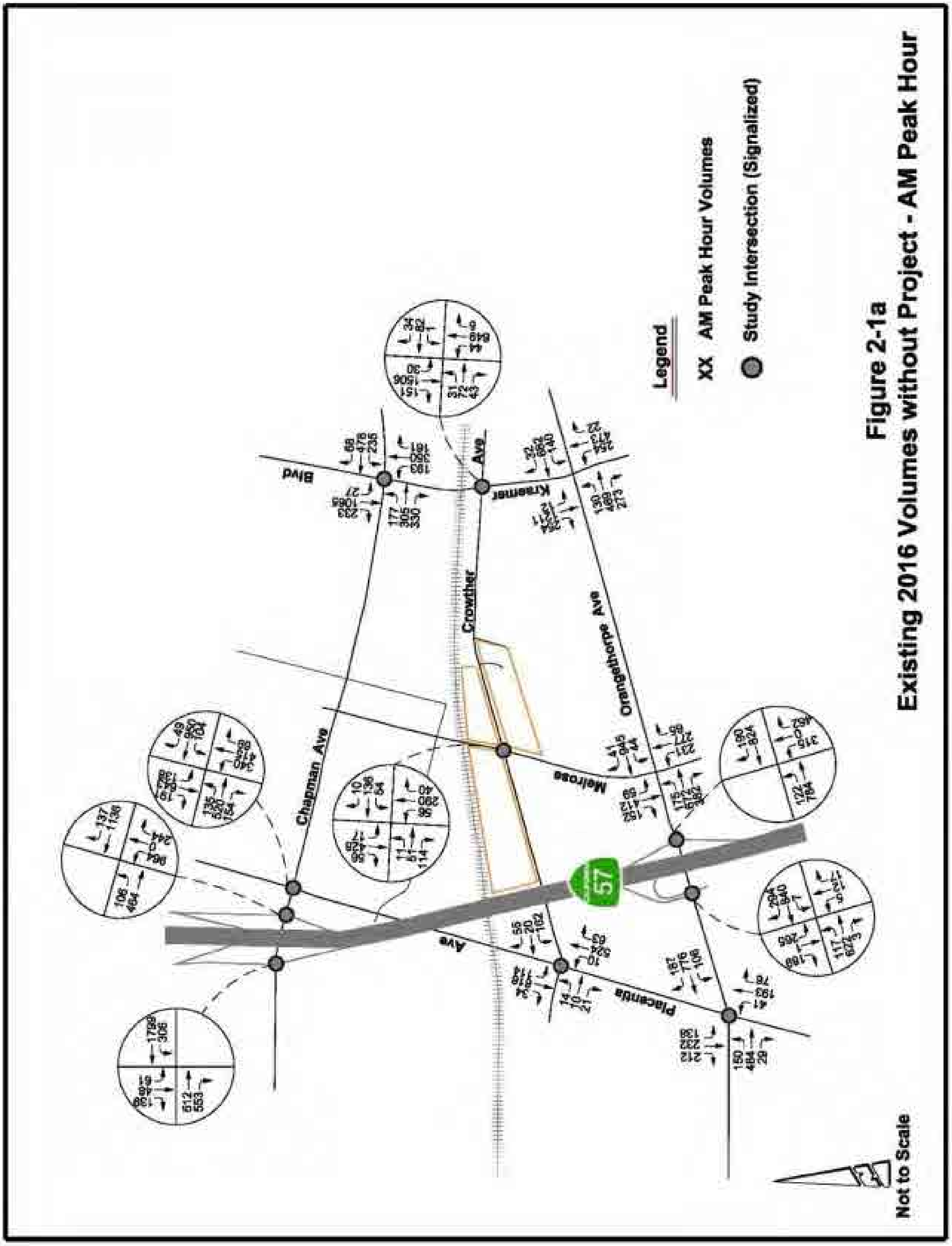


Figure 2-1a
Existing 2016 Volumes without Project - AM Peak Hour

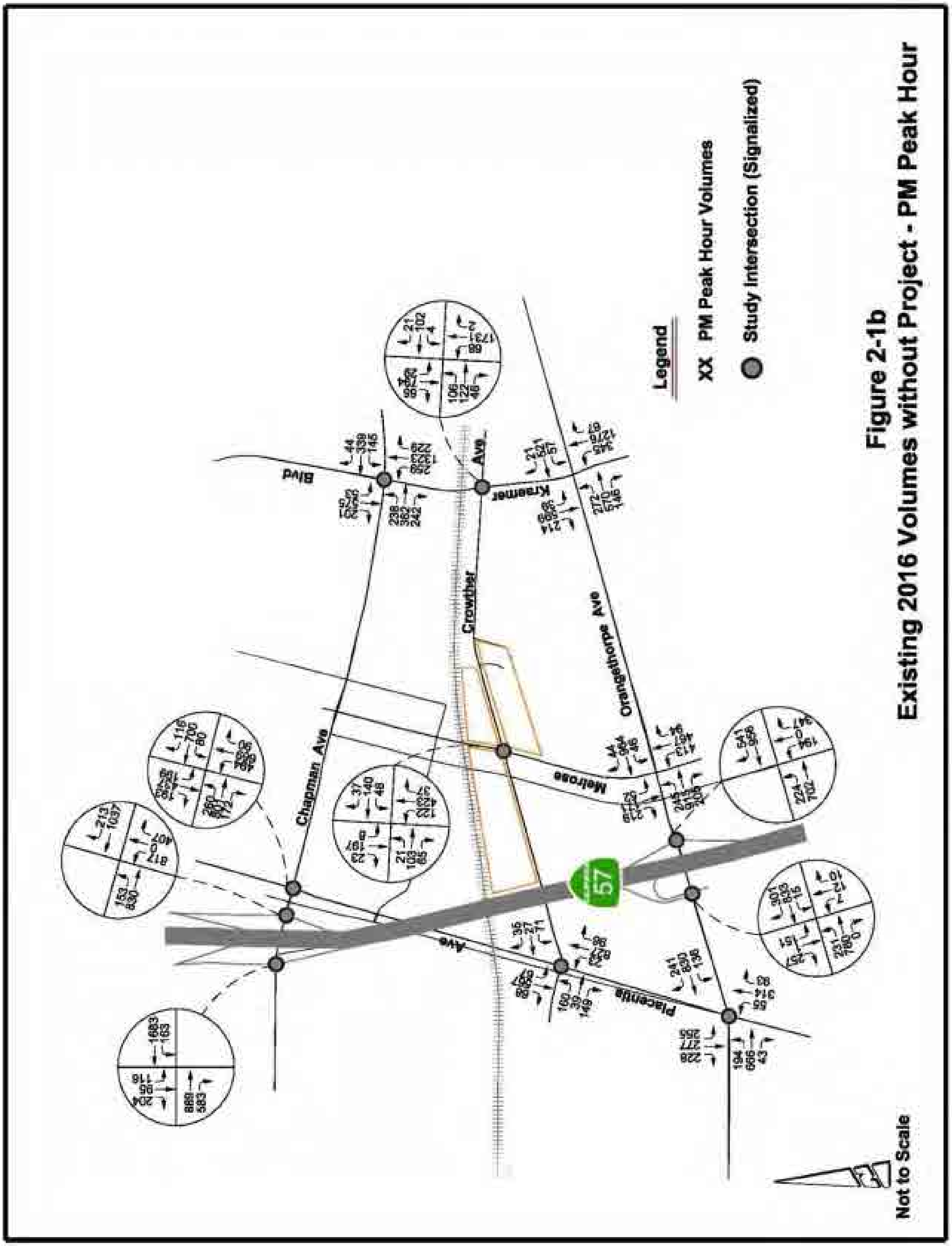


Figure 2-1b
Existing 2016 Volumes without Project - PM Peak Hour

Trip Generation

The density of apartments in the final project could actually be higher considering the type of TOD amenities provided by the project, the number of residents that will commute by rail to work, and the number of residents that will walk, bike, or take a shuttle bus to commute to nearby California State University Fullerton. Typical mixed-use residential/commercial development of this size may produce daily trips in the order of 7,000 – 8,000 trips. Because of the nature of this development as a proposed TOD project and assuming 35% reduction in trips, a total trip generation of 5,000 trips is expected.

The percentage of residential use and commercial use is unknown at this time. However, the TOD site is expected to primarily be residential. With the percentage of commercial expected to be low, the City sought to examine two possible two trip generation scenarios. The first trip generation scenario is TOD with 100% residential use, and the second trip generation scenario is TOD with 75% residential use / 25% commercial use. In order to determine how many peak-hour trips the TOD projects are likely to generate, the Institute of Transportation Engineers (ITE) Trip Generation Manual – 9th Edition was consulted. The ITE Manual is based on thousands of studies across the nation of varying land uses to determine common trip generation characteristics. Although the ITE Manual doesn't have a specific land use type of TOD, it was assumed that the trip generation characteristics of the proposed TOD projects would most closely pattern those of the apartment studies found in ITE Land Use Code 220. It is assumed that the residential component of this Placentia TOD project consist entirely of multi-family "attached" dwelling units. For this reason, the Apartment Land Use (ITE 220) is used. For commercial use, the closest fit to commercial for a TOD project is Shopping Center (ITE 820).

Since the TOD projects cover three project sub-areas in the vicinity of the Crowther Avenue/Melrose Street intersection, the project trip generation determined using the ITE Manual was divided between each of the three sub-areas. Based on the size and proximity to the Metrolink Station, it is estimated that of the 5,000 daily trips, 35% will come from the northwest (NW) corner lot, 35% from the southeast (SE) corner lot, and 30% from the northeast (NE) corner lot. Because the northwest and southeast corner sub-areas are currently occupied, the existing peak-hour trips generated from those two sites were credited against the proposed TOD projects since those trips are already included in the existing traffic flows on the adjacent roadways.

Trip generation scenarios for TOD with 100% residential use and TOD with 75% residential use / 25% commercial use are shown in **Tables 2-2a and 2-2b**, respectively. Based on the analysis of both scenarios, the 100% residential use scenario is expected to generate more peak hour trips overall. Therefore, as a conservative approach, the trip generation for 100% residential use was utilized for analysis. **Table 2-2c** shows the net project trip generation calculated by subtracting existing land use trips from the proposed 100% residential-TOD trips.

Table 2-2a – 100% Residential Use Scenario
Project Trip Generation

Scenario	Quantity	Daily Trips	AM Peak Hour Trips	PM Peak Hour Trips	AM Peak Hour Trips		PM Peak Hour Trips	
					In	Out	In	Out
100% Residential: Single-Family (ITE 220) - 752 DU TOD Project, 5,000 Daily Trips								
Northwest Area (35%)		1,750	134	163	27	107	106	57
Southeast Area (35%)		1,750	134	163	27	107	106	57
Northeast Area (30%)		1,500	115	140	23	92	91	49
Total		**5,000**	**383**	**466**	**77**	**306**	**303**	**163**

Table 2-2b – 75% Residential Use / 25% Commercial Use Scenario
Project Trip Generation

Scenario	Quantity	Daily Trips	AM Peak Hour Trips	PM Peak Hour Trips	AM Peak Hour Trips		PM Peak Hour Trips	
					In	Out	In	Out
75% Residential: Single-Family (ITE 220) - 564 DU 25% Commercial: Shopping Center (ITE 820) - 30 KSF GLA TOD Project, 5,000 Daily Trips								
Northwest Area (35%)		1,750	111	162	27	84	99	63
Southeast Area (35%)		1,750	111	162	27	84	99	63
Northeast Area (30%)		1,500	95	139	23	72	85	54
Total		**5,000**	**317**	**463**	**77**	**240**	**283**	**180**

Table 2-2c – Net Project Trip Generation

Scenario	Quantity	Daily Trips	AM Peak Hour Trips	PM Peak Hour Trips	AM Peak Hour Trips		PM Peak Hour Trips	
					In	Out	In	Out
Existing Land Use								
Northwest Area								
Industrial: Warehousing (ITE 150)	87.94 KSF GFA	441	77	55	61	16	14	41
Southeast Area								
Residential: Single-Family (ITE 210)	13 DU	124	11	13	3	8	8	5
Residential: Apartment (ITE 220)	4 DU	27	2	2	0	2	1	1
Northeast Area								
Industrial: Warehousing (ITE 150)	139.22 KSF GFA	655	99	74	78	21	19	56
Total		1,247	189	144	142	47	42	103
100% Residential: Single-Family (ITE 220) - 752 DU TOD Project, 5,000 Daily Trips								
Northwest Area (35%)		1,750	134	163	27	107	106	57
Southeast Area (35%)		1,750	134	163	27	107	106	57
Northeast Area (30%)		1,500	115	140	23	92	91	49
Total		5,000	383	466	77	306	303	163
Net Trip Generation		**3,753**	**194**	**322**	**-65**	**259**	**261**	**60**

Trip Distribution and Assignment

After the net proposed project trips are evaluated, the next step is to distribute those trips over the roadway network. A graphical summary of trip distribution by percentage is illustrated in Figure 2-2. Based on the trip distribution percentages new trips were then assigned to the network. Figure 2-3 illustrate the morning (AM) and afternoon (PM) peak-hour net project trips (i.e., the net difference after subtracting existing land-use trips from gross project trips) as assigned to various streets and intersections.

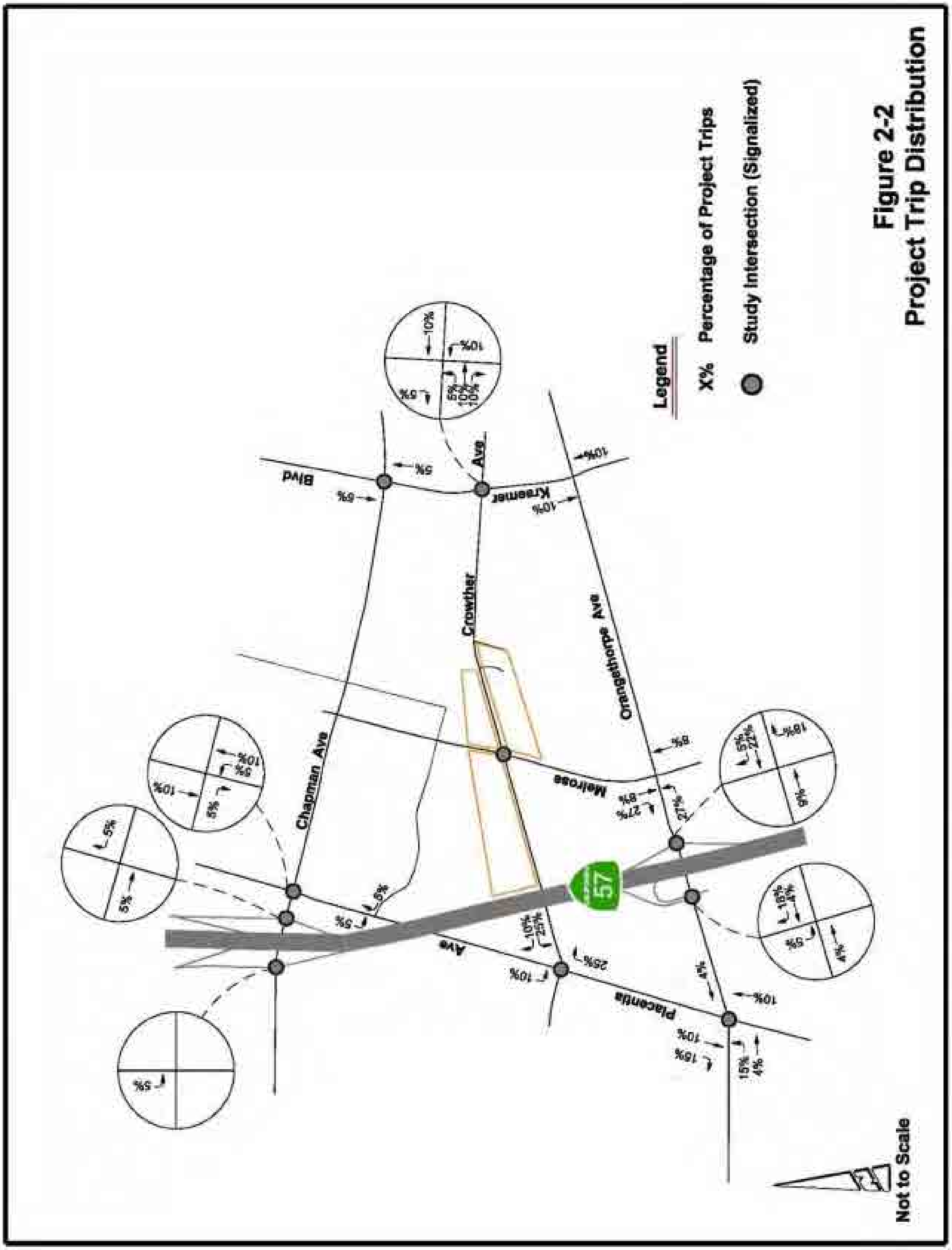
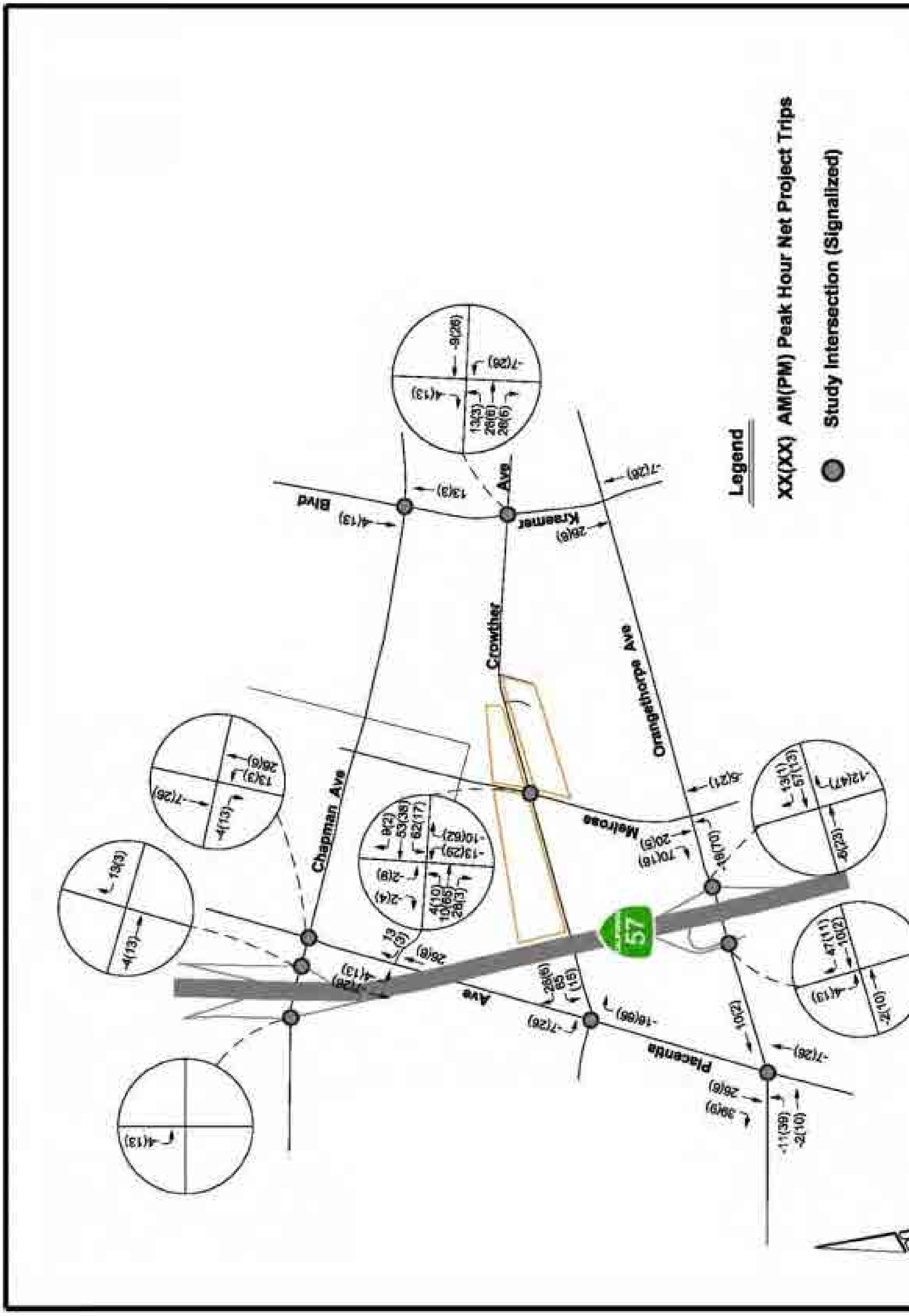


Figure 2-2
Project Trip Distribution



Not to Scale

Figure 2-3
Peak Hour Net Project Trip Generation

Existing with Project – Level of Service Analysis

Signalized Study Intersections

Analysis for Existing Conditions "with Project" scenario for signalized study intersections was conducted using both the ICU and the HCM Operations methodologies. The existing peak-hour volume plus the proposed peak-hour net project trips (see Figures 2-3a and 2-3b), are shown at all signalized study intersections in **Figures 2-4a and 2-4b** for morning (AM) and afternoon (PM) peak hours. The LOS analysis and the significant impact determination for Existing "with Project" are summarized for ICU analysis (signalized intersection locations only) in **Table 2-3a** and for HCM analysis (signalized and usignalized intersection locations) in **Table 2-3b.** For comparison purposes, both tables show Existing "without Project" and Existing "with Project" scenarios. All signalized study intersections continue to operate at acceptable LOS D or better "with Project". Therefore, no significant impacts were identified for Existing "with Project" conditions per City of Placentia guidelines and Orange County Congestion Management Program guidelines.

Project Driveways

The three Project Driveways – A, B, and C along Crowther Avenue were analyzed using HCM Unsignalized methodology. The existing land uses and driveways to the north side of Crowther Avenue will completely be replaced by the proposed project. However, the existing businesses and driveways along the south side of Crowther Avenue will remain the same. In consideration of those south side businesses turning movement counts were collected at the four existing south side driveways between Placentia Avenue and Melrose Street in early March 2016, and are provided in **Appendix D** and shown in **Figures 2-5a and 2-5b**. Eastbound and Westbound thru volumes along Crowther Avenue were extrapolated from existing intersection turning movement count volumes at Placentia Avenue/Crowther Avenue and Crowther Avenue/Melrose Street.

For Existing "with Project" analysis for the three Project Driveways – A, B, and C along Crowther Avenue, gross project trips (without existing land-use trip reduction) were added to the existing driveway turning movement counts. Due to the northwest (NW) corner lot of the project (north side of Crowther Avenue) undergoing complete redevelopment and the provision of a proposed raised median along Crowther Avenue, any existing left-turn vehicular movements to/from each of the existing driveways will have to be re-routed. U-turns will be allowed along Crowther Avenue at Driveway A and Driveway B. Existing "with Project" volumes for project driveways are shown below in **Figure 2-6.**

As shown in **Tables 2-3a and 2-3b**, all project driveway intersections are expected to operate at LOS B under Existing "with Project" scenarios. No significant impacts were identified at project driveways per City of Placentia guidelines and Orange County Congestion Management Program guidelines. However, in the future as smaller, independent developments are planned within the TOD project study area, these project driveways should be analyzed and evaluated to see how they are impacted by traffic from these future developments. The LOS analysis worksheets for Existing "with Project" conditions are provided in **Appendices E-1 and E-2.**

Legend

XX AM Peak Hour Volumes

Study Intersection (Signalized)

Figure 2-4a
Existing 2016 Volumes with Project - AM Peak Hour

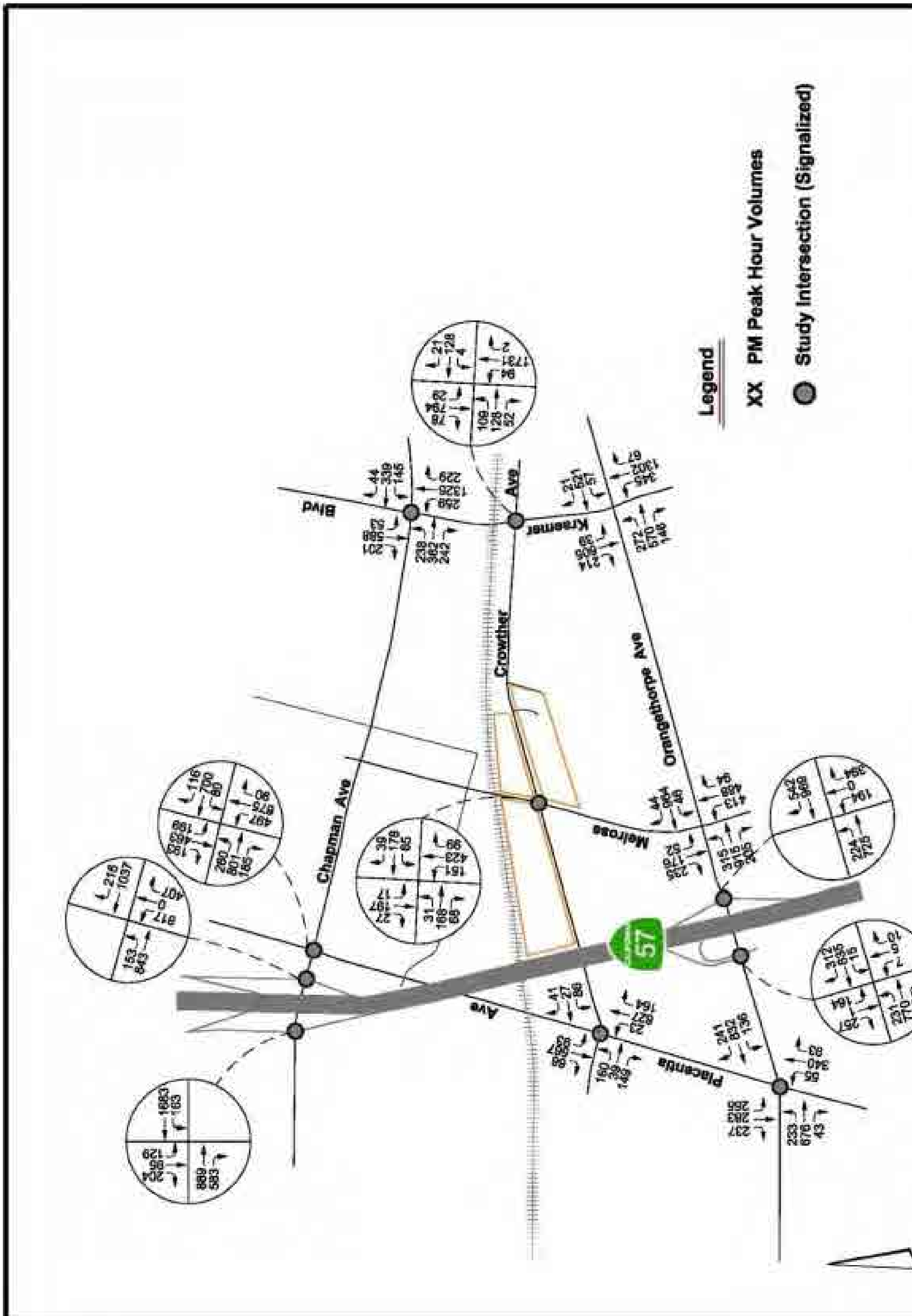


Figure 2-4b
Existing 2016 Volumes with Project - PM Peak Hour

Table 2-3a. Existing 2016 with Project
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection	Without Project				With Project				Change in V/C		Significant Impact
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour	PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]			
1	Chapman Avenue/SR-57 Southbound Ramps	0.661	B	0.669	B	0.661	B	0.677	B	0.000	0.008	No
2	Chapman Avenue/SR-57 Northbound Ramps	0.763	C	0.748	C	0.766	C	0.749	C	0.003	0.001	No
3	Chapman Avenue/Placentia Avenue	0.714	C	0.670	B	0.712	C	0.680	B	-0.002	0.010	No
4	Kraemer Boulevard/Chapman Avenue	0.660	C	0.621	B	0.659	B	0.621	B	-0.001	0.000	No
5	Placentia Avenue/Crowther Avenue	0.414	A	0.512	A	0.453	A	0.557	A	0.039	0.045	No
6	Melrose Street/Crowther Avenue	0.308	A	0.289	A	0.342	A	0.347	A	0.034	0.058	No
7	Kraemer Boulevard/Crowther Avenue	0.592	A	0.529	A	0.612	A	0.546	A	0.020	0.017	No
8	Orangethorpe Avenue/Placentia Avenue	0.441	A	0.506	A	0.456	A	0.533	A	0.015	0.027	No
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.415	A	0.443	A	0.439	A	0.434	A	0.024	-0.009	No
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.557	A	0.614	B	0.564	A	0.644	B	0.007	0.030	No
11	Orangethorpe Avenue/Melrose Street	0.600	A	0.675	B	0.621	B	0.702	B	0.021	0.027	No
12	Kraemer Boulevard/Orangethorpe Avenue	0.776	C	0.719	C	0.784	C	0.719	C	0.008	0.000	No

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. LOS: Level of Service

Table 2-3b. Existing 2016 with Project
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	Without Project						With Project						Change in V/C				Significant Impact
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour		PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	V/C[1]	Delay[2]	
1	Chapman Avenue/SR-57 Southbound Ramps	0.64	10.4	B	0.67	12.5	B	0.64	10.3	B	0.68	12.8	B	0.00	-0.1	0.01	0.3	No
2	Chapman Avenue/SR-57 Northbound Ramps	0.80	28.5	C	0.79	27.3	C	0.81	28.7	C	0.79	27.2	C	0.01	0.2	0.00	-0.1	No
3	Chapman Avenue/Placentia Avenue	0.74	34.3	C	0.71	34.4	C	0.74	34.8	C	0.71	34.6	C	0.00	0.5	0.00	0.2	No
4	Kraemer Boulevard/Chapman Avenue	0.72	34.2	C	0.73	29.5	C	0.72	34.2	C	0.73	29.5	C	0.00	0.0	0.00	0.0	No
5	Placentia Avenue/Crowther Avenue	0.37	8.1	A	0.41	11.4	B	0.42	10.1	B	0.43	11.7	B	0.05	2.0	0.02	0.3	No
6	Melrose Street/Crowther Avenue	0.31	17.5	B	0.35	19.7	B	0.37	20.0	B	0.40	22.7	C	0.06	2.5	0.05	3.0	No
7	Kraemer Boulevard/Crowther Avenue	0.64	14.2	B	0.60	18.1	B	0.67	17.0	B	0.62	19.1	B	0.03	2.8	0.02	1.0	No
8	Orangethorpe Avenue/Placentia Avenue	0.43	28.6	C	0.54	32.4	C	0.45	29.1	C	0.57	34.0	C	0.02	0.5	0.03	1.6	No
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.41	20.3	C	0.38	21.1	C	0.40	20.6	C	0.38	20.8	C	-0.01	0.3	0.00	-0.3	No
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.53	19.5	B	0.52	16.0	B	0.54	18.8	B	0.56	17.5	B	0.01	-0.7	0.04	1.5	No
11	Orangethorpe Avenue/Melrose Street	0.64	30.8	C	0.73	35.1	D	0.69	31.5	C	0.76	36.5	D	0.05	0.7	0.03	1.4	No
12	Kraemer Boulevard/Orangethorpe Avenue	0.81	51.4	C	0.82	46.3	D	0.82	52.7	D	0.82	46.4	D	0.01	1.3	0.00	0.1	No
Project Driveway Locations (Unsignalized)[4]																		
13	Crowther Avenue at Project Driveway A	--	--	--	--	--	--	-	10.4	B	-	10.8	B	--	--	--	--	No
[illegible]	Crowther Avenue at Project Driveway B	--	--	--	--	--	--	--	10.4	B	--	10.8	B	--	--	--	--	No
15	Crowther Avenue at Project Driveway C	--	--	--	--	--	--	--	10.6	B	--	11.9	B	--	--	--	--	No

1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service
4. Unsignalized Intersections were analyzed using the Highway Capacity Software (HCS), Two-way Stop Controlled Intersection. LOS is based on the approach with the worst LOS.

Figure 2-5a. Existing 2016 South Driveway Locations

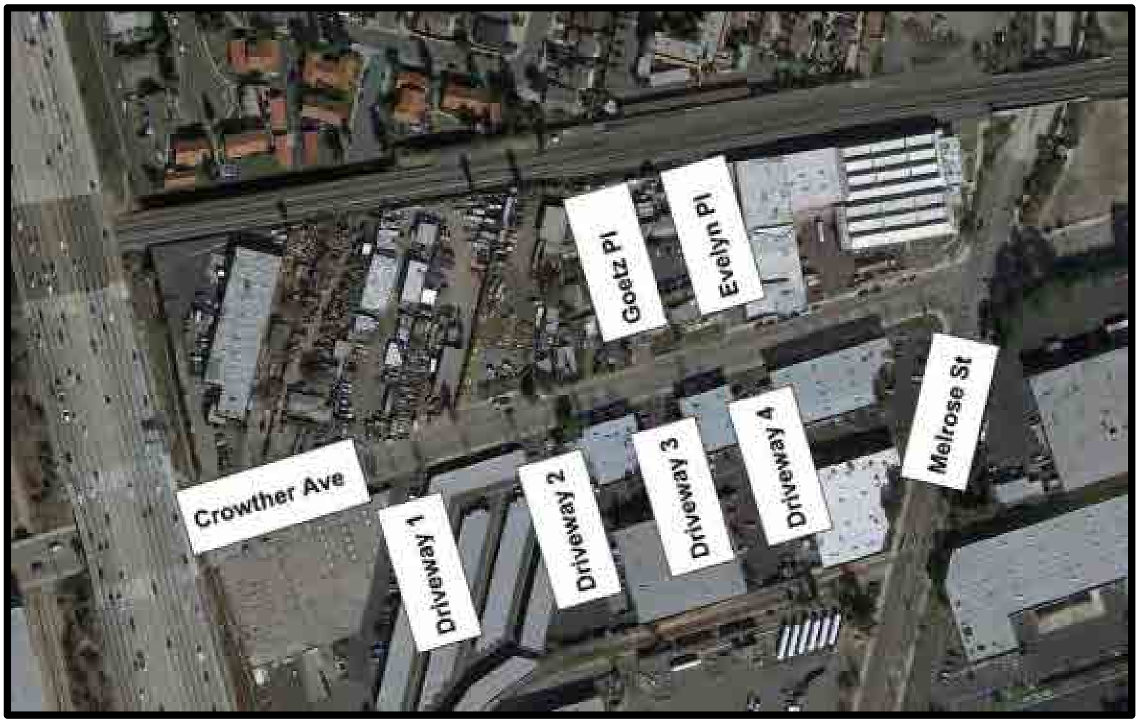


Figure 2-5b. Existing 2016 South Driveway Volumes

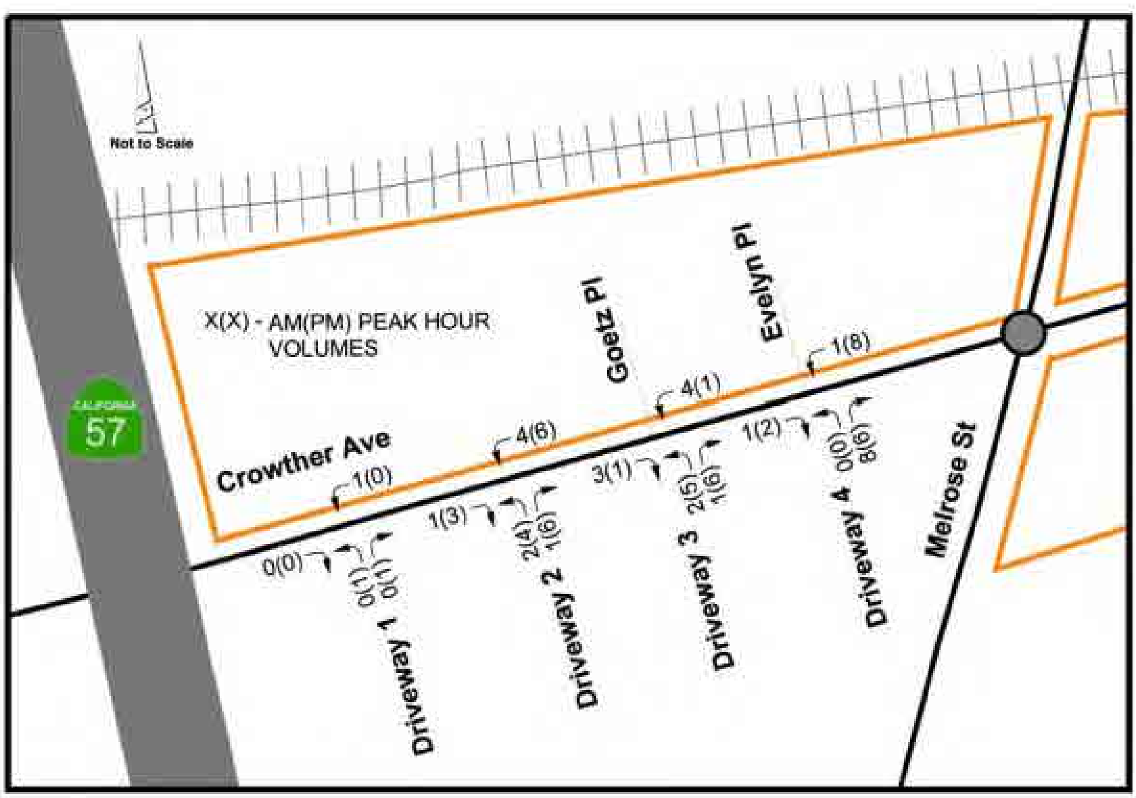
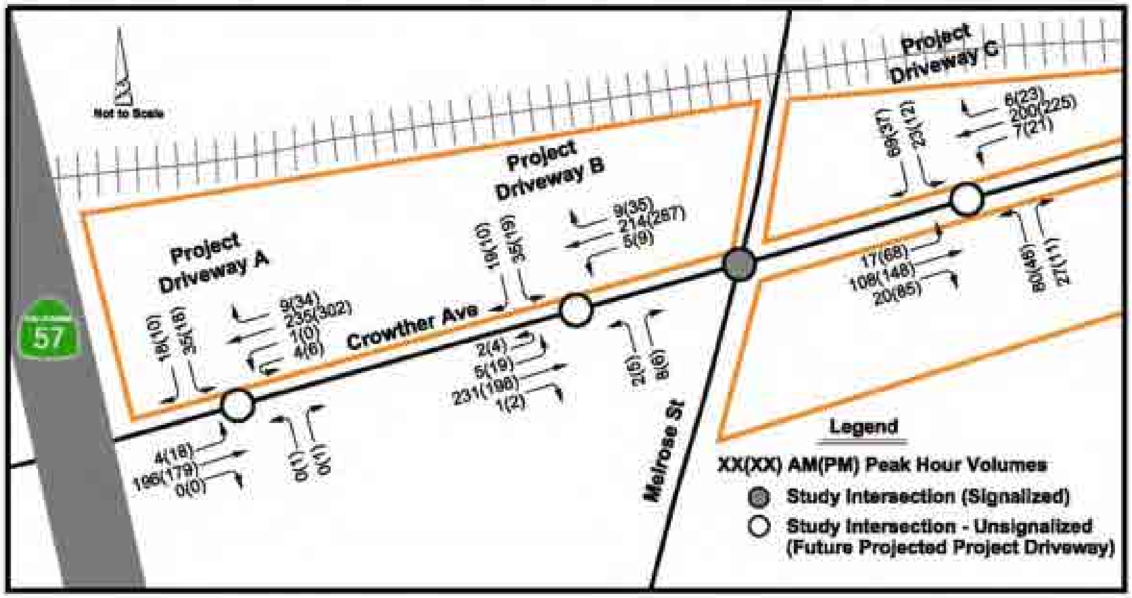


Figure 2-6. Existing 2016 with Project - Project Driveway Volumes



Existing with Project – Segment Analysis

Segment Analysis – Crowther Avenue

- Crowther Avenue (Placentia Avenue – Melrose Street)
- Crowther Avenue (Melrose Street – Kraemer Boulevard)

A segment analysis was conducted to evaluate if there will be any impacts on Crowther Avenue due to the project. Existing daily traffic volumes were conducted in early March 2016 along Crowther Avenue, both west and east of Melrose Street, for comparison with daily volumes per the 2013-2014 OCTA Traffic Flow Map (see Appendix F). Based on the counts, there are 4,954 daily vehicles on Crowther Avenue west of Melrose Street, and 3,998 daily vehicles east of Melrose Street. The count data is provided in Appendix G. The 2013-2014 OCTA Traffic Flow Map shows 5,000 daily vehicle trips for Crowther Avenue between Placentia Avenue and Kraemer Boulevard. The existing daily traffic volume counts for Crowther Avenue west of Melrose Street are close to 5,000 daily vehicle trips, whereas the counts for Crowther Avenue east of Melrose Street are lower due to the construction of the Kraemer Boulevard grade separation project and the detoured traffic. For analysis purposes, 5,000 daily vehicle trips (per the 2013-2014 OCTA Traffic Flow Map) was used for Year 2014 daily volumes along Crowther Avenue to reflect conditions without the construction, and increased by 2% to account for 2016 Existing "without Project" conditions.

Segment analysis for Existing "with Project" is summarized below in Table 2-4. For the "with Project" scenario, the 5,000 daily trips for the TOD project was distributed similarly to the peak hour trip distribution among the three project site areas (NW, SE, NE Corner areas). Based on the distribution and the net trip generation, it is expected that the daily traffic on Crowther Avenue will be 7,258 vehicles between Placentia Avenue and Melrose Street.

Table 2-4. Existing 2016 with Project – Crowther Avenue Segment Analysis

Crowther Ave	Existing 2016 without Project				Existing 2016 with Project				
	Existing Daily Vol*	LOS E Capacity - 4 Lanes (per MPAH)	V/C	LOS	Project Daily Vol	Exist + Project Daily Vol	LOS E Capacity - 4 Lanes (Preferred Alternative)	V/C	LOS
West of Melrose St	5,100	25,000	0.204	A	1,708	6,808	25,000	0.272	A
East of Melrose St	5,100	25,000	0.204	A	2,158	7,258	25,000	0.290	A

Daily volumes are per the 2013-14 OCTA Traffic Flow Map. Volumes were increase by 2% to account for 2016 existing conditions.

Crowther Avenue is classified as a Secondary Arterial per the OCTA Master Plan of Arterial Highways (MPAH). Based on the LOS E capacity of 25,000 daily vehicles for a Secondary Arterial, there is ample capacity based on existing conditions with the TOD project. Crowther Avenue between Placentia Avenue and Kraemer Boulevard is expected to operate at LOS A. Therefore, there are no significant impacts per City of Placentia guidelines.

<u>Segment Analysis – Orangethorpe Avenue per Orange County Congestion Management Program (CMP) Guidelines</u>

- Orangethorpe Avenue (Placentia Avenue – Melrose Street):

A segment analysis was conducted along Orangethorpe Avenue between Placentia Avenue and Melrose Street to evaluate if there will be any impacts per the Orange County CMP guidelines. This segment of Orangethorpe Avenue includes Orangethorpe Avenue and the SR-57 Freeway ramp intersections, both of which are Orange County CMP intersections. Existing daily traffic volumes were obtained from the 2013-2014 OCTA Traffic Flow Map (see Appendix F) and were increased by two percent to account for 2016 Existing conditions. Proposed TOD project trips were then added to 2016 Existing conditions to calculate the Existing "with Project" conditions. Segment analysis for Existing "with Project" is summarized in Table 2-5. Orangethorpe Avenue whtin this area is classified as a Major Arterial per the OCTA MPAH, and has a LOS E capacity of 56,300 vehicles per day (vpd). Under Existing "with Project" conditions, Orangethorpe Avenue will be at most 23,454 daily vehicles and operate at LOS A with no significant impacts per Orange County CMP guidelines.

Table 2-5. Existing 2016 with Project – Orangethorpe Avenue CMP Segment Analysis

Orangethorpe Ave	Existing 2016 without Project				Existing 2016 with Project				
	Existing Daily Vol*	LOS E Capacity - 6 Lanes (per MPAH)	V/C	LOS	Project Daily Vol	Exist + Project Daily Vol	LOS E Capacity - 6 Lanes (per MPAH)	V/C	LOS
Between Placentia Ave and Melrose St	22,440	56,300	0.399	A	1,014	23,454	56,300	0.417	A

Daily volumes are per the 2013-14 OCTA Traffic Flow Map. Volumes were increase by 2% to account for 2016 existing conditions.

Segment analysis for Existing "with Project" shows that both segments of Crowther Avenue to the east and west of Melrose Street, will continue operates at an acceptable LOS. Likewise, the CMP arterial location of Orangethorpe Avenue (Placentia Avenue – Melrose Street) will operate under acceptable LOS conditions "with Project."

III. Project Opening Day (Year 2018) Level of Service Analysis

Opening Day without Project – Level of Service Analysis

Opening Day is when the Proposed Project is expected to open, which is some time in 2018. Therefore, it is important to assess the anticipated traffic conditions in 2018 when the project is expected to be completed (i.e., new TOD uses within the project area will generate up to an estimated 5,000 trips). The LOS analyses for Project Opening Day conditions include added traffic at the study intersections due to ambient growth in the region as well as planned projects ("cumulative projects") within the project vicinity. A projected traffic growth factor of 1.02 (one percent per year for two years) was applied to the existing traffic volumes to reflect the anticipated regional ambient growth from Year 2016 to Year 2018. Additional planned projects ("cumulative projects") within the project vicinity were also added to the project volumes. Per discussion with City staff, the Placentia Metrolink Station is the only cumulative project that will be completed by Year 2018. Details of the cumulative projects are shown in Appendix H.

Opening Day "without Project" scenario reflects Existing (Year 2016) traffic conditions plus traffic due to ambient growth and the additional traffic from cumulative projects – but not from the proposed project. The intersection LOS analysis results are summarized for ICU analysis in Table 3-1a and for HCM analysis in Table 3-1b.

Table 3-1a. Opening Day 2018 without Project
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection	AM Peak Hour		PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]
1	Chapman Avenue/SR-57 Southbound Ramps	0.674	B	0.683	B
2	Chapman Avenue/SR-57 Northbound Ramps	0.783	C	0.769	C
3	Chapman Avenue/Placentia Avenue	0.728	C	0.688	B
4	Kraemer Boulevard/Chapman Avenue	0.697	B	0.657	B
5	Placentia Avenue/Crowther Avenue	0.423	A	0.528	A
6	Melrose Street/Crowther Avenue	0.319	A	0.321	A
7	Kraemer Boulevard/Crowther Avenue	0.627	B	0.550	A
8	Orangethorpe Avenue/Placentia Avenue	0.449	A	0.516	A
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.434	A	0.442	A
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.583	A	0.639	B
11	Orangethorpe Avenue/Melrose Street	0.631	B	0.718	C
12	Kraemer Boulevard/Orangethorpe Avenue	0.789	C	0.727	C

Notes: 1. V/C: Volume-to-Capacity Ratio
2. LOS: Level of Service

Table 3-1b. Opening Day 2018 without Project
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	AM Peak Hour			PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]
1	Chapman Avenue/SR-57 Southbound Ramps	0.65	10.3	B	0.68	12.7	B
2	Chapman Avenue/SR-57 Northbound Ramps	0.82	28.4	C	0.81	27.8	C
3	Chapman Avenue/Placentia Avenue	0.75	39.8	D	0.73	34.8	C
4	Kraemer Boulevard/Chapman Avenue	0.76	35.6	D	0.77	31.7	C
5	Placentia Avenue/Crowther Avenue	0.38	8.3	A	0.41	11.5	B
6	Melrose Street/Crowther Avenue	0.33	17.3	B	0.36	20.5	C
7	Kraemer Boulevard/Crowther Avenue	0.67	15.6	B	0.64	18.9	B
8	Orangethorpe Avenue/Placentia Avenue	0.45	28.9	C	0.55	32.8	C
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.43	25.1	C	0.38	24.9	C
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.58	21.0	C	0.55	18.4	B
11	Orangethorpe Avenue/Melrose Street	0.67	37.6	D	0.78	39.8	D
12	Kraemer Boulevard/Orangethorpe Avenue	0.83	43.3	D	0.83	49.5	D

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service

Under the Opening Day “without Project” scenario for Year 2018, all signalized study intersections operate at LOS D or better. The LOS analysis worksheets for the Opening Day “without Project” are provided in Appendices I-1 and I-2. The projected volumes for the morning and afternoon peak-hours are shown in Figures 3-1a and 3-1b.

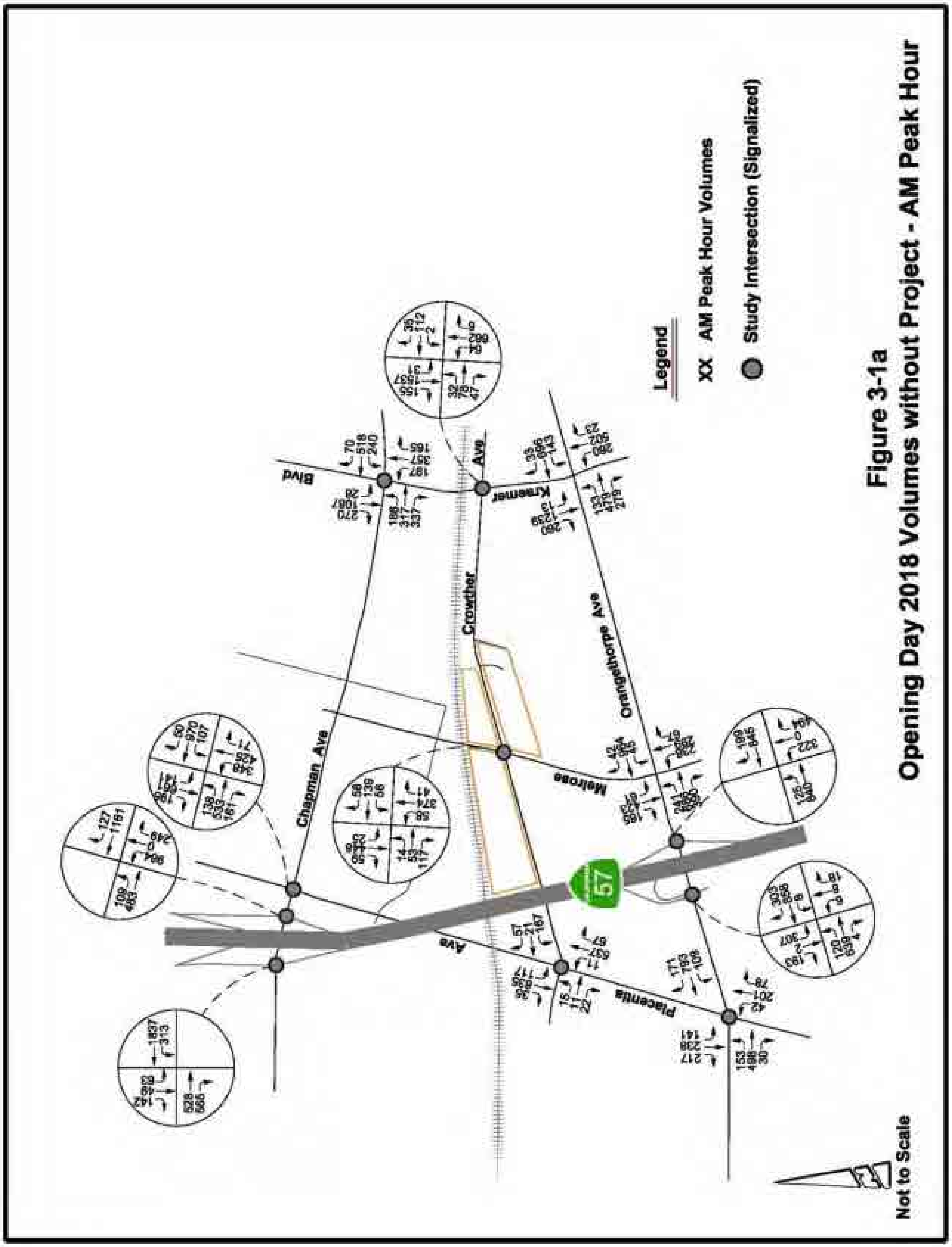


Figure 3-1a
Opening Day 2018 Volumes without Project - AM Peak Hour

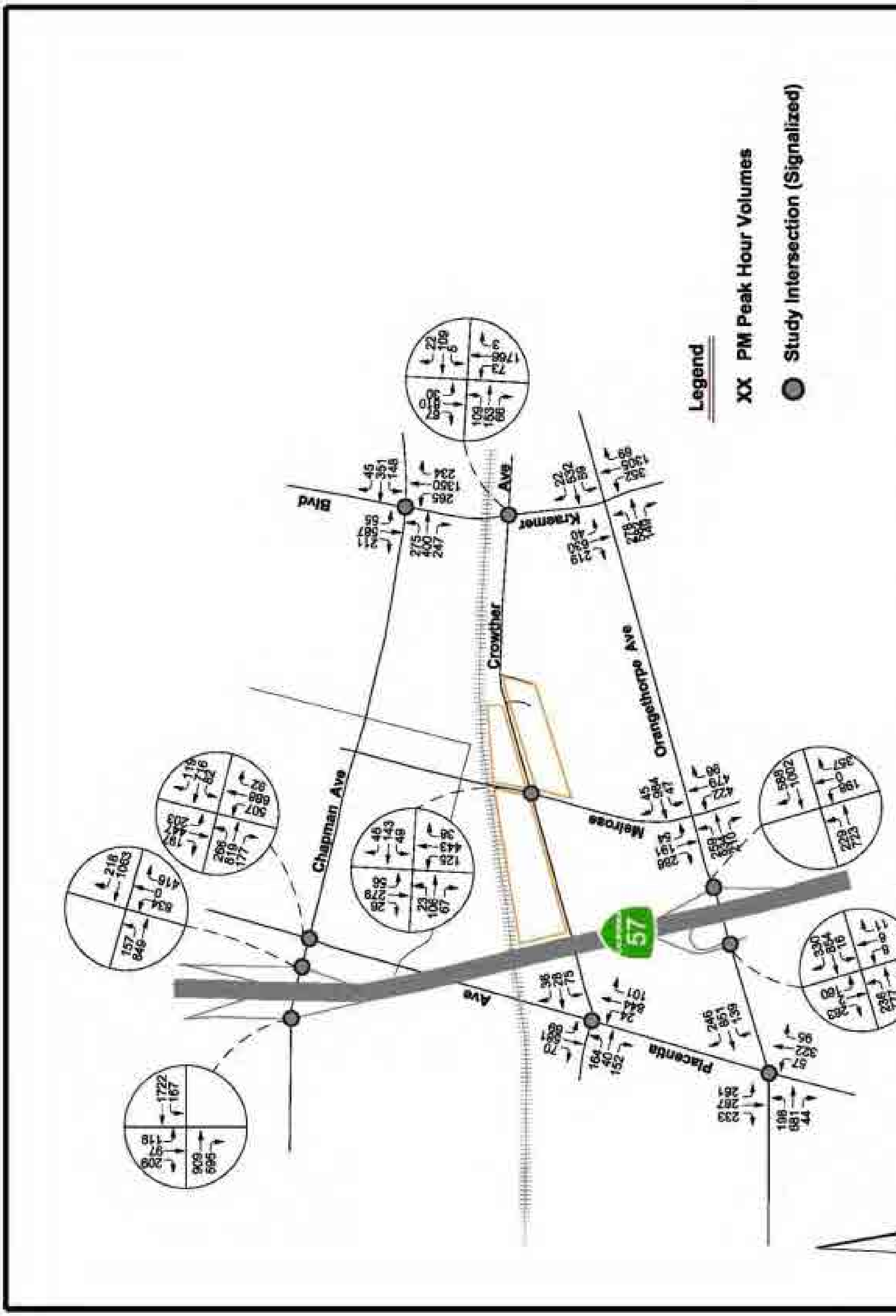


Figure 3-1b
Opening Day 2018 Volumes without Project - PM Peak Hour

Not to Scale

Opening Day with Project Level of Service Analysis

In order to fully assess the impacts of the proposed project on Opening Day, the Opening Day "without Project" scenario is used as a base and the proposed project-related trips are added to the roadway network. The LOS analysis and the significant impact determination for Opening Day "with Project" are summarized for ICU analysis in **Table 3-2a** and for HCM analysis in **Table 3-2b**. For comparison purposes, both tables shows the results for Opening Day "without Project" and Opening Day "with Project" scenarios. LOS analysis worksheets for Opening Day "with Project" are provided in **Appendices J-1 and J-2**. The projected volumes for the morning and afternoon peak-hours are shown in **Figures 3-2a and 3-2b.** Projected volumes at future project driveways are shown in **Figure 3-3**.

The intersection LOS analysis results show that all signalized study intersections continue to operate at LOS D or better "with Project." LOS for each of the three unsignalized future project driveways operates at LOS B "with Project". There are no significant impacts according to City of Placentia or Orange County CMP guidelines. All signalized and unsignalized study intersections and future project driveways continue to operate at acceptable LOS of D or better during Opening Day "with Project" conditions. No improvements are necessary.

Opening Day with Project – Segment Analysis

<u>Segment Analysis – Crowther Avenue</u>

- Crowther Avenue (Placentia Avenue – Melrose Street)
- Crowther Avenue (Melrose Street – Kraemer Boulevard)

A segment analysis was conducted to evaluate if there will be any impacts on Opening Day. In order to fully assess the impacts of the proposed project on Opening Day, the Opening Day "without Project" scenario is used as a base and the proposed project-related trips are added to the roadway network.

Segment analysis for Opening Day "with Project" is summarized in **Table 3-3.** For the Opening Day "with Project" scenario, the 5,000 daily trips for the TOD project were distributed similarly to the peak hour trip distribution among the three study sub-areas (NW, SE, NE Corner lots). Based on the distribution and net trip generation, it is expected that the daily traffic on Crowther Avenue will be at most 7,620 trips between Placentia Avenue and Melrose Street.

Based on the LOS E capacity of 25,000 daily vehicles for a Secondary Arterial, there is ample capacity on Crowther Avenue based on Opening Day conditions with the TOD project. It is expected that Crowther Avenue between Placentia Avenue and Kraemer Boulevard will operate at LOS B or better. Therefore, there will be no significant impacts per City of Placentia guidelines.

Table 3-2a. Opening Day 2018 with Project
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection	Without Project				With Project				Change in V/C		Significant Impact
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour	PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]			
1	Chapman Avenue/SR-57 Southbound Ramps	0.674	B	0.683	B	0.674	B	0.691	B	0.000	0.008	No
2	Chapman Avenue/SR-57 Northbound Ramps	0.783	C	0.769	C	0.787	C	0.770	C	0.004	0.001	No
3	Chapman Avenue/Placentia Avenue	0.728	C	0.688	B	0.736	C	0.688	B	0.008	0.000	No
4	Kraemer Boulevard/Chapman Avenue	0.697	B	0.657	B	0.696	B	0.657	B	-0.001	0.000	No
5	Placentia Avenue/Crowther Avenue	0.423	A	0.528	A	0.461	A	0.572	A	0.038	0.044	No
6	Melrose Street/Crowther Avenue	0.319	A	0.321	A	0.353	A	0.388	A	0.034	0.067	No
7	Kraemer Boulevard/Crowther Avenue	0.627	B	0.550	A	0.637	B	0.563	A	0.010	0.013	No
8	Orangethorpe Avenue/Placentia Avenue	0.449	A	0.516	A	0.464	A	0.543	A	0.015	0.027	No
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.434	A	0.442	A	0.469	A	0.443	A	0.035	0.001	No
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.583	A	0.639	B	0.589	A	0.670	B	0.006	0.031	No
11	Orangethorpe Avenue/Melrose Street	0.631	B	0.718	C	0.652	B	0.745	C	0.021	0.027	No
12	Kraemer Boulevard/Orangethorpe Avenue	0.789	C	0.727	C	0.797	C	0.737	C	0.008	0.010	No

Notes: 1. V/C: Volume-to-Capacity Ratio
2. LOS: Level of Service

Table 3-2b. Opening Day 2018 with Project
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	Without Project						With Project						Change in V/C and Delay				Significant Impact
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour		PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	V/C[1]	Delay[2]	
1	Chapman Avenue/SR-57 Southbound Ramps	0.65	10.3	B	0.68	12.7	B	0.65	10.2	B	0.69	13.0	B	0.00	-0.1	0.01	0.3	No
2	Chapman Avenue/SR-57 Northbound Ramps	0.82	28.4	C	0.81	27.8	C	0.82	28.7	C	0.81	27.8	C	0.00	0.3	0.00	0.0	No
3	Chapman Avenue/Placentia Avenue	0.75	39.8	D	0.73	34.8	C	0.76	41.4	D	0.75	35.2	D	0.01	1.6	0.02	0.4	No
4	Kraemer Boulevard/Chapman Avenue	0.76	35.6	D	0.77	31.7	C	0.76	35.5	D	0.77	31.7	C	0.00	-0.1	0.00	0.0	No
5	Placentia Avenue/Crowther Avenue	0.38	8.3	A	0.41	11.5	B	0.43	10.4	B	0.44	11.9	B	0.05	2.1	0.03	0.4	No
6	Melrose Street/Crowther Avenue	0.33	17.3	B	0.36	20.5	C	0.39	19.8	B	0.43	23.4	C	0.06	2.5	0.07	2.9	No
7	Kraemer Boulevard/Crowther Avenue	0.67	15.6	B	0.64	18.9	B	0.69	18.6	B	0.66	20.0	B	0.02	3.0	0.02	1.1	No
8	Orangethorpe Avenue/Placentia Avenue	0.45	28.9	C	0.55	32.8	C	0.46	28.9	C	0.58	34.1	C	0.01	0.0	0.03	1.3	No
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.43	25.1	C	0.38	24.9	C	0.43	22.4	C	0.39	25.5	C	0.00	-2.7	0.01	0.6	No
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.58	21.0	C	0.55	18.4	B	0.58	19.3	B	0.60	20.4	C	0.00	-1.7	0.05	2.0	No
11	Orangethorpe Avenue/Melrose Street	0.67	37.6	D	0.78	39.8	D	0.70	32.5	C	0.80	41.1	D	0.03	-5.1	0.02	1.3	No
12	Kraemer Boulevard/Orangethorpe Avenue	0.83	43.3	D	0.83	49.5	D	0.84	51.7	D	0.84	49.6	D	0.01	8.4	0.01	0.1	No
Project Driveway Locations (Unsignalized)[4]																		
13	Crowther Avenue at Project Driveway A	--	--	--	--	--	--	-	10.5	B	-	11.0	B	--	--	--	--	No
14	Crowther Avenue at Project Driveway B	--	--	--	--	--	--	--	10.4	B	--	10.9	B	--	--	--	--	No
15	Crowther Avenue at Project Driveway C	--	--	--	--	--	--	--	10.6	B	--	12.0	B	--	--	--	--	No

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service
4. Unsignalized Intersections were analyzed using the Highway Capacity Software (HCS), Two-way Stop Controlled Intersection. LOS is based on the approach with the worst LOS.

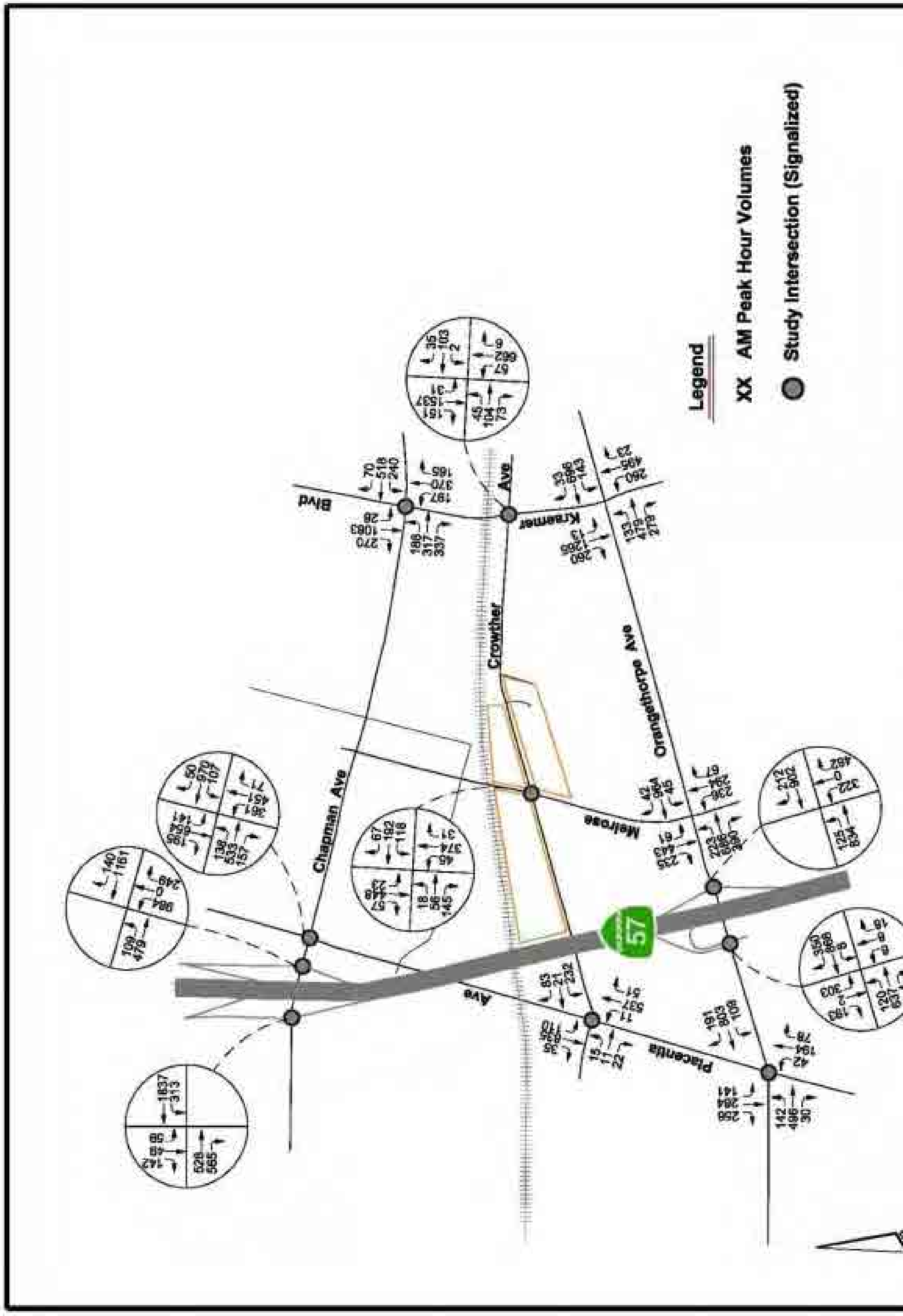


Figure 3-2a
Opening Day 2018 Volumes with Project - AM Peak Hour

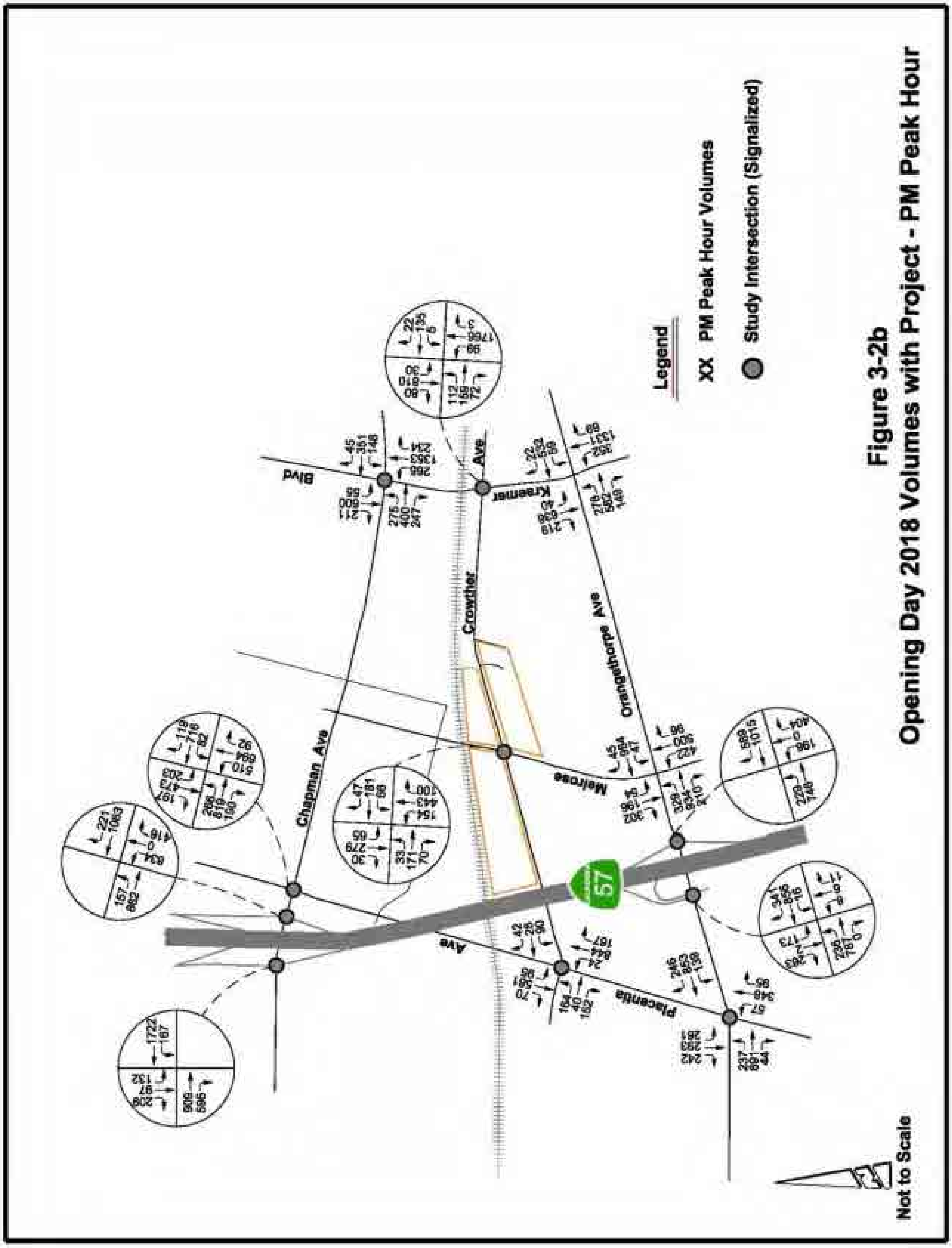


Figure 3-2b
Opening Day 2018 Volumes with Project - PM Peak Hour

Figure 3-3. Opening Day 2018 with Project - Project Driveway Volumes

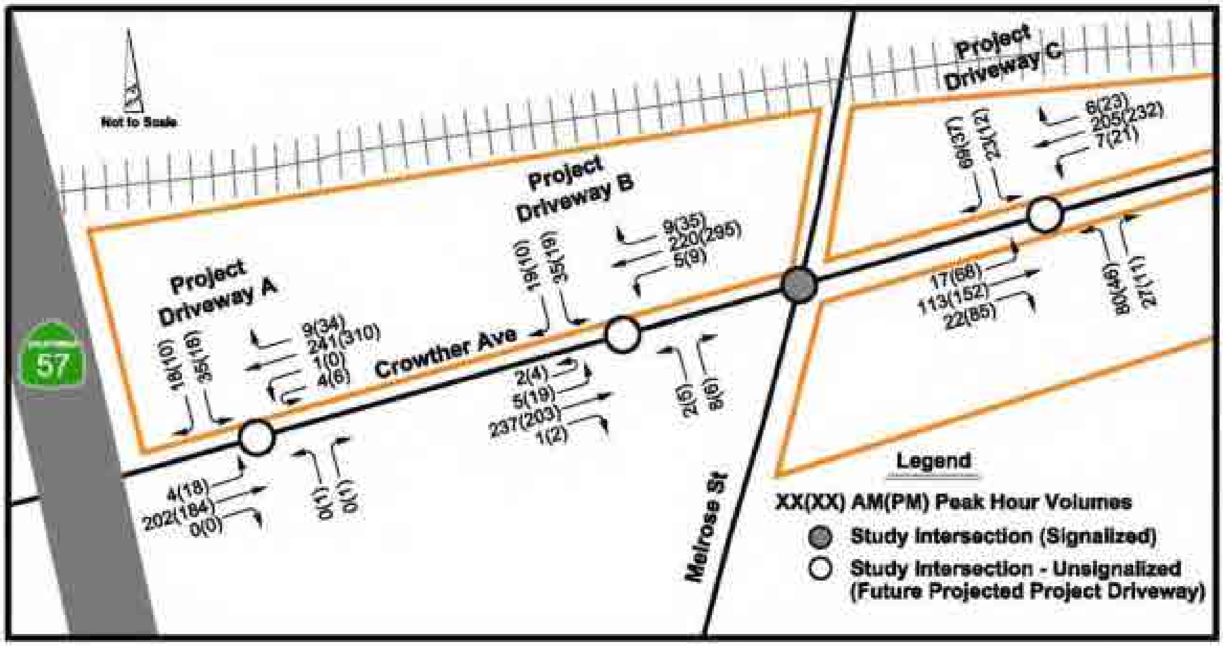


Table 3-3. Opening Day 2018 with Project – Crowther Avenue Segment Analysis

Crowther Ave	Opening Day without Project				Opening Day with Project				
	Opening Day Daily Vol*	LOS E Capacity - 4 Lanes (per MPAH)	V/C	LOS	Project Daily Vol	Opening Day + Project Daily Vol	LOS E Capacity - 4 Lanes (Preferred Alternative)	V/C	LOS
West of Melrose St	5,237	25,000	0.209	A	1,708	6,945	25,000	0.278	A
East of Melrose St	5,462	25,000	0.218	A	2,158	7,620	25,000	0.305	A

Opening Day without Project included the Westgate Metrolink Project and a 2% ambient growth.

Segment Analysis – Orangethorpe Avenue per Orange County Congestion Management Program (CMP) Guidelines

- Orangethorpe Avenue (Placentia Avenue – Melrose Street):

A segment analysis for the Opening Day 2018 scenario was conducted along Orangethorpe Avenue between Placentia Avenue and Melrose Street to evaluate if there will be any impacts per the Orange County CMP guidelines. Existing daily traffic volumes were increased by two percent to account for Project Opening Day plus cumulative project daily trips from the Metrolink Station to calculate Opening Day "with Project" daily traffic. Segment analysis for Existing "with Project" is summarized below in **Table 3-4.** Orangethorpe Avenue within this area is expected to remain a Major Arterial under Opening Day 2018 conditions with an LOS E capacity of 56,300 vehicles per day (vpd). Under Opening Day "with Project" conditions, Orangethorpe Avenue is expected to have 23,454 daily vehicles and operate at LOS A with no significant impacts per Orange County Congestion Management Program guidelines.

Table 3-4. Opening Day 2018 with Project – Orangethorpe Avenue CMP Segment Analysis

Orangethorpe Ave	Opening Day 2018 without Project				Opening Day 2018 with Project				
	Opening Day Daily Vol*	LOS E Capacity - 6 Lanes (per MPAH)	V/C	LOS	Project Daily Vol	Opening Day + Project Daily Vol	LOS E Capacity - 6 Lanes (per MPAH)	V/C	LOS
Between Placentia Ave and Melrose St	23,231	56,300	0.413	A	1,014	24,245	56,300	0.431	A

Opening Day without Project included the Westgate Metrolink Project and a 2% ambient growth.

Segment analysis for Opening Day "with Project" shows that both segments of Crowther Avenue to the east and west of Melrose Street, will continue operate at an acceptable LOS. Likewise, the CMP arterial location of Orangethorpe Avenue (Placentia Avenue – Melrose Street) will operate under acceptable LOS conditions "with Project."

IV. FUTURE BUILDOUT (YEAR 2035) LEVEL OF SERVICE ANALYSIS

Future Buildout 2035

The TOD project area is currently zoned as industrial and will require a land use/zone change. Analyses were conducted for the Future Buildout 2035 to evaluate if any impacts are to occur due to the TOD project. For Year 2035, the projected traffic volumes from the supporting Traffic Study to the Draft General Plan Update - June 26, 2014 (see Appendix B-1) were used. The Current General Plan required an update due to the amendment of land uses within the City. The Current General Plan utilized the Orange County Transportation Analysis Models (OCTAM) for 2010 and 2035 to forecast the future buildout projections. The Draft General Plan Update does not have forecasted volume data for Chapman Avenue/SR-57 Freeway interchange. Therefore, the Future Buildout 2035 volumes for Chapman Avenue and SR-57 Freeway ramp intersections utilized the City of Fullerton Traffix Model. Since the draft General Plan Update has not yet been finalized, the document should be updated to reflect the land use change for the TOD project area. Both "without Project" and "with Project" scenarios were evaluated for the Future Buildout scenario using the ICU and HCM methodologies.

Future Buildout without Project Level of Service Analysis

Based on the projected growth in the study area, more than half of the study intersections are expected to operate at deficient LOS for "without Project" conditions. LOS analysis results for Future Buildout "without Project" are summarized for ICU analysis in Table 4-1a, and for HCM analysis in Table 4-1b.

Table 4-1a. Future Buildout 2035 without Project
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection	AM Peak Hour		PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]
1	Chapman Avenue/SR-57 Southbound Ramps	0.890	D	1.073	F
2	Chapman Avenue/SR-57 Northbound Ramps	1.073	F	1.314	F
3	Chapman Avenue/Placentia Avenue	0.838	D	0.878	D
4	Kraemer Boulevard/Chapman Avenue	0.778	C	0.769	C
5	Placentia Avenue/Crowther Avenue	0.628	B	0.919	E
6	Melrose Street/Crowther Avenue	0.607	B	0.783	C
7	Kraemer Boulevard/Crowther Avenue	0.750	C	0.817	D
8	Orangethorpe Avenue/Placentia Avenue	0.587	A	0.952	E
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.591	A	0.757	C
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.705	C	1.055	F
11	Orangethorpe Avenue/Melrose Street	0.702	C	1.058	F
12	Kraemer Boulevard/Orangethorpe Avenue	0.959	E	0.999	E

Notes: 1. V/C: Volume-to-Capacity Ratio
2. LOS: Level of Service

Table 4-1b. Future Buildout 2035 without Project Highway Capacity Manual (HCM) Analysis Level of Service (LOS) Summary							
No.	Intersection	AM Peak Hour			PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]
1	Chapman Avenue/SR-57 Southbound Ramps	0.91	20.8	C	1.10	46.2	F
2	Chapman Avenue/SR-57 Northbound Ramps	1.16	80.0	F	1.43	158.1	F
3	Chapman Avenue/Placentia Avenue	0.89	42.4	D	0.92	45.9	D
4	Kraemer Boulevard/Chapman Avenue	0.86	43.9	D	0.88	40.0	D
5	Placentia Avenue/Crowther Avenue	0.60	14.0	B	1.34	46.4	F
6	Melrose Street/Crowther Avenue	0.63	27.5	C	0.87	47.3	D
7	Kraemer Boulevard/Crowther Avenue	0.86	34.7	C	0.88	45.6	D
8	Orangethorpe Avenue/Placentia Avenue	0.60	33.0	C	1.13	73.3	F
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.55	28.1	C	0.68	19.6	B
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.73	23.0	C	1.14	98.8	F
11	Orangethorpe Avenue/Melrose Street	0.80	34.7	C	1.21	123.6	F
12	Kraemer Boulevard/Orangethorpe Avenue	1.05	71.7	F	1.15	90.4	F

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service

Under Future Buildout "without Project" conditions, the following locations operate at deficient LOS:

- Chapman Avenue/SR-57 Southbound Ramps (PM Peak Hour Only)
- Chapman Avenue/SR-57 Northbound Ramps (AM Peak Hour, PM Peak Hour)
- Placentia Avenue/Crowther Avenue (PM Peak Hour Only)
- Orangethorpe Avenue/Placentia Avenue (PM Peak Hour Only)
- Orangethorpe Avenue/SR-57 Northbound Ramps (PM Peak Hour Only)
- Orangethorpe Avenue/Melrose Street (PM Peak Hour Only)
- Kraemer Boulevard/Orangethorpe Avenue (AM Peak Hour, PM Peak Hour)

These seven signalized study intersections operating at deficient LOS of E or F already operate at deficient LOS by Future Buildout "without Project", due to projected Citywide Future Buildout per the City of Placentia Draft General Plan Update (see Appendix A). The LOS analysis worksheets for the Future Buildout "without Project" scenario are provided in Appendices K-1 and K-2. The projected volumes for the morning and afternoon peak-hours are shown in Figures 4-1a and 4-1b.

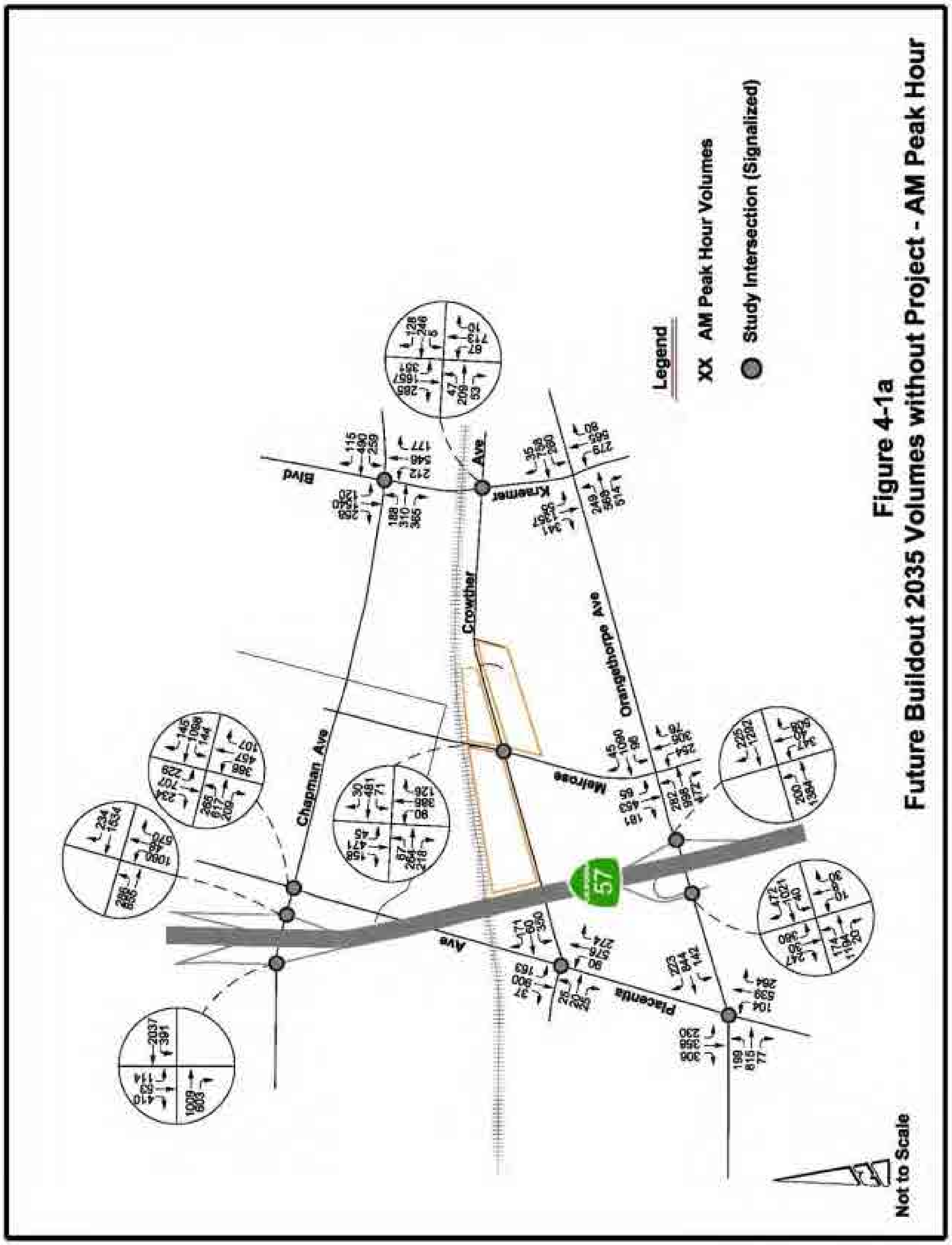


Figure 4-1a
Future Buildout 2035 Volumes without Project - AM Peak Hour

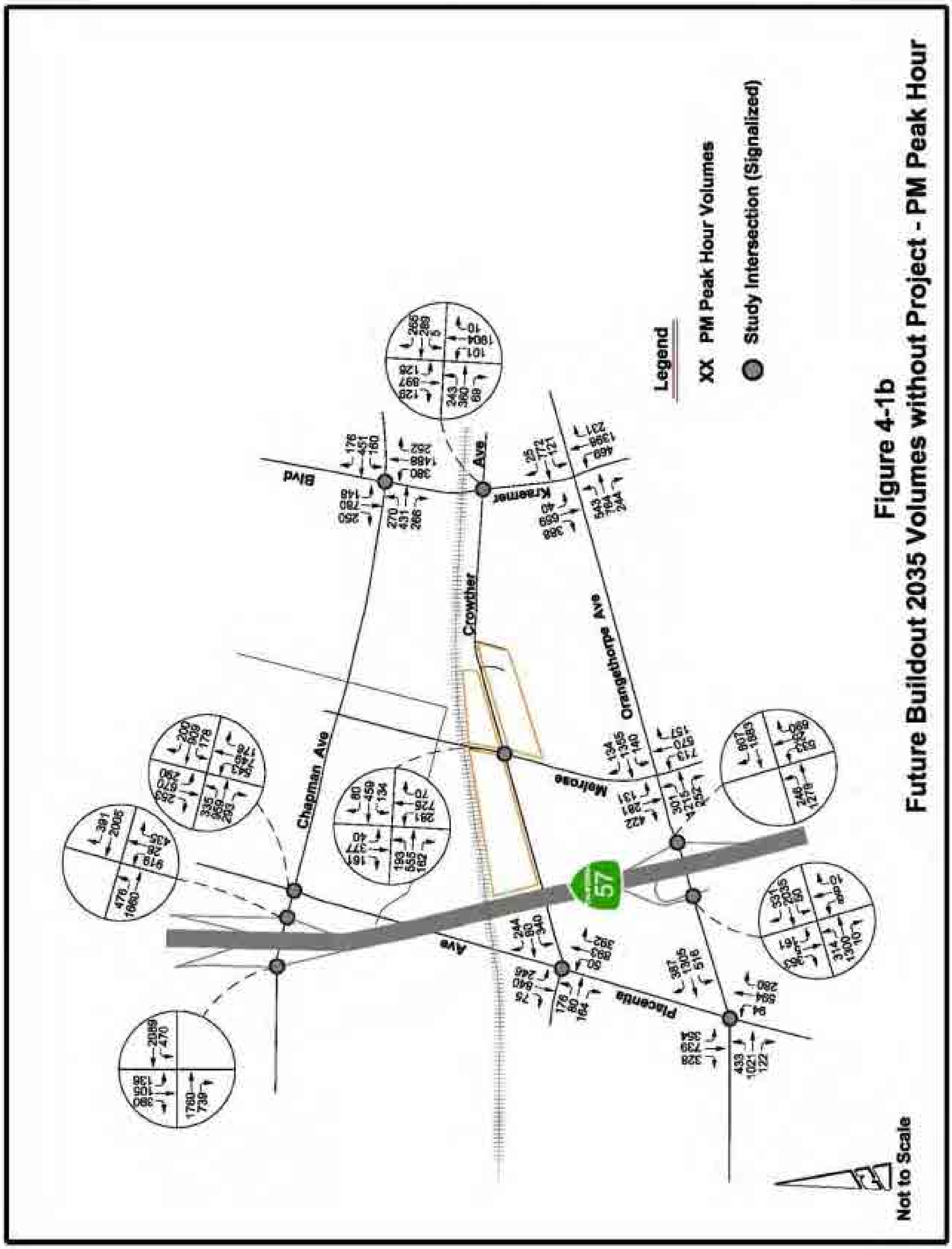


Figure 4-1b
Future Buildout 2035 Volumes without Project - PM Peak Hour

Future Buildout 2035 Trip Generation

The net project trip generation will be different from the other scenarios in that the future land use for the TOD project area was assumed to be 100 percent industrial and to be built out for both General Plan documents. Currently there is a mixed use of industrial, commercial, and residential; and the northeast corner lot is an open lot, which does not generate any trips. In order to estimate the number of trips if the project area were to become 100 percent Industrial (per existing zone use), the square footage of the existing industrial site on the southeast (SE) corner lot was evaluated. Utilizing the square footage of the existing SE industrial building and the acreage of the parcel that it resides on, a rate was established between the square footage of industrial to the acreage of the parcel. The rate was then applied to all three sub-areas to determine what the trip generation (Industrial land use) would be for Future Buildout "without Project". A trip generation credit for the industrial land use was applied to the TOD project trips to determine the net trip generation for Year 2035. The Future Buildout project trip generation analysis is provided in Table 4-2 and is shown in Figure 4-3.

Table 4-2 – Future Buildout 2035 Trip Generation

Scenario	Quantity	Daily Trips	AM Peak Hour Trips	PM Peak Hour Trips	AM Peak Hour Trips		PM Peak Hour Trips	
					In	Out	In	Out
Existing Land Use								
Northwest Area								
Industrial: Warehousing (ITE 150)	202.77 KSF GFA	905	122	94	96	26	24	70
Southeast Area								
Industrial: Warehousing (ITE 150)	182.35 KSF GFA	826	115	88	91	24	22	66
Northeast Area								
Industrial: Warehousing (ITE 150)	42.11 KSF GFA	234	51	34	40	11	9	25
Total		1,965	288	216	227	61	55	161
100% Residential: Single-Family (ITE 220) - 752 DU TOD Project, 5,000 Daily Trips								
Northwest Area (35%)		1,750	134	163	27	107	106	57
Southeast Area (35%)		1,750	134	163		107	106	57
Northeast Area (30%)		1,500	115	140	23	92	91	49
Total		5,000	383	466	50	306	303	163
Net Trip Generation		**3,035**	**95**	**250**	**-177**	**245**	**248**	**2**

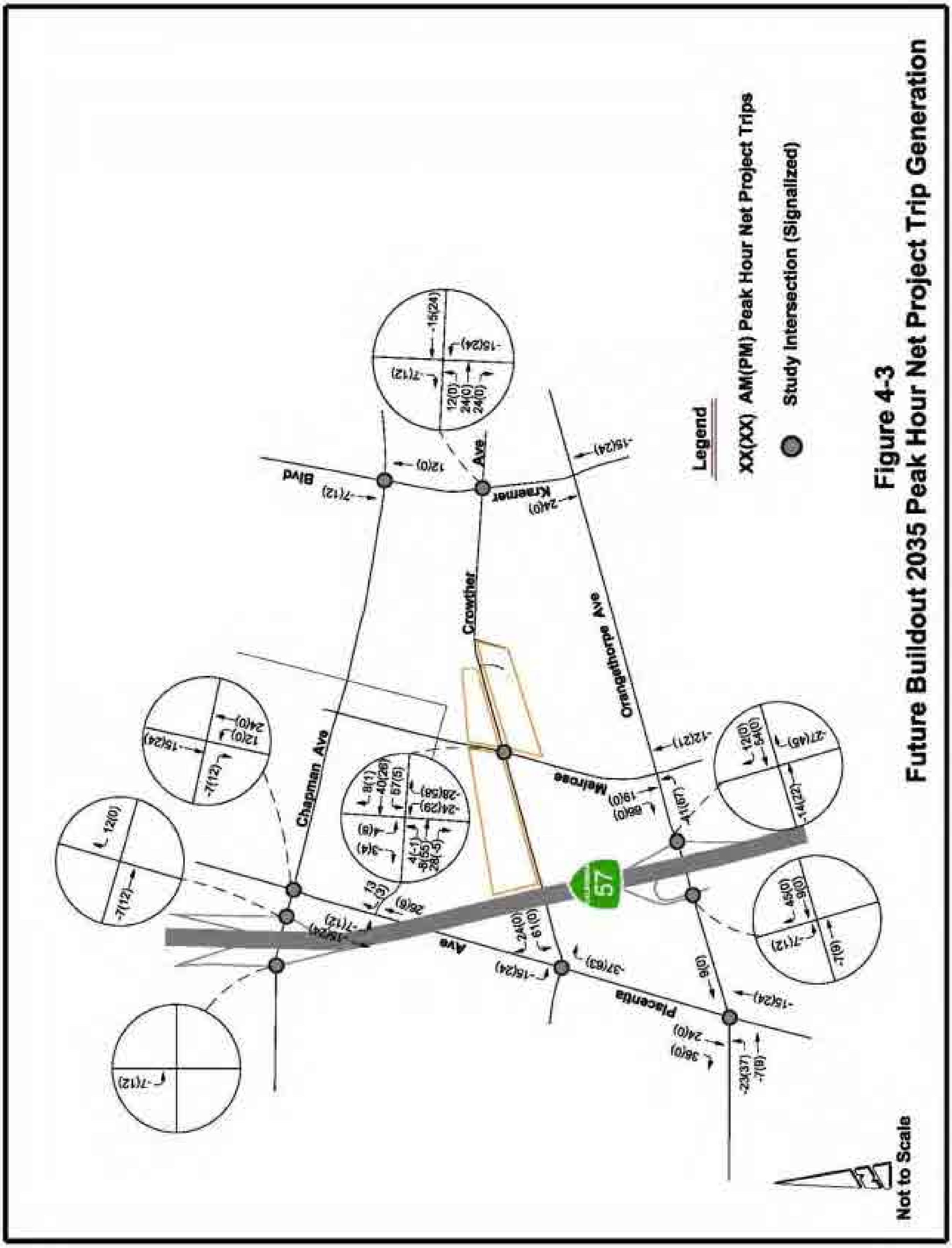


Figure 4-3
Future Buildout 2035 Peak Hour Net Project Trip Generation

Future Buildout with Project Level of Service Analysis

For Future Buildout "with Project" scenario, the LOS does not change at more than half of the study intersections, and most of the study intersections would operate at a deficient LOS under "without Project" conditions and continue to remain deficient under "with Project" conditions.

The level-of-service analyses for Future Buildout "with Project" are shown for ICU Analysis in Table 4-3a and for HCM Analysis in Table 4-3b. The LOS analysis worksheets for the the Future Buildout "with Project" scenario are provided in Appendices L-1 and L-2. Some study intersections during the AM peak hour may experience a decrease in ICU, V/C, and delay due to a negative net project trip generation during the AM peak hour (see Table 4-2). For locations such as Chapman Avenue and the SR-57 Freeway ramp intersections that are deficient under Future Buildout for both "without Project" and "with Project" conditions, the change in ICU is less than 0.01 (per City of Placentia guidelines). Some of the locations are significantly impacted under both the ICU analysis and HCM analysis, whereas others are only impacted under HCM analysis. Listed below are the locations that are significantly impacted:

- Placentia Avenue/Crowther Avenue (PM Peak Hour Only) – ICU Analysis, HCM Analysis
- Orangethorpe Avenue/Placentia Avenue (PM Peak Hour Only) – HCM Analysis
- Orangethorpe Avenue/SR-57 Northbound Ramps (PM Peak Hour Only) – ICU Analysis, HCM Analysis
- Orangethorpe Avenue/Melrose Street (PM Peak Hour Only) – ICU Analysis, HCM Analysis
- Kraemer Boulevard/Orangethorpe Avenue (both AM Peak Hour, PM Peak Hour) – HCM Analysis

The projected volumes for the morning and afternoon peak-hours are shown in Figures 4-4a and 4-4b. Projected volumes at future project driveways are shown in Figure 4-5. Project driveways operate at acceptable LOS C and LOS D under Future Buildout "with Project" conditions. These seven signalized study intersections operating at deficient LOS of E or F were deficient by Future Buildout "without Project", and continue to be deficient "with Project." Mitigations are required to bring each location back to an acceptable LOS of D or better. Since the TOD project will contribute to the future traffic growth at these intersections, the fair share of improvement costs for the TOD project must be determined.

Table 4-3a. Future Buildout 2035 with Project
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection	Without Project				With Project				Change in V/C		Significant Impact
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour	PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]			
1	Chapman Avenue/SR-57 Southbound Ramps	0.890	D	1.073	F	0.890	D	1.073	F	0.000	0.000	No
2	Chapman Avenue/SR-57 Northbound Ramps	1.073	F	1.314	F	1.077	F	1.314	F	0.004	0.000	No
3	Chapman Avenue/Placentia Avenue	0.838	D	0.878	D	0.843	D	0.878	D	0.005	0.000	No
4	Kraemer Boulevard/Chapman Avenue	0.778	C	0.769	C	0.776	C	0.769	C	-0.002	0.000	No
5	Placentia Avenue/Crowther Avenue	0.628	B	0.919	E	0.645	B	0.953	E	0.017	0.034	Yes
6	Melrose Street/Crowther Avenue	0.607	B	0.783	C	0.622	B	0.830	D	0.015	0.047	No
7	Kraemer Boulevard/Crowther Avenue	0.750	C	0.817	D	0.752	C	0.831	D	0.002	0.014	No
8	Orangethorpe Avenue/Placentia Avenue	0.587	A	0.952	E	0.601	A	0.956	E	0.014	0.004	No
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.591	A	0.757	C	0.613	B	0.757	C	0.022	0.000	No
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.705	C	1.055	F	0.702	B	1.081	F	-0.003	0.026	Yes
11	Orangethorpe Avenue/Melrose Street	0.702	C	1.058	F	0.727	C	1.077	F	0.025	0.019	Yes
12	Kraemer Boulevard/Orangethorpe Avenue	0.959	E	0.999	E	0.936	E	0.999	E	-0.023	0.000	No

Notes: 1. V/C: Volume-to-Capacity Ratio
2. LOS: Level of Service

Table 4-3b. Future Buildout 2035 with Project
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	Without Project						With Project						Change in V/C and Delay				Significant Impact
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour		PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	V/C[1]	Delay[2]	
1	Chapman Avenue/SR-57 Southbound Ramps	0.91	20.8	C	1.10	46.2	F	0.91	20.8	C	1.10	46.2	F	0.00	0.0	0.00	0.0	No
2	Chapman Avenue/SR-57 Northbound Ramps	1.16	80.0	F	1.43	158.1	F	1.16	81.4	F	1.43	157.9	F	0.00	1.4	0.00	-0.20	No
3	Chapman Avenue/Placentia Avenue	0.89	42.4	D	0.92	45.9	D	0.88	41.0	D	0.92	46.4	D	-0.01	-1.4	0.00	0.50	No
4	Kraemer Boulevard/Chapman Avenue	0.86	47.8	D	0.88	40.0	D	0.86	43.8	D	0.88	40.1	D	0.00	-4.0	0.00	0.10	No
5	Placentia Avenue/Crowther Avenue	0.60	14.0	B	1.34	46.4	F	0.62	15.4	B	1.52	57.1	F	0.02	1.4	0.18	10.70	Yes
6	Melrose Street/Crowther Avenue	0.63	27.5	C	0.87	47.3	D	0.62	28.5	C	0.90	50.3	D	-0.01	1.0	0.03	3.00	No
7	Kraemer Boulevard/Crowther Avenue	0.86	34.7	C	0.88	45.6	D	0.86	33.9	C	0.89	50.2	D	0.00	-0.8	0.01	4.60	No
8	Orangethorpe Avenue/Placentia Avenue	0.60	33.0	C	1.13	73.3	F	0.62	34.8	C	1.15	76.1	F	0.02	1.8	0.02	2.80	Yes
9	Orangethorpe Avenue/SR-57 Southbound Ramps	0.55	28.1	C	0.68	19.6	B	0.54	25.8	C	0.69	20.0	C	-0.01	-2.3	0.01	0.40	No
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.73	23.0	C	1.14	98.8	F	0.73	20.8	C	1.18	98.9	F	0.00	-2.2	0.04	0.10	Yes
11	Orangethorpe Avenue/Melrose Street	0.80	34.7	C	1.21	123.6	F	0.82	35.2	D	1.22	131.6	F	0.02	0.5	0.01	8.00	Yes
12	Kraemer Boulevard/Orangethorpe Avenue	1.05	71.7	F	1.15	90.4	F	1.06	74.3	F	1.16	91.2	F	0.01	2.6	0.01	0.80	Yes
Project Driveway Locations (Unsignalized)[4]																		
13	Crowther Avenue at Project Driveway A	--	--	--	--	--	--	-	13.9	B	-	15.0	C	--	--	--	--	No
14	Crowther Avenue at Project Driveway B	--	--	--	--	--	--	--	13.8	B	--	15.3	C	--	--	--	--	No
15	Crowther Avenue at Project Driveway C	--	--	--	--	--	--	--	14.0	B	--	20.5	C	--	--	--	--	No

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service
4. Unsignalized Intersections were analyzed using the Highway Capacity Software (HCS). Two-way Stop Controlled Intersection. LOS is based on the approach with the worst LOS.

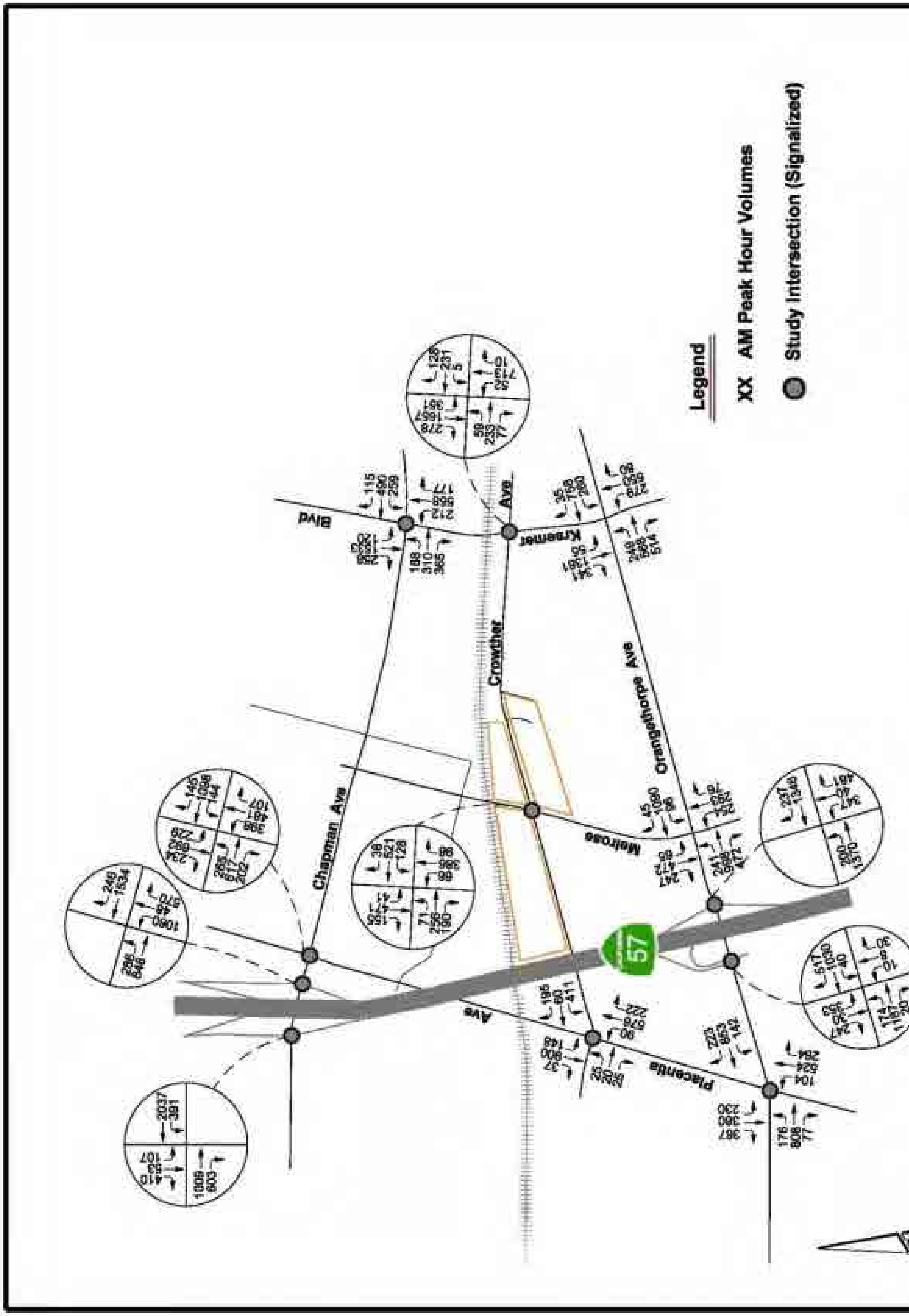


Figure 4-4a
Future Buildout 2035 Volumes with Project - AM Peak Hour

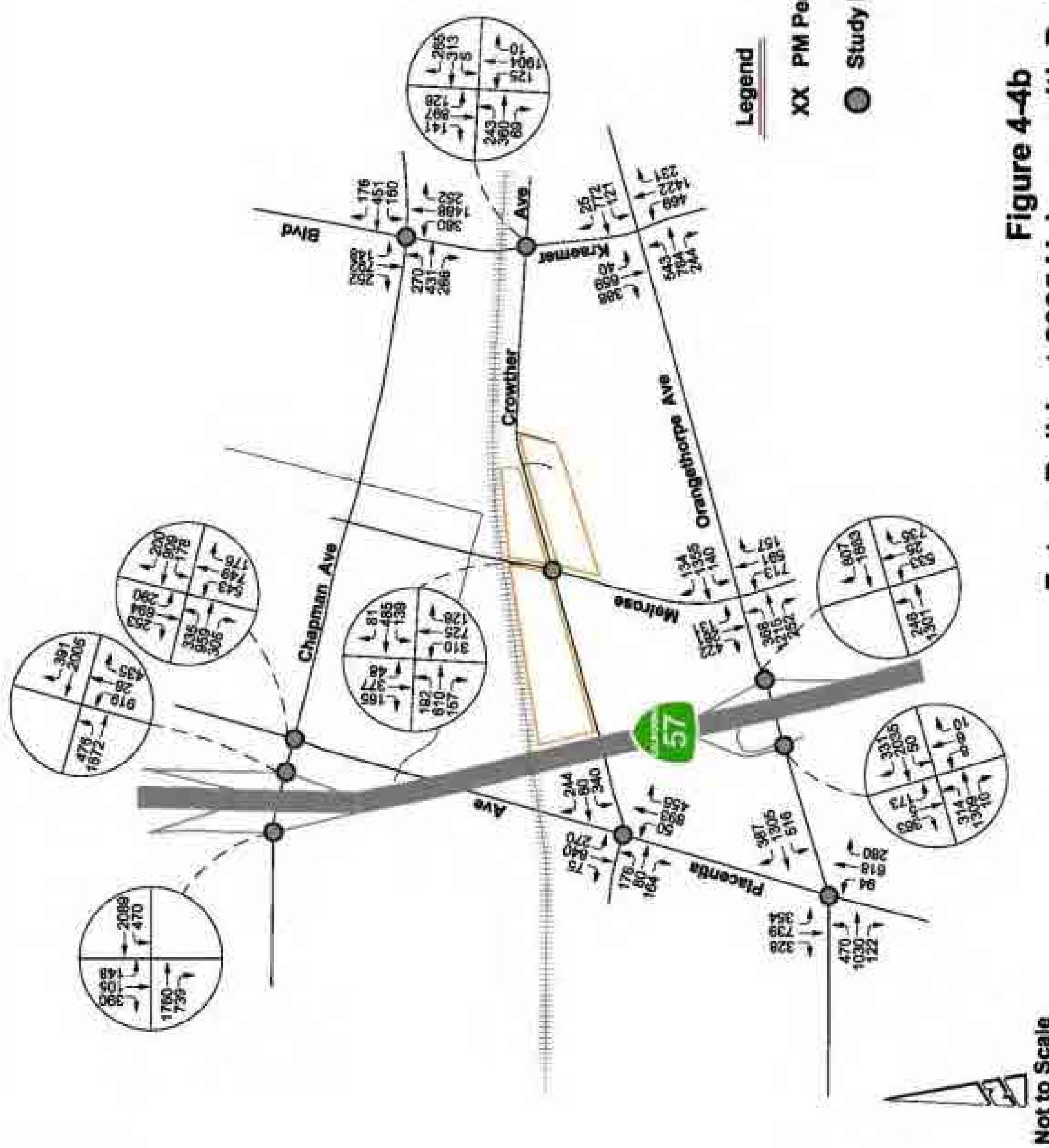


Figure 4-4b
Future Buildout 2035 Volumes with Project - PM Peak Hour

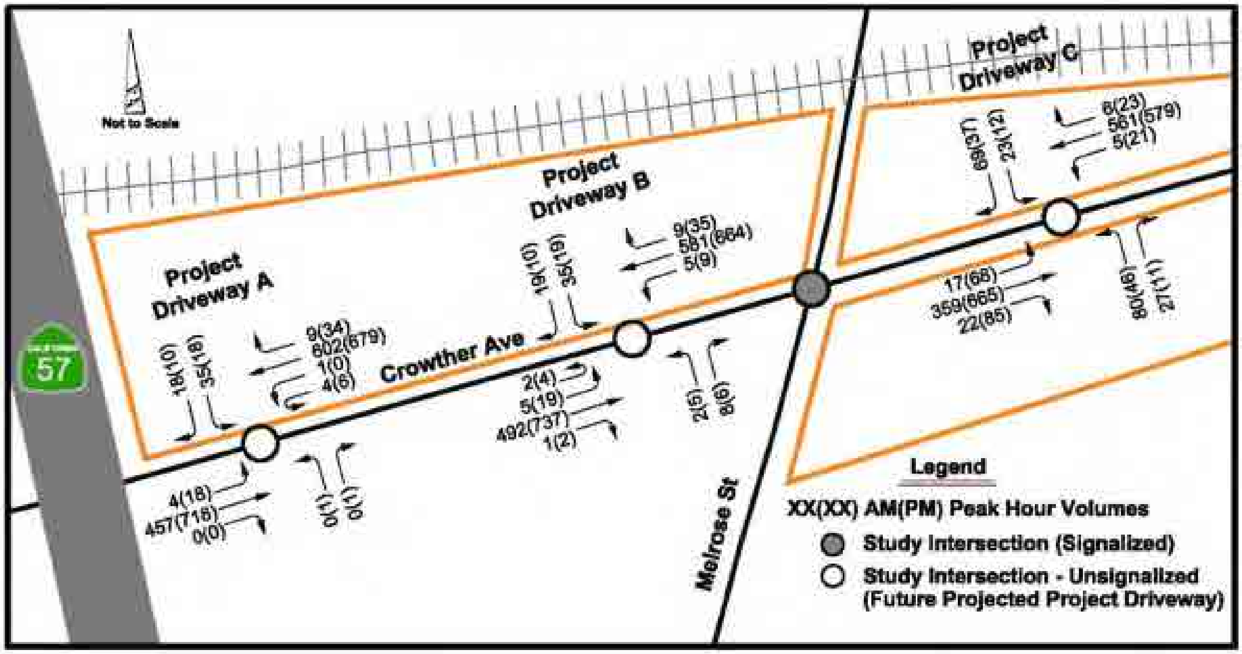


Figure 4-5. Future Buildout with Project - Project Driveway Volumes

Mitigations

Improvements to the intersections that are expected to operate at LOS F were evaluated to determine what is required to alleviate the future traffic impacts and to have those intersections operate at an acceptable LOS D or better. The intersections are expected to operate at a LOS F due to the projected growth at Future Buildout without the TOD project. These mitigations should be completed by Future Buildout. Since the TOD project will contribute to future traffic volumes at these intersections as individual TOD development is entitled, each TOD project shall pay a fair share of the intersection improvement costs at the time of entitlement based on the percentage of trips contributed at each intersection. A high level "order of magnitude" cost estimates is also provided for the needed mitigations. The estimates are rough estimate costs for engineering and construction and will need to be refined during the preliminary engineering phase. The mitigations should be re-evaluated for any refinement of the Draft General Plan Update and/or additional development of the TOD project over and beyond the 5,000 daily trips. All significantly impacted intersections require mitigation prior to Future Buildout. The mitigations and estimated costs are listed below:

<u>Placentia Avenue/Crowther Avenue</u>

Based on the analyses using the HCM methodology, it is recommended to have the project upgrade the left turn signal phasing for all movements from permissive left turns to protected/permissive left turn phasing (PPLT). The LOS is expected to improve PM peak hour conditions from a LOS F to LOS D from this improvement.

- Estimated Cost - $100,000

Orangethorpe Avenue/Placentia Avenue

Provide eastbound/westbound dual left-turn Lanes at Orangethorpe Avenue/Placentia Avenue. The LOS is expected to improve PM peak hour conditions from a LOS F to LOS D from this improvement.

- Estimated Cost - $450,000

Orangethorpe Avenue/SR-57 Northbound Ramps

Restripe Northbound Off-Ramp middle lane as a shared Left-Turn/Thru/Right-Turn Lane.

- Estimated Cost - $50,000

The LOS is expected to improve PM peak hour conditions from a LOS F to LOS D from these improvements.

The westbound right turn movement is expected to increase from an existing 550 vph to 800 vph during the PM period for Year 2035. This movement should be closely monitored and may require additional improvements to reduce the congestion and queuing. An additional improvement would be to modify the existing median on Orangethorpe Avenue to add an exclusive Westbound Right-Turn Lane.

- Estimated Cost - $200,000

Orangethorpe Avenue/Melrose Street

Provide an exclusive southbound right-turn lane with overlap signal phasing and northbound dual left-turn lanes at Orangethorpe Avenue/Melrose Street. The LOS is expected to improve the PM peak hour conditions from LOS F to LOS D from this improvement.

- Estimated Cost - $100,000

Kraemer Boulevard/Orangethorpe Avenue

Restripe Orangethorpe Avenue to provide eastbound dual left-turn lanes. Add an additional north/south thru lane (three lanes each) by restriping the northbound and southbound right turn lanes to thru lanes. Consider modifying the north/south left-turn movements from protected-only left-turn phasing to protected-permissive left-turn (PPLT) phasing. Restripe the southbound left-turn approach to provide a positive offset for better sight distance between the north/south left turn movements.

- Estimated Cost - $100,000

The LOS is expected to improve both AM and PM peak hour conditions from a LOS F to LOS D from these improvements.

Dual left-turn lanes for the northbound approach were analyzed. This improvement would require Kraemer Boulevard to be widened. Due to the bridge and channel 150 feet south of Orangethorpe Avenue, Kraemer Boulevard cannot be widened without substantial costs.

The level-of-service analyses for Future Buildout "with Project Mitigations" are shown for ICU Analysis in Table 4-4a and for HCM Analysis in Table 4-4b. Each mitigation brings the LOS to acceptable LOS of D or better. The LOS analysis worksheets for the Future Buildout "with Project Mitigations" scenario are provided in Appendices M-1 and M-2. It must be determined the percentage of Future Buildout "with Project" traffic is due to the TOD Project to determine their fair share of improvement costs.

Table 4-4a. Future Buildout 2035 with Project Mitigation
Intersection Capacity Utilization (ICU) Analysis
Level of Service (LOS) Summary

No.	Intersection Expected to Operate at a Deficient LOS	Without Project				With Project				With Mitigations			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]	V/C[1]	LOS[2]
5	Placentia Avenue/Crowther Avenue	0.628	B	0.919	E	0.645	B	0.953	E	0.593	B	0.899	D
8	Orangethorpe Avenue/Placentia Avenue	0.587	A	0.952	E	0.601	A	0.956	E	0.547	A	0.818	D
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.705	C	1.055	F	0.702	B	1.081	F	0.542	A	0.818	D
11	Orangethorpe Avenue/Melrose Street	0.702	C	1.058	F	0.727	C	1.077	F	0.575	A	0.747	C
12	Kraemer Boulevard/Orangethorpe Avenue	0.959	E	0.999	E	0.936	E	0.999	E	0.848	D	0.811	D

Notes: 1. V/C: Volume-to-Capacity Ratio
2. LOS: Level of Service

Table 4-4b. Future Buildout 2035 with Project Mitigations
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection Expected to Operate at a Deficient LOS	Without Project						With Project						With Mitigations					
		AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour		
		V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]	V/C[1]	Delay[2]	LOS[3]
5	Placentia Avenue/Crowther Avenue	0.60	14.0	B	1.34	46.4	F	0.62	15.4	B	1.52	57.1	F	0.63	20.3	C	0.88	35.2	D
8	Orangethorpe Avenue/Placentia Avenue	0.60	33.0	C	1.13	73.3	F	0.62	34.8	C	1.15	76.1	F	0.59	33.4	C	0.86	49.8	D
10	Orangethorpe Avenue/SR-57 Northbound Ramps	0.73	23.0	C	1.14	98.8	F	0.73	20.8	C	1.18	98.9	F	0.62	20.7	C	0.98	46.0	D
11	Orangethorpe Avenue/Melrose Street	0.80	34.7	C	1.21	123.6	F	0.82	35.2	D	1.22	131.6	F	0.66	30.7	C	0.89	49.6	D
12	Kraemer Boulevard/Orangethorpe Avenue	1.05	71.7	F	1.15	90.4	F	1.06	74.3	F	1.16	91.2	F	0.91	44.2	D	0.93	43.1	D

Notes: 1. V/C: HCM Volume-to-Capacity Ratio, LOS F for HCM V/C > 1.000 (Over Capacity)
2. Delay in Seconds
3. LOS: Level of Service

Future Buildout with Project – Segment Analysis

Segment Analysis – Crowther Avenue

- Crowther Avenue (Placentia Avenue – Melrose Street)
- Crowther Avenue (Melrose Street – Kraemer Boulevard)

A segment analysis was conducted for the Future Buildout "with Project" scenario and summarized in Table 4-5. The projected Future Buildout daily traffic volumes "without Project" were obtained from the traffic study to the City's Draft General Plan Update (See Appendix B-2). Based on that data, the projected daily traffic on Crowther Avenue in the TOD study area is expected to be 16,000 vehicles. Based on the net trip generation for Future Buildout conditions, the project is expected to add 1,382 vehicles to Crowther Avenue west of Melrose Street and add 1,744 vehicles on Crowther Avenue to the east of Melrose Street. The additional traffic from the TOD project area is not expected to impact the roadway, and Crowther Avenue is expected to operate at LOS C or better.

Table 4-5. Future Buildout 2035 with Project – Crowther Avenue Segment Analysis

Crowther Ave	Year 2035 without Project				Year 2035 with Project				
	Year 2035 Daily Vol*	LOS E Capacity - 4 Lanes (per MPAH)	V/C	LOS	Project Daily Vol	Year 2035 + Project Daily Vol	LOS E Capacity - 4 Lanes (Preferred Alternative)	V/C	LOS
West of Melrose St	16,000	25,000	0.640	B	1,382	17,382	25,000	0.695	B
East of Melrose St	16,000	25,000	0.640	B	1,744	17,744	25,000	0.710	C

Year 2035 project daily volume is per the Draft General Plan Update (in progress).

Segment Analysis – Orangethorpe Avenue per Orange County Congestion Management Program (CMP) Guidelines

- Orangethorpe Avenue (Placentia Avenue – Melrose Street):

A segment analysis for the Future Buildout 2035 "with Project" scenario was conducted along Orangethorpe Avenue between Placentia Avenue and Melrose Street to evaluate if there will be any impacts per the Orange County CMP guidelines. The projected Future Buildout daily traffic volumes "without Project" were also obtained from the City's Draft General Plan Update (see Appendix B-1). Based on that data, the projected daily traffic on Orangethorpe Avenue in the TOD study area is expected to be 32,000 vehicles. The additional traffic from the TOD project area, however, does not significantly impact the roadway. Under the Future Buildout "with Project" scenario, Orangethorpe Avenue will be at most 32,820 daily vehicles with the TOD Project, and operate at LOS A with no significant impacts per Orange County CMP guidelines. The segment analysis is summarized in Table 4-6.

Table 4-6. Future Buildout 2035 with Project – Orangethorpe Avenue CMP Segment Analysis

Orangethorpe Ave	Future Buildout 2035 without Project				Future Buildout 2035 with Project				
	Year 2035 Daily Vol*	LOS E Capacity - 6 Lanes (per MPAH)	V/C	LOS	Project Daily Vol	Year 2035 + Project Daily Vol	LOS E Capacity - 6 Lanes (per MPAH)	V/C	LOS
Between Placentia Ave and Melrose St	32,000	56,300	0.568	A	820	32,820	56,300	0.583	A

Year 2035 project daily volume is per the Draft General Plan Update (in progress).

Segment analysis for Future Buildout "with Project" shows that both segments of Crowther Avenue to the east and west of Melrose Street, will continue to operate at an acceptable LOS. The CMP arterial location of Orangethorpe Avenue (Placentia Avenue – Melrose Street) will continue to operate at acceptable LOS conditions "with Project."

V. On-Site Access and Circulation

The site is served with three full access driveways along Crowther Avenue, two on Crowther Avenue west of Melrose Street (Project Driveways A and B) that service the northeast (NE) corner lot, and one east of Melrose Street (Project Driveway C) that serves both the southeast (SE) and northeast (NE) corner lots. None of the driveways are signalized. As mentioned previously, there is heavy large truck traffic for the parcel of land located at the southwest corner lot, and it is important to maintain truck access to/from this site. Because a raised median is proposed along Crowther Avenue between Placentia Avenue and Melrose Street, all left-turns and U-turns along Crowther Avenue are restricted to Project Driveways A and B.

Alternative Modes of Transportation

Bus Facilities

There are currently no bus routes along Crowther Avenue. The existing bus routes closest to the TOD Project site (see Appendix A2) are OCTA 153 along Placentia Avenue and OCTA 30 along Orangethorpe Avenue. The City will have to coordinate with Orange County Transportation Authority (OCTA) regarding bus routes that will service the Placentia Metrolink Station. Also to be considered is a CSUF shuttle that will provide transportation to students to/from CSUF.

Pedestrian Facilities

Sidewalks are currently on both sides of Melrose Street in the project area and will continue to be present with the proposed TOD Project. Continuous sidewalk is only along the south side of Crowther Avenue, but upon completion of the project and Placentia Metrolink Station, there will be sidewalks on both sides of Crowther Avenue.

Bicycle Facilities

The existing bike routes within vicinity of the TOD Project site (see Appendix B-1) are Class III Bike Routes (One-Road signed) along Melrose Street (South of Crowther Avenue) and Chapman Avenue to the north. There are currently no bicycle facilities along Crowther Avenue. Per the TOD Project, a Class II Bike Route is planned along Crowther Avenue. Crowther Avenue will need to be included in the OCTA Bikeway Strategic Plan and Draft General Plan Update for the City of Placentia.

VI. Construction Traffic

The construction of the project is expected to be completed by Year 2018. Construction activities include building two new buildings including grading, trenching, and paving of parking lot, etc. In order to minimize any short-term construction impacts, the following conditions, at a minimum, will be utilized.

- There is heavy large truck traffic for the parcel on the southwest corner of Melrose Street and Crowther Avenue. Therefore it is very important to maintain truck access to and from this site.
- Hours of construction operation will be five days a week. In accordance with the City of Placentia Municipal Code, construction activities are limited to between the hours of 9 AM to 4 PM on working days (Monday – Friday).
- Construction truck and worker automobile traffic will utilize the proposed primary driveways along Melrose Street and Crowther Avenue for access to and from the project site.
- Trucks transporting materials to and from the project site must utilize the designated truck routes along Placentia Avenue, Crowther Avenue, Melrose Street, and Orangethorpe Avenue.
- Trucks entering or exiting the construction site will need to yield to public traffic at all times.
- It is unlikely that street traffic will be impacted by on-site construction activities; however, should it be necessary for temporary lane closures and/or detour routes for utility work or other such work in the public right-of-way those temporary traffic control activities are to be conducted in compliance with the requirements and guidelines outlined in the California Manual of Uniform Traffic Control Devices (MUTCD).
- Construction staging should be conducted on-site and under no circumstances will be allowed on local or residential streets.
- Construction work with-in the public right-of-way needs to be in compliance with the City standards.
- The applicant will be fully responsible for the repair of damages to any public facility due to the hauling or transporting of construction related materials.
- Parking for the construction trucks and worker trucks will be on-site away from the adjacent public roadways and existing businesses open for business.

VII. Conclusions

The conclusions of this traffic impact analysis are as follows:

- All signalized study intersections and unsignalized project driveway intersections operate at acceptable LOS D or better during Existing (Year 2016) and Opening Day (Year 2018) Conditions for “without Project” and “with Project”.

- The additional traffic from the TOD project area is not expected to impact Crowther Avenue. The future projected daily volume, including the TOD Project traffic, is expected to be less than 18,000 vehicles per day, which is well below the capacity of Crowther Avenue of 25,000 vehicles per day.

- The additional traffic from the TOD project area is also not expected to impact Orangethorpe Avenue (CMP Segment). The future projected daily volumes, including the TOD Project traffic, is expected to be less than 33,000 vehicles per day (vpd), which is well below the LOS E capacity of 56,300 vehicles per day (vpd).

- The TOD project is adjacent to and will be directly served by the Placentia Metrolink Station. OCTA will need to discuss and plan out future bus routes that will serve this new Metrolink Station. Pedestrian sidewalks surround the site, and the adjacent streets are of sufficient width to accommodate bicycle traffic. The proposed project is not expected to have a negative impact on any alternative modes of transportation.

- In order to minimize any short term construction impacts, the project construction activities should be in accordance with the City of Placentia Municipal Code and the conditions stated in this report.

- Seven signalized study intersections will experience deficient LOS by Future Buildout 2035 “without Project” due to projected Citywide Future Buildout. Mitigations (suggested improvements) to these intersections that are expected to operate LOS F were evaluated to determine what is required to alleviate the future traffic impacts and to have those intersections operate at an acceptable LOS. Since the TOD project will contribute to the future growth of those intersections, the fair share of improvement costs for the TOD project must be determined.

APPENDIX 5b

APPENDIX A

Excerpts from
Transit Cooperative Research Program (TCRP) Report 128
– "Effects of TOD on Housing, Parking, and Travel"

consecutive weekdays, one-day estimates were computed by dividing the two 24-hour counts by two.) For all 17 TOD-housing projects combined, a weighted average trip generation rate was estimated. (The ITE manual defines weighted average as the sum of trip ends for all projects divided by the sum of the independent variable, which in this case is number of dwelling units.) The computed rates for TOD-housing projects were compared to those found in the latest edition of the ITE manual for the equivalent land use (i.e., apartments and condominiums) (ITE, 2003). Comparisons are drawn using the ITE manual's weighted averages as well as estimates derived from best-fitting regression equations. The degree to which there are systematic differences in estimated and actual trip generation and parking generation rates of TODs are highlighted. The types of TOD projects for which there appear to be the largest discrepancies are identified.

Additionally, results were cross-classified among sampled projects in terms of distance to CBD, distance to the nearest station, parking provisions, and other factors including the quality of walking environment (e.g., with or without adjoining sidewalks). Multivariate regression equations that predict the trip generation rates of TOD housing as a function of these and other variables also are estimated.

Lastly, the implications of research findings for various public policies and practices are discussed. To the degree that TOD-housing projects exhibit below-normal trip generation rates, a strong case can be made for using sliding-scale impact fees to evaluate new TOD proposals. This might, for instance, result in lowering the estimated trip generation rates within a quarter mile of a station and with continuous sidewalk access and in a mixed-use neighborhood by a fixed percent, such as 20%.

Comparison of Vehicle Trip Generation Rates

TOD-housing clearly reduces auto trips in the four urbanized areas that were studied. Below, results for both 24-hour periods as well as peak periods are summarized.

Average Weekday Trip Comparisons

Table 2.2 shows that in all cases, 24-hour weekday vehicle trip rates were considerably below the ITE weighted average rate for similar uses. [The comparable ITE land use category for 16 of the 17 projects is Apartments (ITE Code 220). The average trip rate for apartments is 6.72 vehicle trips per dwelling unit on a weekday based on the experiences of 86 apartment projects across the United States (averaging 212 dwelling units in size). The best-fitting regression equation for apartments is:

$$T = 6.01(X) + 150.35 \ (R^2 = 0.88)$$

where T = Vehicle Trip Ends and X = Number of Dwelling Units. For the Wayside Commons projects, the corresponding ITE land-use category is Residential Condominium (ITE Code 230). The average trip rate for condominiums is 5.68 vehicle trips per dwelling unit on a weekday based on the experiences of 54 owner-occupied condominium and townhouse projects across the United States (averaging 183 dwelling units in size). The best-fitting regression equation for condominiums is:

$$\mathrm{Ln}(T) = 0.85(X) + 2.55 \ (R^2 = 0.83)$$

where

T = Vehicle Trip Ends,
X = Number of Dwelling Units, and
Ln = natural logarithm.

Taking the (unweighted) average across the 17 case-study projects, TOD-housing projects generated around 47% less vehicle traffic than that predicted by the ITE manual (3.55 trips per dwelling unit for TOD-housing versus 6.67 trips per dwelling unit by ITE estimates). This held true using both the weighted average ITE rate as well as the ITE rates predicted using the best fitting regression equations. Results were quite similar in both cases.

The biggest trip reduction effects were found in the Washington, D.C. metropolitan area. Among the five mid-to-high rise apartment projects near Metrorail stations outside the District of Columbia, vehicle trip generation rates were more than 60% below that predicted by the ITE manual. There, 24-hour vehicle trip rates ranged from a high of 4.72 trip ends per dwelling unit at the more suburban Avalon project near the Grosvenor Metrorail Station (and outside the beltway) to a low of around one vehicle weekday for every two dwelling units at the Meridian near Alexandria's Braddock Station. The comparatively low vehicle trip generation rates for TOD-housing near Washington Metrorail stations matches up with recent findings on high transit modal splits for a 2005 survey of 18 residential sites (WMATA, 2006). For projects within a quarter mile of a Metrorail station (which matched the locations of all five TOD housing projects studied in the Washington metropolitan area), on average 49% of residents used Metrorail for their commute or school trips. One of the projects surveyed, the Avalon apartments at Grosvenor Station, also was surveyed in the 2005 study. The Avalon, which had the highest trip generation rate among the five projects surveyed in the Washington area, had an impressively high work-and-school trip transit modal split in the 2005 survey: 54%.

It is important to realize that high transit ridership levels and significant trip reduction in metropolitan Washington is tied to the region's successful effort to create a network of

Table 2.2. Comparison of TOD housing and ITE vehicle trip generation rates: 24 hour estimates.

	TOD Veh. Trip Rate (24 hr.)	Average ITE Rate (24 Hours) ITE Rate (24 hr.)	TOD rate as % of ITE Rate (24 hr.)	% point difference from ITE Rate	Regression ITE Rate (24 Hours) ITE Rate (24 hr.)	TOD rate as % of ITE Rate (24 hr.)	% point difference from ITE Rate
Philadelphia/NE NJ							
Gaslight Commons	5.08	6.72	75.52%	-24.48%	6.76	75.05%	-24.95%
Station Square	4.76	6.72	70.81%	-29.19%	6.44	73.84%	-26.16%
Mean	4.92	--	73.17%	-26.83%	6.60	74.45%	-25.55%
Std. Dev.	0.22	--	3.33%	3.33%	0.22	0.86%	0.86%
Portland, Oregon							
Center Commons	4.79	6.72	71.30%	-28.70%	6.53	73.36%	-26.64%
Collins Circle	0.88	6.72	13.08%	-86.92%	7.22	12.17%	-87.83%
Gresham Central	5.91	6.72	87.95%	-12.05%	7.68	76.95%	-23.05%
The Merrick Apts.	2.01	6.72	29.84%	-70.16%	6.82	29.39%	-70.61%
Quatama Crossing	6.34	6.72	94.38%	-5.62%	6.22	101.95%	1.95%
Mean	3.99	--	59.31%	-40.69%	6.52	58.76%	-41.24%
Std. Dev.	2.42	--	36.05%	36.05%	0.62	36.88%	36.88%
San Francisco Bay Area							
Mission Wells	3.21	6.72	47.80%	-52.20%	6.39	50.23%	-49.77%
Montelena Homes	2.46	6.72	36.57%	-63.43%	6.81	36.09%	-63.91%
Park Regency	5.01	6.72	74.61%	-25.39%	6.19	81.04%	-18.96%
Verandas	3.10	6.72	46.17%	-53.83%	6.54	47.42%	-52.58%
Wayside Commons	3.26	5.86	55.68%	-44.32%	6.00	54.34%	-45.66%
Mean	3.41	--	52.17%	-47.83%	6.39	53.83%	-46.17%
Std. Dev.	0.95	--	14.27%	14.27%	0.31	16.66%	16.66%
Washington, D.C. Area							
Avalon	4.72	6.72	70.21%	-29.79%	6.31	74.75%	-25.25%
Gallery	3.04	6.72	45.25%	-54.75%	6.66	45.66%	-54.34%
Lennox	2.38	6.72	35.41%	-64.59%	6.38	37.29%	-62.71%
Meridian	0.55	6.72	8.24%	-91.76%	6.34	8.73%	-91.27%
Quincey	1.91	6.72	28.49%	-71.51%	6.31	30.34%	-69.66%
Mean	2.52	--	37.52%	-62.48%	6.40	39.35%	-60.65%
Std. Dev.	1.53	--	22.76%	22.76%	0.15	24.06%	24.06%
Unweighted Average	3.55	6.67	53.29%	-46.71%	6.59	53.92%	-46.08%

Note: Fitted Curve Equation for Apartments: T = 6.01(X) + 150.35, where T = average vehicle trip ends and X = number of dwelling units.
Fitted Curve Equation for Condominiums (Wayside Commons): Ln(T) = 0.85 Ln(X) + 2.55

TODs, as revealed by the Rosslyn-Ballston corridor (and discussed in detail in *TCRP Report 102: Transit Oriented Development in the United States: Experiences, Challenges, and Prospects*). Synergies clearly derive from having transit-oriented housing tied to transit-oriented employment and transit-oriented shopping.

After the Washington, D.C. area, TOD-housing in the Portland area tended to have the lowest weekday trip generation rates, on average, around 40% below that predicted by the ITE manual. The range of experiences, however, varied a lot, from a low of 0.88 weekday vehicle trips per dwelling unit for Collins Circle in downtown Portland to a high of 6.34 for more suburban Quantama Crossing (only slightly below the average rate from the ITE manual and a bit above the regression-generated estimate from the ITE manual).

Also among the surveyed Portland-area apartments, notable for its low trip generation rate, is The Merrick Apartments near the MAX light rail Convention Center station in the Lloyd District, across the river from downtown Portland: 2.01 weekday trips. Travel behavior of the residents of The Merrick apartments also was studied in 2005 (Dill, 2005). Based on a 43% response rate from 150 surveyed households at The Merrick apartments, trip generation estimates can be imputed from that survey. The 2005 survey asked: "In the past week (Saturday January 29 through Friday February 4), how many times did you go to the following place *from your home* in a vehicle, walking, bicycling, riding the bus, or riding MAX light rail? Each time you left your home during the week is a trip." From household responses, an average of 1.42 daily vehicle trips per dwelling from The Merrick apartments was made. Doubling this rate (assuming those who drove away each day also returned) yields an estimated daily rate of 2.84 vehicle trips per dwelling unit. This is a bit higher than that found in the tube count survey, but still substantially lower than the ITE rate. (Differences are likely due to several factors. These results are based on objective physical counts whereas the 2005 survey results were based on a sample of self-reported responses. Also, the 2005 study included weekend days whereas this study was based on middle-of-the-week experiences.) The 2005 survey also estimated that 18% of all trips made by residents of The Merrick apartments are by transit (both rail and bus). For work and school trips, transit's estimated modal split was 23%. A follow-up 2005 survey of The Merrick apartment residents further indicated that transit is the primary commute mode for 27.9% of residents (Dill, 2006).

Another study further sheds light on the results for one of Portland's surveyed apartments: Center Commons in east Portland. This study's survey found a weekday rate of 4.79 trips per dwelling unit for Center Commons, more than one-quarter below ITE's estimated rates for apartments. For a thesis prepared for the Master of Urban and Regional Planning degree at Portland State University, a mailback survey of 246 residents of Center Commons was conducted in 2002, producing a response rate of 39%. That survey found that 45.8% of responding residents of Center Commons takes MAX light rail or bus to work.

As with metropolitan Washington D.C., Portland's success at reducing automobile trips around transit-oriented housing cannot be divorced from the regional context. High ridership and reduced car travel at the surveyed housing projects stems from the successful integration of urban development and rail investments along the Gresham-downtown-westside axis. In Portland, as in Washington, TODs are not isolated islands but rather nodes along corridors of compact, mixed-use, walking friendly development.

The San Francisco Bay Area also averaged vehicle trip generation rates substantially below estimates by the ITE manual. Among the East Bay TOD-housing projects studied, Montelena Homes (formerly Archstone Barrington Hills) had the lowest weekday rate: 2.46 trip ends per dwelling unit, 63% below ITE's rate. A 2003 survey of residents of this project found very high transit usage among Montelena Homes residents: 55% stated they commute by transit (both rail and bus) (Lund, et al, 2004). The 2003 survey found the following commute-trip transit modal splits (compared to this research's recorded weekday trip rates): Wayside Commons: 56% (3.26 daily trips per dwelling unit); Verandas: 54% (3.1 daily trips per dwelling unit); Park Regency: 37% (5.01 daily trips per dwelling unit); and Mission Wells: 13% (3.21 daily trips per dwelling unit).

Lastly, the two apartment projects near suburban commuter rail stations outside Philadelphia and the Newark metropolitan area of northeast New Jersey averaged weekday vehicle trip generation rates roughly one-quarter less than the number predicted by the ITE manual. This is an appreciable difference given the relatively low-density settings of these projects and that commuter rail offers limited midday and late-night services.

AM Peak Comparisons

Table 2.3 compares recorded trip generation rates with those from the ITE manual for the AM Peak. In tabulating the results, the one-hour period in the AM peak with the highest tube count was treated as the AM peak. In most instances, this fell between the 7 AM and 9 AM period. In general, patterns were quite similar to those found for the 24-hour period. As before, the greatest differential between AM trip generation and ITE estimates were for TOD-housing closest to CBDs - notably, Collins Circle and The Merrick Apartments in the case of Portland, and the Meridian Apartments near the Braddock Metrorail station in Alexandria, Virgina.

PM Peak Comparisons

Table 2.4 shows the results for the PM peak. (The one-hour period in the PM peak with the highest tube count was treated as the PM peak. This generally occurred in the 4 PM to 7 PM period.) PM trip generation rates are generally higher than the morning peak since commuter traffic often intermixes with trips for shopping, socializing, recreation, and other activities. In general, PM trip generation rates for TOD-housing were closer to ITE predictions than the AM peak. Notable exceptions were the lowest trip generators. For example, the PM rates for Collins Circle and Meridian were 84.3% and 91.7% below ITE predictions, respectively. For the AM period, the differentials were 78.7% and 90.0%, respectively (from Table 2.3).

Weighted Average Comparisons

The summary results presented so far are based on unweighted averages, that is, each project is treated as a data point in computing averages regardless of project size. The ITE manual, however, presents weighted averages of trip generation by summing all trip ends among cases and dividing by the sum of dwelling units. Thus for apple to apple comparisons, weighted average vehicle trip rates were computed for all

Table 2.3. Comparison of TOD housing and ITE vehicle trip generation rates: AM peak estimates.

		Average Rate			Regression Rate		
	Veh. Trip Rate (AM peak hr.)	ITE Rate (AM peak hr.)	TOD rate as % of ITE Rate (AM pk hr.)	% Below ITE Rate	ITE Rate (AM peak hr.)	TOD rate as % of ITE Rate (AM pk hr.)	% Below ITE Rate
Philadelphia/NE NJ							
Gaslight Commons	0.40	0.55	72.73%	-27.27%	0.55	72.59%	-27.41%
Station Square	0.36	0.55	66.21%	-33.79%	0.54	67.17%	-32.83%
Mean	0.38	--	69.47%	-30.53%	--	69.88%	-30.12%
Std. Dev.	0.03	--	4.61%	4.61%	--	3.83%	3.83%
Portland, Oregon							
Center Commons	0.25	0.55	45.45%	-54.55%	0.54	45.90%	-54.10%
Collins Circle	0.12	0.55	21.26%	-78.74%	0.56	20.74%	-79.26%
Gresham Central	0.59	0.55	107.07%	7.07%	0.58	102.10%	2.10%
The Merrick Apts.	0.13	0.55	23.10%	-76.90%	0.55	22.98%	-77.02%
Quatama Crossing	0.30	0.55	54.98%	-45.02%	0.54	56.42%	-43.58%
Mean	0.28	--	50.37%	-49.63%	--	39.70%	-60.30%
Std. Dev.	0.19	--	34.83%	34.83%	--	23.65%	23.65%
San Francisco Bay Area							
Mission Wells	0.48	0.55	86.72%	-13.28%	0.54	88.20%	-11.80%
Montelena Homes	0.17	0.55	31.43%	-68.57%	0.55	31.30%	-68.70%
Park Regency	0.34	0.55	61.85%	-38.15%	0.53	63.59%	-36.41%
Verandas	0.19	0.55	35.14%	-64.86%	0.54	35.47%	-64.53%
Wayside Commons	0.21	0.44	47.35%	-52.65%	0.62	33.50%	-66.50%
Mean	0.28	--	52.50%	-47.50%	--	50.41%	-49.59%
Std. Dev.	0.13	--	22.53%	22.53%	--	24.88%	24.88%
Washington							
Avalon	0.44	0.55	80.30%	-19.70%	0.54	82.02%	-17.98%
Gallery	0.25	0.55	44.86%	-55.14%	0.55	45.01%	-54.99%
Lennox	0.18	0.55	32.47%	-67.53%	0.54	33.05%	-66.95%
Meridian	0.05	0.55	9.95%	-90.05%	0.54	10.15%	-89.85%
Quincey	0.18	0.55	32.91%	-67.09%	0.54	33.62%	-66.38%
Mean	0.22	--	40.10%	-59.90%	--	21.88%	-78.12%
Std. Dev.	0.14	--	25.78%	25.78%	--	16.60%	16.60%
Unweighted Average	0.28	0.54	51.30%	-48.70%	0.55	50.64%	-49.36%

Note: Fitted Curve Equation for Apartments: T = 0.53(X) + 4.21 where T = average vehicle trip ends and X = number of dwelling units.
Fitted Curve Equation for Condominium (Wayside Commons): Ln(T) = 0.82 Ln(X) + 0.17

17 projects combined for weekday, AM peak, and PM peak. (As done in the ITE manual, the weighted average was computed by summing all trip ends among the 17 projects and dividing by the sum of dwelling units.) Figure 2.6 summarizes the results. Over a typical weekday period, the 17 surveyed TOD-housing projects averaged 44% fewer vehicle trips than estimated by the ITE manual (3.754 versus 6.715). The weighted average differentials were even larger during peak periods: 49% lower rates during the AM peak and 48% lower rates during the PM peak. To the degree that impact fees are based on peak travel conditions, one can infer that traffic impacts studies might end up overstating the potential congestion-inducing effects of TOD-housing in large rail-served metropolitan areas, such as Washington, D.C., by as much as 50%.

Scatterplots

The ITE *Trip Generation* manual reports summary findings in a scatterplot form, with summary best-fitting regression equations. Figures 2.7 through 2.9 show the best-fitting plots for the average weekday, AM peak, and PM peak periods, respectively. Linear plots fit the data points reasonably well, explaining over two-thirds of the variation in vehicle trip ends. The Merrick Apartments in Portland stands as an outlier, producing far fewer vehicle trip ends relative to its project size

Table 2.4. Comparison of TOD housing and ITE vehicle trip generation rates: PM peak estimates.

		Average Rate			Regression Rate		
	Veh. Trip Rate (PM peak hr.)	ITE Rate (PM peak hr.)	TOD rate as % of ITE Rate (PM pk hr.)	% Below ITE Rate	ITE Rate (PM peak hr.)	TOD rate as % of ITE Rate (PM pk hr.)	% Below ITE Rate
Philadelphia/NE NJ							
Gaslight Commons	0.460	0.67	68.66%	-31.34%	0.688	66.90%	-33.10%
Station Square	0.558	0.67	83.25%	-16.75%	0.651	85.73%	-14.27%
Mean	0.51	--	75.96%	-24.04%	0.67	76.32%	-23.68%
Std. Dev.	0.07	--	10.32%	10.32%	0.03	13.32%	13.32%
Portland, Oregon							
Center Commons	0.380	0.67	56.75%	-43.25%	0.661	57.53%	-42.47%
Collins Circle	0.105	0.67	15.65%	-84.35%	0.741	14.14%	-85.86%
Gresham Central	0.461	0.67	68.82%	-31.18%	0.795	58.03%	-41.97%
The Merrick Apts.	0.170	0.67	25.41%	-74.59%	0.695	24.51%	-75.49%
Quatama Crossing	0.487	0.67	72.63%	-27.37%	0.625	77.91%	-22.09%
Mean	0.32	--	47.85%	-52.15%	0.70	46.42%	-53.58%
Std. Dev.	0.17	--	25.85%	25.85%	0.07	26.32%	26.32%
San Francisco Bay Area							
Mission Wells	0.487	0.67	72.72%	-27.28%	0.645	75.56%	-24.44%
Montelena Homes	0.202	0.67	30.17%	-69.83%	0.693	29.16%	-70.84%
Park Regency	0.435	0.67	64.93%	-35.07%	0.621	70.10%	-29.90%
Verandas	0.367	0.67	54.78%	-45.22%	0.662	55.43%	-44.57%
Wayside Commons	0.337	0.52	64.72%	-35.28%	0.586	57.47%	-42.53%
Mean	0.37	--	57.46%	-42.54%	0.64	57.55%	-42.45%
Std. Dev.	0.11	--	16.53%	16.53%	0.04	17.98%	17.98%
Washington							
Avalon	0.370	0.67	55.26%	-44.74%	0.635	58.28%	-41.72%
Gallery	0.234	0.67	34.89%	-65.11%	0.676	34.59%	-65.41%
Lennox	0.220	0.67	32.90%	-67.10%	0.643	34.28%	-65.72%
Meridian	0.056	0.67	8.33%	-91.67%	0.638	8.74%	-91.26%
Quincey	0.201	0.67	30.06%	-69.94%	0.635	31.71%	-68.29%
Mean	0.22	--	32.29%	-67.71%	0.65	33.52%	-66.48%
Std. Dev.	0.11	--	16.69%	16.69%	0.02	17.55%	17.55%
Unweighted Average	0.391	0.661	62.10%	-37.90%	0.664	49.42%	-50.58%

Note: Fitted Curve Equation for Apartments: T = 0.60(X) + 17.52 where T = average vehicle trip ends and X = number of dwelling units
Fitted Curve Equation for Condominium (Wayside Commons): T = 0.34(X) + 38.17

than the other TOD-housing projects. Omitting this single case improved the regression fits considerably, with respective R-square values of 0.829, 0.800, and 0.847 for the weekday, AM peak, and PM peak.

Using the average weekday best-fitting regression equation in Figure 2.8, the estimated number of daily vehicle trips generated by a 400-unit apartment project is 1,508.3 [−523.7 + (5.26 * 400) = 1,508.3]. For the same apartment land-use category (ITE code of 220), the latest *ITE Trip Generation Manual* would predict 2,554.35 daily vehicle trips for the same 400-unit apartment [150.35 + (6.01 * 400) = 2,554.35]. Based on the empirical experiences of the sampled projects, the ITE regression equation for apartments overstates traffic impacts of transit-oriented housing by 39%.

How Do Rates Vary?

To better understand the nature of vehicle trip generation for TOD housing projects, additional analyses that explored associations between trip generation and various explanatory variables were carried out. For ratio-scale variables, scatterplots and bivariate regression equations were estimated. Such analyses treat every observation the same, thus the cases are unweighted. For those analyses with reasonably good statistical

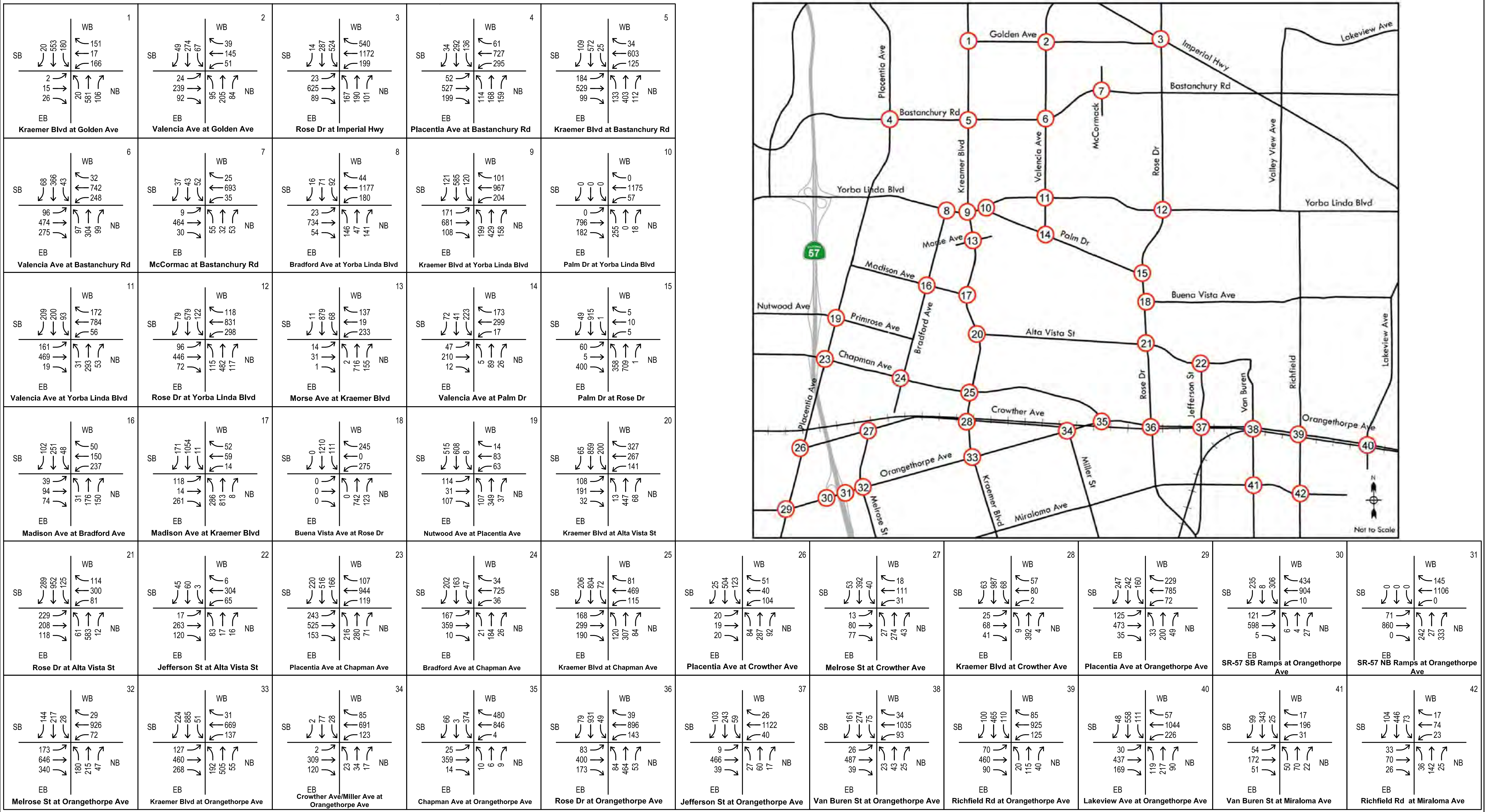
APPENDIX B

Intersection Turning Movement Counts

APPENDIX B-1

City Provided Traffic Counts from
Draft General Plan Update

Existing Year 2016 Peak Hour Volumes



J:\2012\JB13154 PL GenPlan Update\Analysis\Figures\TIAH

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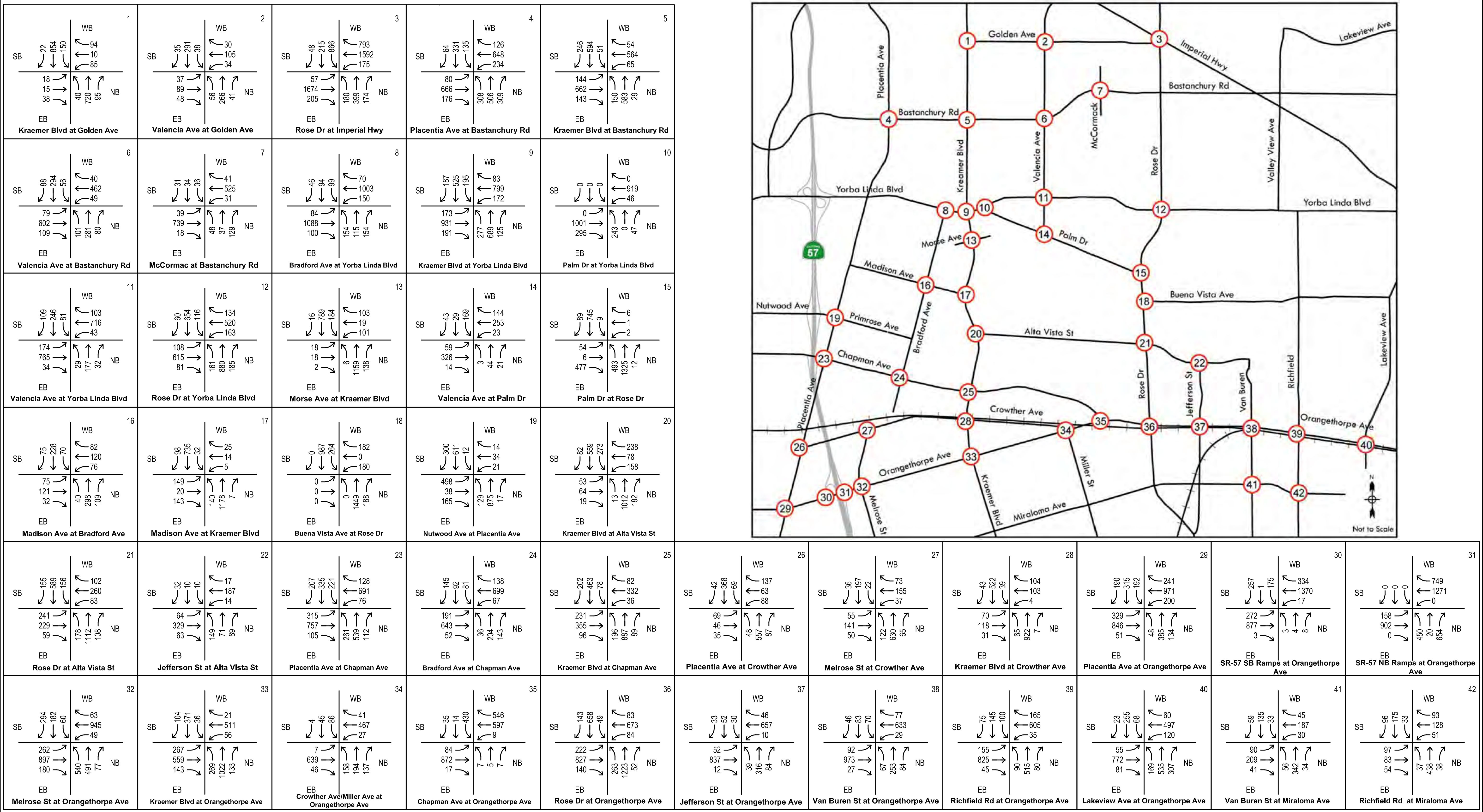
City of Placentia

General Plan Update

Figure 4-3

Existing AM Peak Hour Volumes



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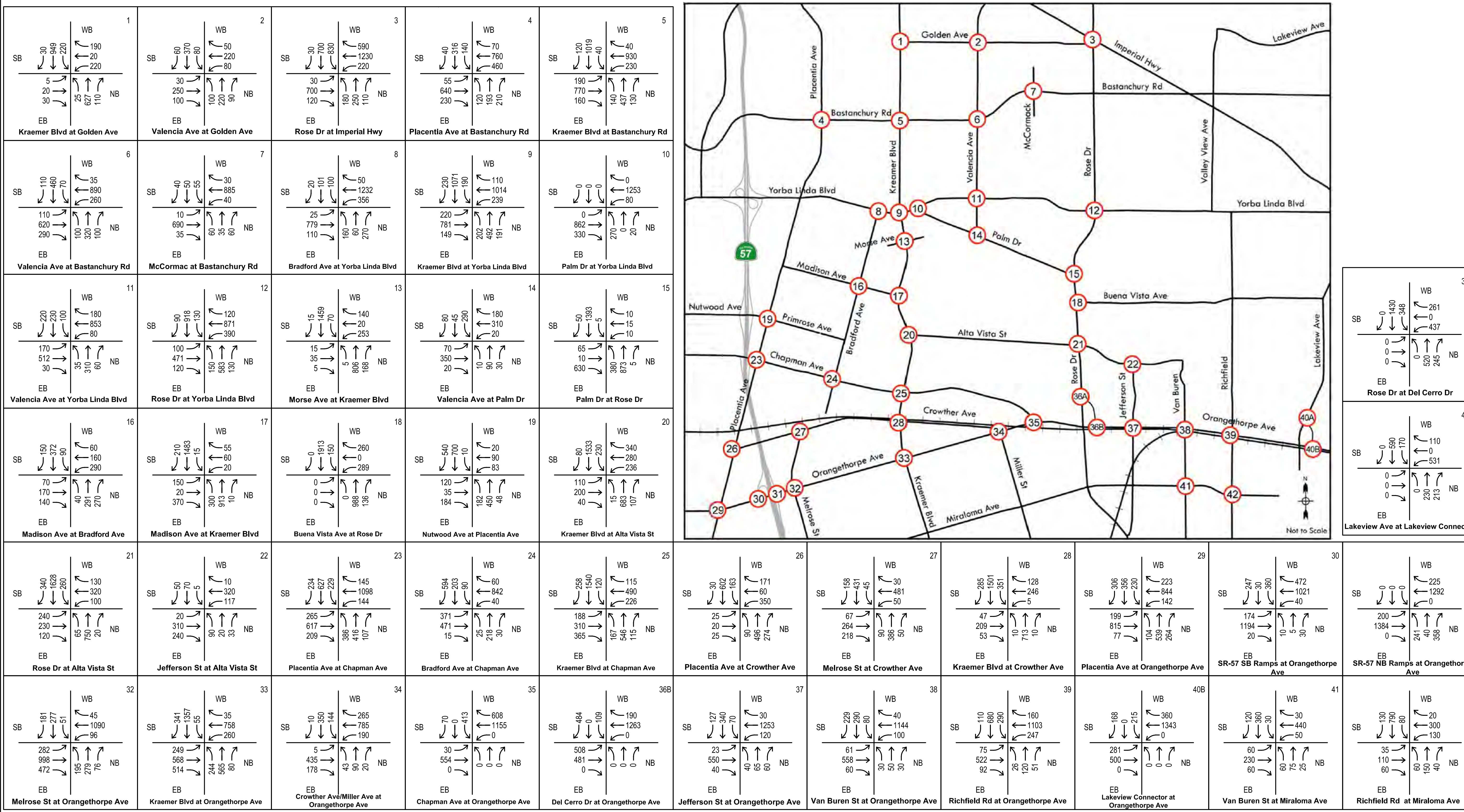
City of Placentia | Figure 4-4
General Plan Update | Existing PM Peak Hour Volumes

Proposed Year 2035 Peak Hour Volumes



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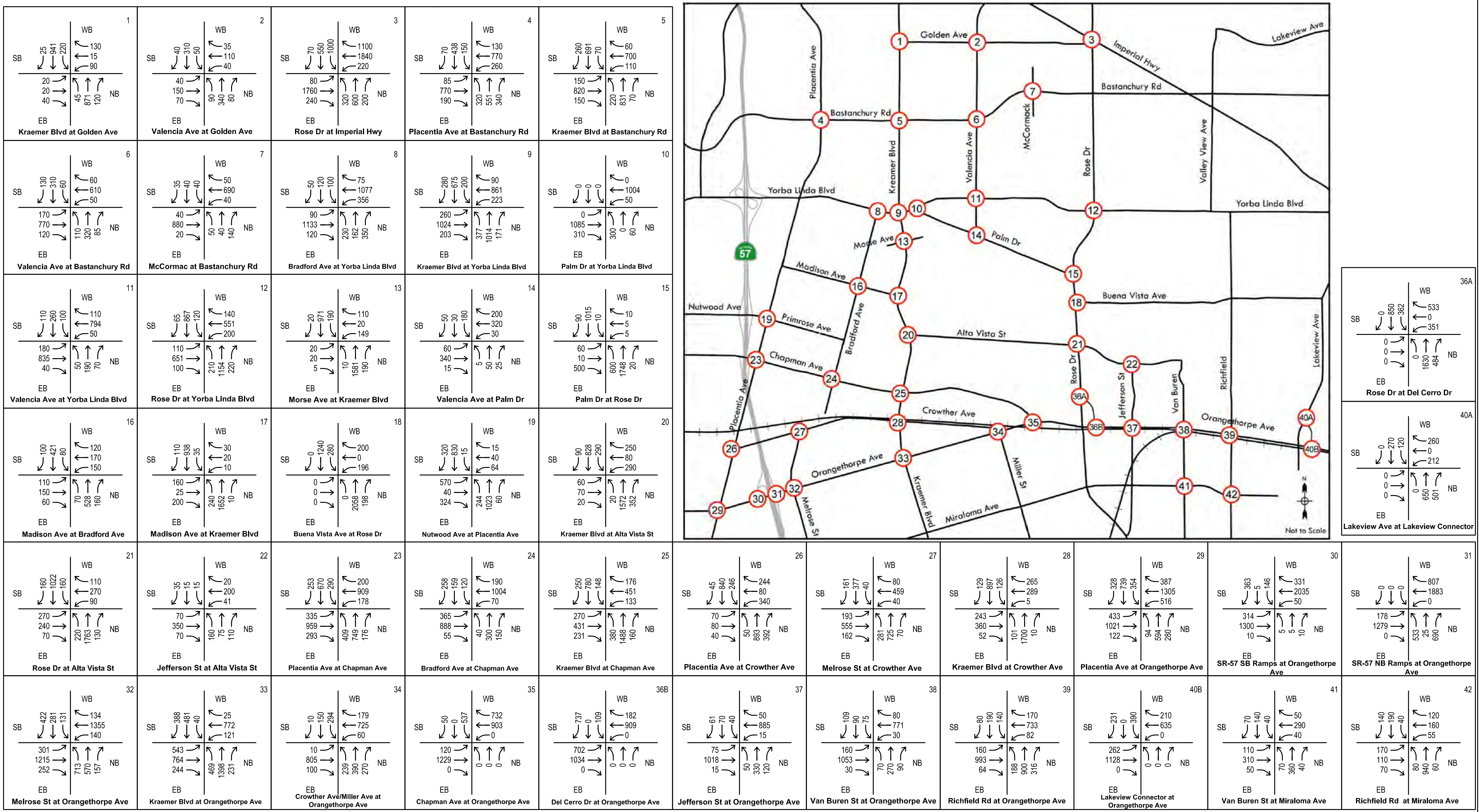
City of Placentia

General Plan Update

Figure 5-5

Proposed General Plan AM Peak Hour Volumes



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City of Placentia | Figure 5-6

General Plan Update | Proposed General Plan PM Peak Hour Volumes

APPENDIX B-2

New Traffic Counts
at Remaining Locations

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	SR-57 SB Ramps	LOCATION #:	6
	EAST & WEST:	Chapman	CONTROL:	SIGNAL

NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W E ►
S ▼

Add U-Turns to Left Turns

	NORTHBOUND SR-57 SB Ramps			SOUTHBOUND SR-57 SB Ramps			EASTBOUND Chapman			WESTBOUND Chapman				U-TURNS				
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
LANES:	X	X	X	0.5	0.5	1	X	3	0	1	2	X		0	0	0	0	
AM 7:00 AM	0	0	0	6	35	19	0	123	149	102	288	0	722	0	0	0	0	0
7:15 AM	0	0	0	20	18	17	0	151	140	87	335	0	768	0	0	0	0	0
7:30 AM	0	0	0	24	15	28	0	141	171	85	382	0	846	0	0	0	0	0
7:45 AM	0	0	0	16	8	35	0	116	129	67	474	0	845	0	0	0	0	0
8:00 AM	0	0	0	5	10	32	0	123	130	67	487	0	854	0	0	0	0	0
8:15 AM	0	0	0	16	15	44	0	132	123	87	456	0	873	0	0	0	0	0
8:30 AM	0	0	0	9	4	25	0	158	153	66	335	0	750	0	0	0	0	0
8:45 AM	0	0	0	16	7	26	0	116	111	46	284	0	606	0	0	0	0	0
VOLUMES	0	0	0	112	112	226	0	1,060	1,106	607	3,041	0	6,264	0	0	0	0	0
APPROACH %	0%	0%	0%	25%	25%	50%	0%	49%	51%	17%	83%	0%						
APP/DEPART	0	/	0	450	/	1,825	2,166	/	1,172	3,648	/	3,267	0					
BEGIN PEAK HR		7:30 AM																
VOLUMES	0	0	0	61	48	139	0	512	553	306	1,799	0	3,418					
APPROACH %	0%	0%	0%	25%	19%	56%	0%	48%	52%	15%	85%	0%						
PEAK HR FACTOR		0.000			0.827			0.853			0.950		0.979					
APP/DEPART	0	/	0	248	/	907	1,065	/	573	2,105	/	1,938	0					
PM 4:00 PM	0	0	0	19	44	33	0	229	172	65	350	0	912	0	0	0	0	0
4:15 PM	0	0	0	17	22	35	0	190	148	52	374	0	838	0	0	0	0	0
4:30 PM	0	0	0	17	2	32	0	216	133	57	371	0	828	0	0	0	2	2
4:45 PM	0	0	0	25	4	34	0	209	106	44	433	0	855	0	0	0	0	0
5:00 PM	0	0	0	25	16	44	0	212	135	43	449	0	924	0	0	0	0	0
5:15 PM	0	0	0	27	40	60	0	211	179	35	420	0	972	0	0	0	1	1
5:30 PM	0	0	0	34	30	55	0	221	142	43	422	0	947	0	0	0	0	0
5:45 PM	0	0	0	30	9	45	0	245	127	42	392	0	890	0	0	0	0	0
VOLUMES	0	0	0	194	167	338	0	1,733	1,142	381	3,211	0	7,166	0	0	0	3	3
APPROACH %	0%	0%	0%	28%	24%	48%	0%	60%	40%	11%	89%	0%						
APP/DEPART	0	/	0	699	/	1,687	2,875	/	1,930	3,592	/	3,549	0					
BEGIN PEAK HR		5:00 PM																
VOLUMES	0	0	0	116	95	204	0	889	583	163	1,683	0	3,733					
APPROACH %	0%	0%	0%	28%	23%	49%	0%	60%	40%	9%	91%	0%						
PEAK HR FACTOR		0.000			0.817			0.944			0.938		0.960					
APP/DEPART	0	/	0	415	/	840	1,472	/	1,006	1,846	/	1,887	0					

SR-57 SB Ramps

← NORTH SIDE →

Chapman WEST SIDE EAST SIDE **Chapman**

← SOUTH SIDE →

SR-57 SB Ramps

	PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0
7:15 AM	2	2	0	0	4	2	2	0	0	4	0	0	0	0	0
7:30 AM	3	0	0	0	3	2	0	0	0	2	1	0	0	0	1
7:45 AM	3	8	0	0	11	0	0	0	0	0	3	8	0	0	11
8:00 AM	3	2	0	0	5	2	2	0	0	4	1	0	0	0	1
8:15 AM	10	5	0	0	15	4	2	0	0	6	6	3	0	0	9
8:30 AM	4	1	0	0	5	3	1	0	0	4	1	0	0	0	1
8:45 AM	4	2	0	0	6	2	2	0	0	4	2	0	0	0	2
TOTAL	30	20	0	0	50	16	9	0	0	25	14	11	0	0	25
PM 4:00 PM	3	1	0	0	4	0	0	0	0	0	3	1	0	0	4
4:15 PM	2	0	0	0	2	2	0	0	0	2	0	0	0	0	0
4:30 PM	2	2	0	0	4	1	0	0	0	1	1	2	0	0	3
4:45 PM	3	4	0	0	7	2	1	0	0	3	1	3	0	0	4
5:00 PM	3	11	0	0	14	0	9	0	0	9	3	2	0	0	5
5:15 PM	3	4	0	0	7	0	1	0	0	1	3	3	0	0	6
5:30 PM	0	5	0	0	5	0	3	0	0	3	0	2	0	0	2
5:45 PM	1	3	0	0	4	1	0	0	0	1	0	3	0	0	3
TOTAL	17	30	0	0	47	6	14	0	0	20	11	16	0	0	27

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

SR-57 SB Ramps (north leg)

TOTAL	**1,149**	**564**	**279**	**306**
PM	**699**	338	167	194
AM	**450**	226	112	112

TOTAL	**0**
PM	0
AM	0

Chapman (east leg)

AM	**3,648**	0	3,041	607
PM	**3,592**	0	3,211	381
TOTAL	**7,240**	**0**	**6,252**	**988**

AM	1,172
PM	1,930
TOTAL	**3,102**

Chapman (west leg)

TOTAL	**6,816**
PM	3,549
AM	3,267

TOTAL	**0**	**2,793**	**2,248**	**5,041**
PM	0	1,733	1,142	**2,875**
AM	0	1,060	1,106	**2,166**

SR-57 SB Ramps (south leg)

AM	1,825
PM	1,687
TOTAL	**3,512**

AM	0	0	0	**0**
PM	0	0	0	**0**
TOTAL	**0**	**0**	**0**	**0**

PEAK HOUR

AM 7:30 AM

PM 5:00 PM

SR-57 SB Ramps (north leg)

TOTAL	**663**	**343**	**143**	**177**
PM	**415**	204	95	116
AM	**248**	139	48	61

TOTAL	**0**
PM	0
AM	0

Chapman (east leg)

AM	**2,105**	0	1,799	306
PM	**1,846**	0	1,683	163
TOTAL	**3,951**	**0**	**3,482**	**469**

AM	573
PM	1,006
TOTAL	**1,579**

Chapman (west leg)

TOTAL	**3,825**
PM	1,887
AM	1,938

TOTAL	**0**	**1,401**	**1,136**	**2,537**
PM	0	889	583	**1,472**
AM	0	512	553	**1,065**

SR-57 SB Ramps (south leg)

AM	907
PM	840
Total	**1,747**

AM	0	0	0	**0**
PM	0	0	0	**0**
Total	**0**	**0**	**0**	**0**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	SR-57 NB Ramps	LOCATION #:	7
	EAST & WEST:	Chapman	CONTROL:	SIGNAL

NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W
E ►
S ▼

Add U-Turns to Left Turns

	NORTHBOUND SR-57 NB Ramps			SOUTHBOUND SR-57 NB Ramps			EASTBOUND Chapman			WESTBOUND Chapman				U-TURNS				
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
LANES:	1.5	X	1.5	X	X	X	1	2	X	X	2	0		0	0	0	0	
AM 7:00 AM	154	0	59	0	0	0	23	110	0	0	218	18	582	0	0	0	0	0
7:15 AM	175	0	83	0	0	0	38	137	0	0	250	34	717	0	0	0	0	0
7:30 AM	226	0	97	0	0	0	28	129	0	0	231	36	747	0	0	0	0	0
7:45 AM	246	0	60	0	0	0	27	116	0	0	295	41	785	0	0	0	0	0
8:00 AM	245	0	42	0	0	0	27	108	0	0	313	26	761	0	0	0	0	0
8:15 AM	247	0	45	0	0	0	24	115	0	0	297	21	749	0	0	0	0	0
8:30 AM	198	0	76	0	0	0	30	155	0	0	226	30	715	0	0	0	0	0
8:45 AM	157	0	50	0	0	0	38	103	0	0	203	30	581	0	0	0	0	0
VOLUMES	1,648	0	512	0	0	0	235	973	0	0	2,033	236	5,637	0	0	0	0	0
APPROACH %	76%	0%	24%	0%	0%	0%	19%	81%	0%	0%	90%	10%						
APP/DEPART	2,160	/	471	0	/	0	1,208	/	1,485	2,269	/	3,681	0					
BEGIN PEAK HR	7:30 AM																	
VOLUMES	964	0	244	0	0	0	106	468	0	0	1,136	124	3,042					
APPROACH %	80%	0%	20%	0%	0%	0%	18%	82%	0%	0%	90%	10%						
PEAK HR FACTOR		0.935			0.000			0.914			0.929		0.969					
APP/DEPART	1,208	/	230	0	/	0	574	/	712	1,260	/	2,100	0					
PM 4:00 PM	156	0	105	0	0	0	39	190	0	0	249	47	786	0	0	0	0	0
4:15 PM	184	0	88	0	0	0	28	198	0	0	258	45	801	0	0	0	0	0
4:30 PM	154	0	83	0	0	0	29	184	0	0	254	43	747	0	0	0	0	0
4:45 PM	209	0	98	0	0	0	26	207	0	0	265	44	849	0	0	0	0	0
5:00 PM	228	0	106	0	0	0	33	201	0	0	270	55	893	0	0	0	0	0
5:15 PM	196	0	98	0	0	0	36	194	0	0	260	50	834	0	0	0	0	0
5:30 PM	212	0	111	0	0	0	40	206	0	0	253	52	874	0	0	0	0	0
5:45 PM	181	0	92	0	0	0	44	229	0	0	254	56	856	0	0	0	0	0
VOLUMES	1,520	0	781	0	0	0	275	1,609	0	0	2,063	392	6,640	0	0	0	0	0
APPROACH %	66%	0%	34%	0%	0%	0%	15%	85%	0%	0%	84%	16%						
APP/DEPART	2,301	/	667	0	/	0	1,884	/	2,390	2,455	/	3,583	0					
BEGIN PEAK HR	5:00 PM																	
VOLUMES	817	0	407	0	0	0	153	830	0	0	1,037	213	3,457					
APPROACH %	67%	0%	33%	0%	0%	0%	16%	84%	0%	0%	83%	17%						
PEAK HR FACTOR		0.916			0.000			0.900			0.962		0.968					
APP/DEPART	1,224	/	366	0	/	0	983	/	1,237	1,250	/	1,854	0					

SR-57 NB Ramps

← NORTH SIDE →

Chapman WEST SIDE EAST SIDE **Chapman**

← SOUTH SIDE →

SR-57 NB Ramps

PEDESTRIAN + BIKE CROSSINGS

	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL
AM 7:00 AM	1	1	0	0	2
7:15 AM	4	3	0	0	7
7:30 AM	4	5	0	0	9
7:45 AM	3	10	0	0	13
8:00 AM	2	3	0	0	5
8:15 AM	10	6	0	0	16
8:30 AM	3	2	0	0	5
8:45 AM	5	4	0	0	9
TOTAL	32	34	0	0	66
PM 4:00 PM	2	1	0	0	3
4:15 PM	2	1	0	0	3
4:30 PM	3	3	0	0	6
4:45 PM	2	5	0	0	7
5:00 PM	4	7	0	0	11
5:15 PM	3	5	0	0	8
5:30 PM	1	8	0	0	9
5:45 PM	1	1	0	0	2
TOTAL	18	31	0	0	49

PEDESTRIAN CROSSINGS

	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL
AM 7:00 AM	1	0	0	0	1
7:15 AM	4	2	0	0	6
7:30 AM	2	5	0	0	7
7:45 AM	0	4	0	0	4
8:00 AM	1	3	0	0	4
8:15 AM	5	2	0	0	7
8:30 AM	1	2	0	0	3
8:45 AM	3	3	0	0	6
TOTAL	17	21	0	0	38
PM 4:00 PM	0	0	0	0	0
4:15 PM	1	0	0	0	1
4:30 PM	2	0	0	0	2
4:45 PM	1	0	0	0	1
5:00 PM	1	5	0	0	6
5:15 PM	0	1	0	0	1
5:30 PM	1	4	0	0	5
5:45 PM	1	0	0	0	1
TOTAL	7	10	0	0	17

BICYCLE CROSSINGS

	NS	SS	ES	WS	TOTAL
AM 7:00 AM	0	1	0	0	1
7:15 AM	0	1	0	0	1
7:30 AM	2	0	0	0	2
7:45 AM	3	6	0	0	9
8:00 AM	1	0	0	0	1
8:15 AM	5	4	0	0	9
8:30 AM	2	0	0	0	2
8:45 AM	2	1	0	0	3
TOTAL	15	13	0	0	28
PM 4:00 PM	2	1	0	0	3
4:15 PM	1	1	0	0	2
4:30 PM	1	3	0	0	4
4:45 PM	1	5	0	0	6
5:00 PM	3	2	0	0	5
5:15 PM	3	4	0	0	7
5:30 PM	0	4	0	0	4
5:45 PM	0	1	0	0	1
TOTAL	11	21	0	0	32

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

SR-57 NB Ramps (north leg)

TOTAL	**0**	**0**	**0**	**0**	**1,138**
PM	**0**	0	0	0	667
AM	**0**	0	0	0	471

Chapman (west leg)

TOTAL	**7,264**	**510**	**2,582**	**0**	**3,092**
PM	3,583	275	1,609	0	**1,884**
AM	3,681	235	973	0	**1,208**

Chapman (east leg)

AM	**2,269**	236	2,033	0	1,485
PM	**2,455**	392	2,063	0	2,390
TOTAL	**4,724**	**628**	**4,096**	**0**	**3,875**

SR-57 NB Ramps (south leg)

AM	0	1,648	0	512	**2,160**
PM	0	1,520	0	781	**2,301**
TOTAL	**0**	**3,168**	**0**	**1,293**	**4,461**

PEAK HOUR

AM 7:30 AM

PM 5:00 PM

SR-57 NB Ramps (north leg)

TOTAL	**0**	**0**	**0**	**0**	**596**
PM	**0**	0	0	0	366
AM	**0**	0	0	0	230

Chapman (west leg)

TOTAL	**3,954**	**259**	**1,298**	**0**	**1,557**
PM	1,854	153	830	0	**983**
AM	2,100	106	468	0	**574**

Chapman (east leg)

AM	**1,260**	124	1,136	0	712
PM	**1,250**	213	1,037	0	1,237
TOTAL	**2,510**	**337**	**2,173**	**0**	**1,949**

SR-57 NB Ramps (south leg)

AM	0	964	0	244	**1,208**
PM	0	817	0	407	**1,224**
Total	**0**	**1,781**	**0**	**651**	**2,432**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	Placentia	LOCATION #:	8
	EAST & WEST:	Chapman	CONTROL:	SIGNAL

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N ◄ W E ► S ▼

☑ Add U-Turns to Left Turns

		NORTHBOUND Placentia			SOUTHBOUND Placentia			EASTBOUND Chapman			WESTBOUND Chapman				U-TURNS				
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
	LANES:	2	2	0	1	2	0	2	2	1	1	2	1		0	0	0	0	
AM	7:00 AM	61	50	10	19	152	45	26	105	46	18	139	15	686	0	0	2	0	2
AM	7:15 AM	62	64	12	36	142	37	34	115	55	15	174	13	759	1	0	7	0	8
AM	7:30 AM	66	128	32	42	186	39	49	123	54	26	184	8	937	0	0	2	0	2
AM	7:45 AM	86	78	13	36	176	45	28	106	40	23	197	12	840	0	0	2	0	2
AM	8:00 AM	91	104	13	24	149	61	24	98	35	37	188	8	832	0	0	0	0	0
AM	8:15 AM	97	105	11	36	132	46	34	101	25	18	158	21	784	0	0	0	0	0
AM	8:30 AM	73	79	6	28	106	44	48	119	51	18	129	18	719	0	0	5	0	5
AM	8:45 AM	55	58	13	23	98	30	26	93	32	24	126	23	601	0	0	4	1	5
AM	VOLUMES	591	666	110	244	1,141	347	269	860	338	179	1,295	118	6,158	1	0	22	1	24
AM	APPROACH %	43%	49%	8%	14%	66%	20%	18%	59%	23%	11%	81%	7%						
AM	APP/DEPART	1,367	/	1,031	1,732	/	1,658	1,467	/	1,215	1,592	/	2,254	0					
AM	BEGIN PEAK HR		7:30 AM																
AM	VOLUMES	340	415	69	138	643	191	135	428	154	104	727	49	3,393					
AM	APPROACH %	41%	50%	8%	14%	66%	20%	19%	60%	21%	12%	83%	6%						
AM	PEAK HR FACTOR		0.912			0.910			0.793			0.944		0.905					
AM	APP/DEPART	824	/	595	972	/	901	717	/	635	880	/	1,262	0					
PM	4:00 PM	113	153	22	54	130	52	65	168	49	25	143	21	995	0	0	5	0	5
PM	4:15 PM	80	143	31	49	131	53	67	180	47	13	158	32	984	0	0	6	0	6
PM	4:30 PM	114	153	21	46	121	55	50	177	31	36	130	32	966	0	0	5	1	6
PM	4:45 PM	113	147	32	45	110	58	71	189	40	22	140	28	995	0	0	1	1	2
PM	5:00 PM	130	165	20	42	85	50	54	206	38	24	133	27	974	0	0	6	0	6
PM	5:15 PM	131	186	21	58	112	42	73	176	51	15	124	25	1,014	0	0	3	0	3
PM	5:30 PM	120	171	17	54	130	43	62	230	43	19	137	36	1,062	0	0	4	1	5
PM	5:45 PM	104	163	22	49	111	65	70	208	38	24	122	18	994	0	0	5	0	5
PM	VOLUMES	905	1,281	186	397	930	418	512	1,534	337	178	1,087	219	7,984	0	0	35	3	38
PM	APPROACH %	38%	54%	8%	23%	53%	24%	21%	64%	14%	12%	73%	15%						
PM	APP/DEPART	2,372	/	1,977	1,745	/	1,442	2,383	/	2,120	1,484	/	2,445	0					
PM	BEGIN PEAK HR		4:45 PM																
PM	VOLUMES	494	669	90	199	437	193	260	801	172	80	534	116	4,045					
PM	APPROACH %	39%	53%	7%	24%	53%	23%	21%	65%	14%	11%	73%	16%						
PM	PEAK HR FACTOR		0.927			0.913			0.920			0.951		0.952					
PM	APP/DEPART	1,253	/	1,031	829	/	687	1,233	/	1,092	730	/	1,235	0					

Placentia

← NORTH SIDE →

Chapman WEST SIDE EAST SIDE **Chapman**

← SOUTH SIDE →

Placentia

		PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
		N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM	7:00 AM	2	1	4	2	9	2	1	4	1	8	0	0	0	1	1
AM	7:15 AM	1	2	3	2	8	1	2	3	1	7	0	0	0	1	1
AM	7:30 AM	5	6	8	1	20	2	6	4	1	13	3	0	4	0	7
AM	7:45 AM	1	9	4	4	18	0	2	1	2	5	1	7	3	2	13
AM	8:00 AM	2	4	9	4	19	0	3	4	2	9	2	1	5	2	10
AM	8:15 AM	6	6	6	5	23	1	4	3	4	12	5	2	3	1	11
AM	8:30 AM	2	7	5	2	16	1	7	4	2	14	1	0	1	0	2
AM	8:45 AM	1	3	4	3	11	0	3	3	2	8	1	0	1	1	3
AM	TOTAL	20	38	43	23	124	7	28	26	15	76	13	10	17	8	48
PM	4:00 PM	2	4	3	4	13	0	3	2	2	7	2	1	1	2	6
PM	4:15 PM	3	4	2	2	11	3	3	2	1	9	0	1	0	1	2
PM	4:30 PM	3	2	3	0	8	2	1	2	0	5	1	1	1	0	3
PM	4:45 PM	2	9	12	2	25	1	8	9	1	19	1	1	3	1	6
PM	5:00 PM	8	13	11	1	33	6	11	5	0	22	2	2	6	1	11
PM	5:15 PM	2	5	6	3	16	0	2	3	1	6	2	3	3	2	10
PM	5:30 PM	3	10	5	1	19	2	7	3	0	12	1	3	2	1	7
PM	5:45 PM	5	1	7	0	13	5	1	5	0	11	0	0	2	0	2
PM	TOTAL	28	48	49	13	138	19	36	31	5	91	9	12	18	8	47

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia / SC0856 / ALL HOURS

Placentia (north leg)

	Total			
TOTAL	3,477	765	2,071	641
PM	1,745	418	930	397
AM	1,732	347	1,141	244

	Departing
TOTAL	3,008
PM	1,977
AM	1,031

Chapman (west leg)

	Departing
TOTAL	4,699
PM	2,445
AM	2,254

				Total
TOTAL	781	2,394	675	3,850
PM	512	1,534	337	2,383
AM	269	860	338	1,467

Chapman (east leg)

	Total			
AM	1,592	118	1,295	179
PM	1,484	219	1,087	178
TOTAL	3,076	337	2,382	357

	Departing
AM	1,215
PM	2,120
TOTAL	3,335

Placentia (south leg)

	Departing
AM	1,658
PM	1,442
TOTAL	3,100

				Total
AM	591	666	110	1,367
PM	905	1,281	186	2,372
TOTAL	1,496	1,947	296	3,739

Placentia / PEAK HOUR

AM 7:30 AM

PM 4:45 PM

Placentia (north leg)

	Total			
TOTAL	1,801	384	1,080	337
PM	829	193	437	199
AM	972	191	643	138

	Departing
TOTAL	1,626
PM	1,031
AM	595

Chapman (west leg)

	Departing
TOTAL	2,497
PM	1,235
AM	1,262

				Total
TOTAL	395	1,229	326	1,950
PM	260	801	172	1,233
AM	135	428	154	717

Chapman (east leg)

	Total			
AM	880	49	727	104
PM	730	116	534	80
TOTAL	1,610	165	1,261	184

	Departing
AM	635
PM	1,092
TOTAL	1,727

Placentia (south leg)

	Departing
AM	901
PM	687
Total	1,588

				Total
AM	340	415	69	824
PM	494	669	90	1,253
Total	834	1,084	159	2,077

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	Kraemer	LOCATION #:	10
	EAST & WEST:	Chapman	CONTROL:	SIGNAL

NOTES:

AM
PM
MD
OTHER
OTHER

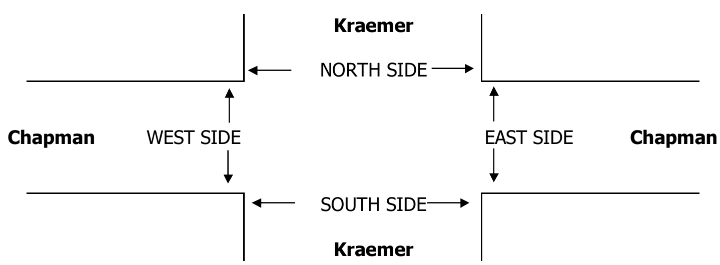
▲ N
◄ W
E ►
S ▼

☑ Add U-Turns to Left Turns

	NORTHBOUND Kraemer			SOUTHBOUND Kraemer			EASTBOUND Chapman			WESTBOUND Chapman			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	2.5	0.5	1	2.5	0.5	2	1	0	1	2	0	
AM 7:00 AM	21	49	19	2	264	46	27	20	65	42	31	7	593
7:15 AM	44	78	15	6	256	55	34	30	76	65	53	7	719
7:30 AM	56	104	20	11	279	55	51	34	75	42	90	14	831
7:45 AM	48	14	46	7	261	71	43	58	102	65	99	15	829
8:00 AM	37	152	54	3	297	61	40	63	94	54	101	21	977
8:15 AM	52	80	41	6	228	46	43	38	59	74	84	18	769
8:30 AM	51	70	8	5	166	51	29	26	53	39	71	8	577
8:45 AM	29	86	25	5	202	46	26	35	43	41	40	6	584
VOLUMES	338	633	228	45	1,953	431	293	304	567	422	569	96	5,879
APPROACH %	28%	53%	19%	2%	80%	18%	25%	26%	49%	39%	52%	9%	
APP/DEPART	1,199	/	1,022	2,429	/	2,944	1,164	/	578	1,087	/	1,335	0
BEGIN PEAK HR		7:30 AM											
VOLUMES	193	350	161	27	1,065	233	177	193	330	235	374	68	3,406
APPROACH %	27%	50%	23%	2%	80%	18%	25%	28%	47%	35%	55%	10%	
PEAK HR FACTOR		0.724			0.918			0.862			0.946		0.872
APP/DEPART	704	/	595	1,325	/	1,629	700	/	382	677	/	800	0
PM 4:00 PM	71	254	36	12	133	56	53	51	37	30	27	10	770
4:15 PM	83	284	30	9	153	43	55	84	56	35	33	7	872
4:30 PM	57	285	49	31	114	47	56	70	39	34	29	10	821
4:45 PM	78	317	48	12	147	57	70	53	37	31	26	6	882
5:00 PM	56	319	59	10	150	37	58	60	55	38	20	9	871
5:15 PM	66	360	58	12	157	65	68	73	70	36	38	5	1,008
5:30 PM	68	337	68	18	138	44	52	67	54	31	24	12	913
5:45 PM	69	307	44	13	130	55	60	86	63	40	37	18	922
VOLUMES	548	2,463	392	117	1,122	404	472	544	411	275	234	77	7,059
APPROACH %	16%	72%	12%	7%	68%	25%	33%	38%	29%	47%	40%	13%	
APP/DEPART	3,403	/	3,007	1,643	/	1,781	1,427	/	1,075	586	/	1,196	0
BEGIN PEAK HR		5:00 PM											
VOLUMES	259	1,323	229	53	575	201	238	286	242	145	119	44	3,714
APPROACH %	14%	73%	13%	6%	69%	24%	31%	37%	32%	47%	39%	14%	
PEAK HR FACTOR		0.935			0.886			0.908			0.811		0.921
APP/DEPART	1,811	/	1,609	829	/	948	766	/	580	308	/	577	0

U-TURNS

	NB	SB	EB	WB	TTL
LANES	0	0	0	0	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	1	1
8:30 AM	2	0	0	0	2
8:45 AM	1	0	0	0	1
AM TOTAL	3	0	0	1	4
4:00 PM	0	1	2	3	6
4:15 PM	0	2	1	4	7
4:30 PM	1	0	0	4	5
4:45 PM	1	2	11	4	18
5:00 PM	0	0	0	5	5
5:15 PM	0	1	0	4	5
5:30 PM	1	3	0	0	4
5:45 PM	1	0	0	7	8
PM TOTAL	4	9	14	31	58



	PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	3	2	2	3	10	3	2	1	0	6	0	0	1	3	4
7:15 AM	5	7	5	3	20	5	5	4	2	16	0	2	1	1	4
7:30 AM	3	8	19	4	34	3	8	18	1	30	0	0	1	3	4
7:45 AM	0	3	2	0	5	0	3	1	0	4	0	0	1	0	1
8:00 AM	8	14	26	3	51	6	14	24	1	45	2	0	2	2	6
8:15 AM	5	4	6	3	18	4	4	6	3	17	1	0	0	0	1
8:30 AM	5	5	10	0	20	5	5	8	0	18	0	0	2	0	2
8:45 AM	1	3	2	0	6	0	2	1	0	3	1	1	1	0	3
TOTAL	30	46	72	16	164	26	43	63	7	139	4	3	9	9	25
PM 4:00 PM	7	4	4	0	15	4	4	4	0	12	3	0	0	0	3
4:15 PM	7	11	1	3	22	6	8	1	2	17	1	3	0	1	5
4:30 PM	1	10	0	5	16	1	10	0	2	13	0	0	0	3	3
4:45 PM	1	5	1	0	7	1	4	1	0	6	0	1	0	0	1
5:00 PM	5	4	3	3	15	5	3	3	1	12	0	1	0	2	3
5:15 PM	1	4	0	3	8	1	4	0	3	8	0	0	0	0	0
5:30 PM	3	4	0	1	8	2	3	0	1	6	1	1	0	0	2
5:45 PM	3	2	2	2	9	2	2	2	2	8	1	0	0	0	1
TOTAL	28	44	11	17	100	22	38	11	11	82	6	6	0	6	18

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

Kraemer

4,072	**835**	**3,075**	**162**	**TOTAL**
1,643	404	1,122	117	**PM**
2,429	431	1,953	45	**AM**

TOTAL	**4,029**
PM	3,007
AM	1,022

Chapman

TOTAL	**2,531**	**765**	**848**	**978**	**2,591**
PM	1,196	472	544	411	**1,427**
AM	1,335	293	304	567	**1,164**

Chapman

AM	**1,087**	96	569	422	578
PM	**586**	77	234	275	1,075
TOTAL	**1,673**	**173**	**803**	**697**	**1,653**

Kraemer

2,944	**AM**	338	633	228	**1,199**
1,781	**PM**	548	2,463	392	**3,403**
4,725	**TOTAL**	**886**	**3,096**	**620**	**4,602**

PEAK HOUR

AM 7:30 AM

PM 5:00 PM

Kraemer

2,154	**434**	**1,640**	**80**	**TOTAL**
829	201	575	53	**PM**
1,325	233	1,065	27	**AM**

TOTAL	**2,204**
PM	1,609
AM	595

Chapman

TOTAL	**1,377**	**415**	**479**	**572**	**1,466**
PM	577	238	286	242	**766**
AM	800	177	193	330	**700**

Chapman

AM	**677**	68	374	235	382
PM	**308**	44	119	145	580
TOTAL	**985**	**112**	**493**	**380**	**962**

Kraemer

1,629	**AM**	193	350	161	**704**
948	**PM**	259	1,323	229	**1,811**
2,577	**Total**	**452**	**1,673**	**390**	**2,515**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	Placentia	LOCATION #:	4
	EAST & WEST:	Crowther	CONTROL:	SIGNAL

NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W E ►
S ▼

Add U-Turns to Left Turns

		NORTHBOUND Placentia			SOUTHBOUND Placentia			EASTBOUND Crowther			WESTBOUND Crowther			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	1	2	0	1	2	0	0	1	0	1	1	1	
AM	7:00 AM	2	56	19	40	184	5	2	1	0	15	4	7	335
AM	7:15 AM	2	101	18	27	201	1	1	3	3	27	4	9	397
AM	7:30 AM	1	130	17	37	212	6	3	2	3	31	4	11	457
AM	7:45 AM	4	134	19	41	206	12	2	2	8	50	4	16	498
AM	8:00 AM	3	149	17	14	222	8	4	0	4	41	8	17	487
AM	8:15 AM	2	111	10	22	178	8	5	6	6	40	4	11	403
AM	8:30 AM	3	115	12	15	140	13	7	5	1	22	8	5	346
AM	8:45 AM	5	82	13	23	147	9	11	8	1	24	5	13	341
AM	VOLUMES	22	878	125	219	1,490	62	35	27	26	250	41	89	3,264
AM	APPROACH %	2%	86%	12%	12%	84%	4%	40%	31%	30%	66%	11%	23%	
AM	APP/DEPART	1,025	/	1,002	1,771	/	1,766	88	/	371	380	/	125	0
AM	BEGIN PEAK HR		7:30 AM											
AM	VOLUMES	10	524	63	114	818	34	14	10	21	162	20	55	1,845
AM	APPROACH %	2%	88%	11%	12%	85%	4%	31%	22%	47%	68%	8%	23%	
AM	PEAK HR FACTOR		0.883			0.932			0.662			0.846		0.926
AM	APP/DEPART	597	/	593	966	/	1,001	45	/	187	237	/	64	0
PM	4:00 PM	5	151	24	17	173	17	21	10	11	35	6	34	504
PM	4:15 PM	1	177	21	16	138	19	13	8	12	29	5	36	475
PM	4:30 PM	8	207	22	17	119	11	27	7	4	47	11	50	530
PM	4:45 PM	6	182	19	14	139	16	15	5	8	30	10	25	469
PM	5:00 PM	3	226	28	19	164	22	18	7	13	47	8	34	589
PM	5:15 PM	6	212	29	17	145	19	11	8	10	36	10	40	543
PM	5:30 PM	2	216	34	5	144	8	15	11	5	10	10	31	491
PM	5:45 PM	4	176	14	14	136	19	14	6	7	38	7	33	468
PM	VOLUMES	35	1,547	191	119	1,158	131	134	62	70	272	67	283	4,069
PM	APPROACH %	2%	87%	11%	8%	82%	9%	50%	23%	26%	44%	11%	45%	
PM	APP/DEPART	1,773	/	1,964	1,408	/	1,500	266	/	372	622	/	233	0
PM	BEGIN PEAK HR		4:30 PM											
PM	VOLUMES	23	827	98	67	567	68	71	27	35	160	39	149	2,131
PM	APPROACH %	2%	87%	10%	10%	81%	10%	53%	20%	26%	46%	11%	43%	
PM	PEAK HR FACTOR		0.922			0.856			0.875			0.806		0.904
PM	APP/DEPART	948	/	1,047	702	/	762	133	/	192	348	/	130	0

	U-TURNS				
	NB	SB	EB	WB	TTL
LANES	0	0	0	0	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
VOLUMES	0	0	0	0	0

Placentia

← NORTH SIDE →

Crowther ↑ WEST SIDE ↓ ↑ EAST SIDE ↓ **Crowther**

← SOUTH SIDE →

Placentia

		PEDESTRIAN + BIKE CROSSINGS				
		N SIDE	S SIDE	E SIDE	W SIDE	TOTAL
AM	7:00 AM	0	3	0	1	4
AM	7:15 AM	0	2	4	1	7
AM	7:30 AM	1	1	4	1	7
AM	7:45 AM	0	1	7	0	8
AM	8:00 AM	0	0	1	0	1
AM	8:15 AM	0	3	2	3	8
AM	8:30 AM	0	1	1	0	2
AM	8:45 AM	0	1	6	0	7
AM	TOTAL	1	12	25	6	44
PM	4:00 PM	0	0	2	1	3
PM	4:15 PM	0	3	2	0	5
PM	4:30 PM	0	0	3	1	4
PM	4:45 PM	1	0	1	2	4
PM	5:00 PM	0	1	4	0	5
PM	5:15 PM	0	0	4	1	5
PM	5:30 PM	0	0	3	2	5
PM	5:45 PM	0	0	0	0	0
PM	TOTAL	1	4	19	7	31

	PEDESTRIAN CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL
7:00 AM	0	2	0	1	3
7:15 AM	0	1	0	0	1
7:30 AM	0	1	3	0	4
7:45 AM	0	1	6	0	7
8:00 AM	0	0	0	0	0
8:15 AM	0	3	0	1	4
8:30 AM	0	0	0	0	0
8:45 AM	0	0	3	0	3
TOTAL	0	8	12	2	22
4:00 PM	0	0	2	1	3
4:15 PM	0	2	1	0	3
4:30 PM	0	0	0	1	1
4:45 PM	0	0	0	0	0
5:00 PM	0	1	3	0	4
5:15 PM	0	0	3	1	4
5:30 PM	0	0	2	2	4
5:45 PM	0	0	0	0	0
TOTAL	0	3	11	5	19

	BICYCLE CROSSINGS				
	NS	SS	ES	WS	TOTAL
7:00 AM	0	1	0	0	1
7:15 AM	0	1	4	1	6
7:30 AM	1	0	1	1	3
7:45 AM	0	0	1	0	1
8:00 AM	0	0	1	0	1
8:15 AM	0	0	2	2	4
8:30 AM	0	1	1	0	2
8:45 AM	0	1	3	0	4
TOTAL	1	4	13	4	22
4:00 PM	0	0	0	0	0
4:15 PM	0	1	1	0	2
4:30 PM	0	0	3	0	3
4:45 PM	1	0	1	2	4
5:00 PM	0	0	1	0	1
5:15 PM	0	0	1	0	1
5:30 PM	0	0	1	0	1
5:45 PM	0	0	0	0	0
TOTAL	1	1	8	2	12

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia / SC0856 / ALL HOURS

Placentia (north)

3,179	**193**	**2,648**	**338**	**TOTAL**
1,408	131	1,158	119	**PM**
1,771	62	1,490	219	**AM**

TOTAL	**2,966**
PM	1,964
AM	1,002

Crowther (west)

	TOTAL	PM	AM
	358	233	125
	169	134	35
	89	62	27
	96	70	26
	354	**266**	**88**

Crowther (east)

	AM	PM	TOTAL
	380	**622**	**1,002**
	89	283	**372**
	41	67	**108**
	250	272	**522**
	371	372	**743**

Placentia (south)

1,766	**AM**	22	878	125	**1,025**
1,500	**PM**	35	1,547	191	**1,773**
3,266	**TOTAL**	**57**	**2,425**	**316**	**2,798**

PEAK HOUR

AM 7:30 AM

PM 4:30 PM

Placentia (north)

1,668	**102**	**1,385**	**181**	**TOTAL**
702	68	567	67	**PM**
966	34	818	114	**AM**

TOTAL	**1,640**
PM	1,047
AM	593

Crowther (west)

	TOTAL	PM	AM
	194	130	64
	85	71	14
	37	27	10
	56	35	21
	178	**133**	**45**

Crowther (east)

	AM	PM	TOTAL
	237	**348**	**585**
	55	149	**204**
	20	39	**59**
	162	160	**322**
	187	192	**379**

Placentia (south)

1,001	**AM**	10	524	63	**597**
762	**PM**	23	827	98	**948**
1,763	**Total**	**33**	**1,351**	**161**	**1,545**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	Melrose	LOCATION #:	5
	EAST & WEST:	Crowther	CONTROL:	SIGNAL

NOTES:

AM PM MD OTHER OTHER

N ▲ ◄ W E ► S ▼

☑ Add U-Turns to Left Turns

	NORTHBOUND Melrose			SOUTHBOUND Melrose			EASTBOUND Crowther			WESTBOUND Crowther				U-TURNS				
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
LANES:	1	2	0	1	2	0	1	1	1	1	1	1		0	0	0	0	
AM 7:00 AM	11	48	15	4	74	5	1	12	30	8	19	3	230	0	0	0	0	0
7:15 AM	13	63	14	3	83	11	3	17	29	10	20	1	267	0	0	0	0	0
7:30 AM	12	126	15	4	105	17	2	13	30	11	34	1	370	0	0	0	0	0
7:45 AM	20	55	6	5	155	16	4	12	30	23	45	5	376	0	0	0	0	0
8:00 AM	11	46	5	5	85	12	2	9	25	10	37	3	250	0	0	0	0	0
8:15 AM	15	36	12	1	71	6	1	9	13	17	24	2	207	0	0	0	0	0
8:30 AM	8	30	8	3	54	4	2	13	20	12	25	4	183	0	0	0	0	0
8:45 AM	10	25	12	3	40	5	2	9	15	12	25	0	158	0	0	0	0	0
VOLUMES	100	429	87	28	667	76	17	94	192	103	229	19	2,041	0	0	0	0	0
APPROACH %	16%	70%	14%	4%	87%	10%	6%	31%	63%	29%	65%	5%						
APP/DEPART	616	/	465	771	/	962	303	/	209	351	/	405	0					
BEGIN PEAK HR		7:15 AM																
VOLUMES	56	290	40	17	428	56	11	51	114	54	136	10	1,263					
APPROACH %	15%	75%	10%	3%	85%	11%	6%	29%	65%	27%	68%	5%						
PEAK HR FACTOR		0.631			0.712			0.898			0.685		0.840					
APP/DEPART	386	/	311	501	/	596	176	/	108	200	/	248	0					
PM 4:00 PM	30	60	7	2	52	5	8	25	15	19	26	6	255	0	0	0	0	0
4:15 PM	17	79	5	5	44	4	4	29	19	11	25	2	244	0	0	0	0	0
4:30 PM	25	116	13	3	43	8	4	28	14	19	40	15	328	0	0	0	0	0
4:45 PM	24	90	1	1	41	5	6	17	13	10	25	8	241	0	0	0	0	0
5:00 PM	42	107	12	1	56	7	4	39	24	13	34	8	347	1	0	0	0	1
5:15 PM	31	110	11	3	57	3	7	19	14	6	41	6	308	0	0	0	0	0
5:30 PM	25	107	7	2	42	6	4	23	13	8	24	1	262	0	0	0	0	0
5:45 PM	19	91	10	2	52	4	5	23	16	5	28	7	262	0	0	0	0	0
VOLUMES	213	760	66	19	387	42	42	203	128	91	243	53	2,247	1	0	0	0	1
APPROACH %	21%	73%	6%	4%	86%	9%	11%	54%	34%	24%	63%	14%						
APP/DEPART	1,039	/	855	448	/	607	373	/	288	387	/	497	0					
BEGIN PEAK HR		4:30 PM																
VOLUMES	122	423	37	8	197	23	21	103	65	48	140	37	1,224					
APPROACH %	21%	73%	6%	4%	86%	10%	11%	54%	34%	21%	62%	16%						
PEAK HR FACTOR		0.904			0.891			0.705			0.760		0.882					
APP/DEPART	582	/	481	228	/	311	189	/	148	225	/	284	0					

Melrose

NORTH SIDE

Crowther WEST SIDE EAST SIDE **Crowther**

SOUTH SIDE

Melrose

	PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0
7:15 AM	3	2	10	1	16	2	2	10	1	15	1	0	0	0	1
7:30 AM	1	0	0	2	3	1	0	0	1	2	0	0	0	1	1
7:45 AM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2
8:00 AM	1	1	0	2	4	1	1	0	0	2	0	0	0	2	2
8:15 AM	1	0	0	1	2	1	0	0	1	2	0	0	0	0	0
8:30 AM	0	0	3	0	3	0	0	3	0	3	0	0	0	0	0
8:45 AM	2	0	0	0	2	2	0	0	0	2	0	0	0	0	0
TOTAL	9	5	13	6	33	8	3	13	3	27	1	2	0	3	6
PM 4:00 PM	0	0	2	2	4	0	0	0	2	2	0	0	2	0	2
4:15 PM	1	0	1	0	2	1	0	1	0	2	0	0	0	0	0
4:30 PM	14	2	7	3	26	14	2	5	3	24	0	0	2	0	2
4:45 PM	0	0	3	0	3	0	0	3	0	3	0	0	0	0	0
5:00 PM	0	0	2	0	2	0	0	2	0	2	0	0	0	0	0
5:15 PM	1	0	2	0	3	1	0	2	0	3	0	0	0	0	0
5:30 PM	0	0	1	4	5	0	0	0	4	4	0	0	1	0	1
5:45 PM	2	0	1	0	3	0	0	1	0	1	2	0	0	0	2
TOTAL	18	2	19	9	48	16	2	14	9	41	2	0	5	0	7

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia — SC0856 — ALL HOURS

Melrose (north leg)

TOTAL	1,219	118	1,054	47	1,320
PM	448	42	387	19	855
AM	771	76	667	28	465

Crowther (west leg)

TOTAL	902	59	297	320	676
PM	497	42	203	128	373
AM	405	17	94	192	303

Crowther (east leg)

AM	351	19	229	103	209
PM	387	53	243	91	288
TOTAL	738	72	472	194	497

Melrose (south leg)

AM	962	100	429	87	616
PM	607	213	760	66	1,039
TOTAL	1,569	313	1,189	153	1,655

PEAK HOUR

AM 7:15 AM

PM 4:30 PM

Melrose (north leg)

TOTAL	729	79	625	25	792
PM	228	23	197	8	481
AM	501	56	428	17	311

Crowther (west leg)

TOTAL	532	32	154	179	365
PM	284	21	103	65	189
AM	248	11	51	114	176

Crowther (east leg)

AM	200	10	136	54	108
PM	225	37	140	48	148
TOTAL	425	47	276	102	256

Melrose (south leg)

AM	596	56	290	40	386
PM	311	122	423	37	582
Total	907	178	713	77	968

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	Kraemer	LOCATION #:	9
	EAST & WEST:	Crowther	CONTROL:	SIGNAL

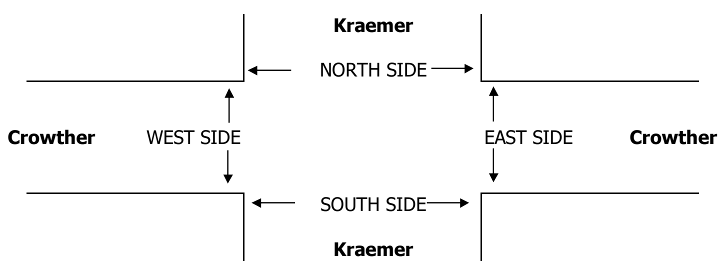
NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W E ►
S ▼

☑ Add U-Turns to Left Turns

	NORTHBOUND Kraemer			SOUTHBOUND Kraemer			EASTBOUND Crowther			WESTBOUND Crowther				U-TURNS				
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
LANES:	1	3	0	1	2	1	1	1	0	1	1	1		0	0	0	0	
AM 7:00 AM	7	81	0	2	308	22	2	2	6	1	0	3	434	0	0	0	0	0
7:15 AM	5	136	1	3	405	25	4	0	10	0	1	9	599	0	0	0	0	0
7:30 AM	9	190	2	5	350	28	8	0	13	1	0	5	611	0	0	0	0	0
7:45 AM	11	144	1	14	406	49	6	2	10	0	1	11	655	0	0	0	0	0
8:00 AM	19	179	1	8	345	49	13	0	10	0	1	9	634	0	0	0	0	0
8:15 AM	8	152	1	7	341	31	6	0	9	0	1	7	563	0	0	0	0	0
8:30 AM	7	142	0	7	232	25	5	2	11	1	0	2	434	0	0	0	0	0
8:45 AM	7	118	0	1	263	22	8	1	9	3	2	6	440	0	0	0	1	1
VOLUMES	73	1,142	6	47	2,650	251	52	7	78	6	6	52	4,370	0	0	0	1	1
APPROACH %	6%	94%	c	2%	90%	9%	38%	5%	57%	9%	9%	81%						
APP/DEPART	1,221	/	1,246	2,948	/	2,733	137	/	61	64	/	330	0					
BEGIN PEAK HR		7:15 AM																
VOLUMES	44	649	5	30	1,506	151	31	2	43	1	3	34	2,499					
APPROACH %	6%	93%	1%	2%	89%	9%	41%	3%	57%	3%	8%	89%						
PEAK HR FACTOR		0.868			0.899			0.826			0.792		0.954					
APP/DEPART	698	/	714	1,687	/	1,550	76	/	37	38	/	198	0					
PM 4:00 PM	16	338	1	9	187	11	18	2	14	1	2	5	604	0	0	0	0	0
4:15 PM	18	362	1	9	214	18	26	1	22	0	1	4	676	0	0	0	0	0
4:30 PM	23	379	1	4	181	13	33	3	12	0	1	3	653	0	0	0	0	0
4:45 PM	19	399	0	9	211	21	22	1	8	0	0	4	694	0	0	0	0	0
5:00 PM	19	408	0	8	184	16	31	3	17	2	0	4	692	1	0	0	0	1
5:15 PM	22	444	2	6	212	17	29	2	9	1	0	10	754	0	0	0	0	0
5:30 PM	8	480	0	6	187	11	24	1	12	1	0	3	733	0	0	0	0	0
5:45 PM	14	401	0	10	186	21	24	1	6	0	0	6	669	0	0	0	0	0
VOLUMES	139	3,211	5	61	1,562	128	207	14	100	5	4	39	5,475	1	0	0	0	1
APPROACH %	4%	96%	0%	3%	89%	7%	64%	4%	31%	10%	8%	81%						
APP/DEPART	3,355	/	3,457	1,751	/	1,668	321	/	80	48	/	270	0					
BEGIN PEAK HR		4:45 PM																
VOLUMES	68	1,731	2	29	794	65	106	7	46	4	0	21	2,873					
APPROACH %	4%	96%	0%	3%	89%	7%	67%	4%	29%	16%	0%	84%						
PEAK HR FACTOR		0.923			0.921			0.779			0.568		0.953					
APP/DEPART	1,801	/	1,858	888	/	845	159	/	38	25	/	132	0					



	PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	0	1	3	4	8	0	1	2	1	4	0	0	1	3	4
7:15 AM	0	0	2	2	4	0	0	1	0	1	0	0	1	2	3
7:30 AM	1	4	7	2	14	0	4	6	2	12	1	0	1	0	2
7:45 AM	0	1	7	1	9	0	0	2	0	2	0	1	5	1	7
8:00 AM	0	1	3	2	6	0	1	2	2	5	0	0	1	0	1
8:15 AM	0	0	1	1	2	0	0	1	1	2	0	0	0	0	0
8:30 AM	0	1	3	0	4	0	1	2	0	3	0	0	1	0	1
8:45 AM	0	0	1	1	2	0	0	1	1	2	0	0	0	0	0
TOTAL	1	8	27	13	49	0	7	17	7	31	1	1	10	6	18
PM 4:00 PM	0	1	2	5	8	0	1	1	1	3	0	0	1	4	5
4:15 PM	0	1	1	1	3	0	1	0	1	2	0	0	1	0	1
4:30 PM	0	3	3	4	10	0	3	3	2	8	0	0	0	2	2
4:45 PM	0	3	1	2	6	0	3	0	2	5	0	0	1	0	1
5:00 PM	0	5	2	2	9	0	5	2	0	7	0	0	0	2	2
5:15 PM	0	0	2	0	2	0	0	1	0	1	0	0	1	0	1
5:30 PM	0	2	2	0	4	0	1	2	0	3	0	1	0	0	1
5:45 PM	0	0	0	3	3	0	0	0	3	3	0	0	0	0	0
TOTAL	0	15	13	17	45	0	14	9	9	32	0	1	4	8	13

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

Kraemer (north leg)

4,699	**379**	**4,212**	**108**	**TOTAL**
1,751	128	1,562	61	**PM**
2,948	251	2,650	47	**AM**

TOTAL	**4,703**
PM	3,457
AM	1,246

Crowther (west leg)

TOTAL	**600**	**259**	**21**	**178**	**458**
PM	270	207	14	100	**321**
AM	330	52	7	78	**137**

Crowther (east leg)

AM	**64**	52	6	6	61
PM	**48**	39	4	5	80
TOTAL	**112**	**91**	**10**	**11**	**141**

Kraemer (south leg)

AM	2,733	73	1,142	6	**1,221**
PM	1,668	139	3,211	5	**3,355**
TOTAL	**4,401**	**212**	**4,353**	**11**	**4,576**

PEAK HOUR

AM 7:15 AM

PM 4:45 PM

Kraemer (north leg)

2,575	**216**	**2,300**	**59**	**TOTAL**
888	65	794	29	**PM**
1,687	151	1,506	30	**AM**

TOTAL	**2,572**
PM	1,858
AM	714

Crowther (west leg)

TOTAL	**330**	**137**	**9**	**89**	**235**
PM	132	106	7	46	**159**
AM	198	31	2	43	**76**

Crowther (east leg)

AM	**38**	34	3	1	37
PM	**25**	21	0	4	38
TOTAL	**63**	**55**	**3**	**5**	**75**

Kraemer (south leg)

AM	1,550	44	649	5	**698**
PM	845	68	1,731	2	**1,801**
Total	**2,395**	**112**	**2,380**	**7**	**2,499**

Intersection Turning Movement
Prepared by:
National Data & Surveying Services

Project ID: CA13_1040_001 **Day:** THURSDAY

City: City of Fullerton **Date:** 2/28/2013

AM

NS/EW Streets:	Placentia Ave			Placentia Ave			Orangethorpe Ave			Orangethorpe Ave			
	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	2	1	2	2	0	1	3	0	1	3	1	
7:00 AM	8	25	13	32	47	34	34	90	3	19	126	35	466
7:15 AM	7	55	15	29	61	49	30	107	4	28	132	52	569
7:30 AM	12	50	16	31	67	50	42	144	4	29	181	51	677
7:45 AM	8	52	23	33	68	74	41	126	9	27	229	42	732
8:00 AM	9	49	23	27	52	51	36	115	10	25	183	53	633
8:15 AM	12	42	14	47	45	37	31	99	6	25	183	41	582
8:30 AM	13	34	20	57	48	32	26	84	5	24	167	64	574
8:45 AM	11	47	17	38	29	38	27	90	5	25	181	72	580
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	80	354	141	294	417	365	267	855	46	202	1382	410	4813
APPROACH %'s :	13.91%	61.57%	24.52%	27.32%	38.75%	33.92%	22.86%	73.20%	3.94%	10.13%	69.31%	20.56%	
PEAK HR START TIME :	730 AM												TOTAL
PEAK HR VOL :	41	193	76	138	232	212	150	484	29	106	776	187	2624
PEAK HR FACTOR :		0.934			0.831			0.872			0.897		0.896

UTURNS			
NB	SB	EB	WB
			0
			0
			0
			0
			0
			0
			0
			1
NB	SB	EB	WB
0	0	0	1

CONTROL : 1-Way Stop WB

Intersection Turning Movement

Prepared by:

National Data & Surveying Services

Project ID: CA13_1040_001 **Day:** THURSDAY

City: City of Fullerton **Date:** 2/28/2013

PM

NS/EW Streets: Placentia Ave (NORTHBOUND) | Placentia Ave (SOUTHBOUND) | Orangethorpe Ave (EASTBOUND) | Orangethorpe Ave (WESTBOUND)

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	1	2	1	2	2	0	1	3	0	1	3	1	
4:00 PM	13	76	35	48	75	50	38	169	16	39	158	55	772
4:15 PM	14	57	39	54	72	45	54	129	22	44	187	56	773
4:30 PM	15	67	22	68	67	60	57	178	13	39	191	64	841
4:45 PM	15	79	34	56	55	50	42	148	9	29	198	53	768
5:00 PM	13	84	20	76	83	62	44	196	8	32	228	73	919
5:15 PM	12	84	17	55	72	56	51	144	13	36	213	51	804
5:30 PM	13	67	23	59	68	48	45	147	10	35	204	77	796
5:45 PM	12	67	25	53	44	41	46	140	5	28	189	57	707
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
TOTAL VOLUMES :	107	581	215	469	536	412	377	1251	96	282	1568	486	6380
APPROACH %'s :	11.85%	64.34%	23.81%	33.10%	37.83%	29.08%	21.87%	72.56%	5.57%	12.07%	67.12%	20.80%	
PEAK HR START TIME :	430 PM												TOTAL
PEAK HR VOL :	55	314	93	255	277	228	194	666	43	136	830	241	3332
PEAK HR FACTOR :		0.902			0.860			0.910			0.906		0.906

CONTROL : 1-Way Stop WB

UTURNS

	NB	SB	EB	WB
4:00 PM				1
4:15 PM				1
4:30 PM				2
4:45 PM				0
5:00 PM				0
5:15 PM				1
5:30 PM				2
5:45 PM				0
TOTAL	0	0	0	7

ITM Peak Hour Summary

Prepared by:

National Data & Surveying Services

Placentia Ave and Orangethorpe Ave , City of Fullerton

Date: 2/28/2013
Day: Thursday

Project #: CA13_1040_001

AM Peak Hour	730 AM
NOON Peak Hour	1230 PM
PM Peak Hour	430 PM

Peak Hour Summary

N

Placentia Ave

Orangethorpe Ave

Southbound Approach

	Left	Through	Right	Out
Lanes	0	2	2	
AM	212	232	138	530
NOON	160	149	219	515
PM	228	277	255	749

Eastbound Approach

	AM	NOON	PM
Out	1029	767	1113

Lanes		AM	NOON	PM
1	Left	150	153	194
3	Through	484	462	666
0	Right	29	42	43

CONTROL

1-Way Stop WB

Westbound Approach

	AM	NOON	PM	Lanes
Right	187	209	241	1
Through	776	560	830	3
Left	106	97	136	1
Out	698	759	1014	

Northbound Approach

	Out	Left	Through	Right
AM	367	41	193	76
NOON	288	47	153	78
PM	456	55	314	93
Lanes		1	2	1

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	11:30 AM	2:00 PM
PM	4:00 PM	6:00 PM

Total Ins & Outs

North Leg

	In	Out
AM	582	530
NOON	528	515
PM	760	749

East Leg

	AM	NOON	PM
In	1069	866	1207
Out	698	759	1014

West Leg

	AM	NOON	PM
Out	1029	767	1113
In	663	657	903

South Leg

	Out	In
AM	367	310
NOON	288	278
PM	456	462

Total Volume Per Leg

North Leg

AM	1112
NOON	1043
PM	1509

East Leg

AM	NOON	PM
1767	1625	2221

West Leg

AM	NOON	PM
1692	1424	2016

South Leg

AM	677
NOON	566
PM	918

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	SR-57 SB Ramps	LOCATION #:	1
	EAST & WEST:	Orangethorpe	CONTROL:	SIGNAL

NOTES:

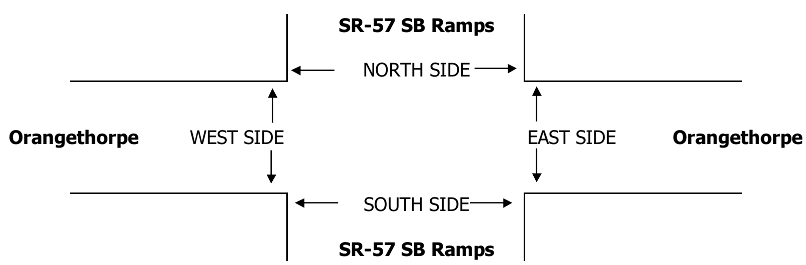
AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

☑ Add U-Turns to Left Turns

		NORTHBOUND SR-57 SB Ramps			SOUTHBOUND SR-57 SB Ramps			EASTBOUND Orangethorpe			WESTBOUND Orangethorpe			
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	LANES:	0	1	0	1.3	0.3	0.3	2	3	0	1	3	1	
AM	7:00 AM	0	4	3	41	0	28	29	90	0	1	137	92	425
AM	7:15 AM	1	1	2	42	0	32	22	168	0	2	137	96	503
AM	7:30 AM	2	1	11	40	2	23	23	157	0	2	167	67	495
AM	7:45 AM	3	3	7	68	1	51	23	170	1	1	225	87	640
AM	8:00 AM	2	1	6	73	0	64	26	169	1	1	228	61	632
AM	8:15 AM	0	1	3	59	0	33	32	144	0	1	205	79	557
AM	8:30 AM	0	2	1	65	0	41	36	139	1	4	182	67	538
AM	8:45 AM	1	2	4	73	0	48	41	119	0	3	162	77	530
AM	VOLUMES	9	15	37	461	3	320	232	1,156	3	15	1,443	626	4,320
AM	APPROACH %	15%	25%	61%	59%	0%	41%	17%	83%	0%	1%	69%	30%	
AM	APP/DEPART	61	/	873	784	/	14	1,391	/	1,661	2,084	/	1,772	0
AM	BEGIN PEAK HR		7:45 AM											
AM	VOLUMES	5	7	17	265	1	189	117	622	3	7	840	294	2,367
AM	APPROACH %	17%	24%	59%	58%	0%	42%	16%	84%	0%	1%	74%	26%	
AM	PEAK HR FACTOR		0.558			0.830			0.946			0.911		0.925
AM	APP/DEPART	29	/	418	455	/	8	742	/	907	1,141	/	1,034	0
PM	4:00 PM	2	0	0	32	0	50	68	184	1	2	190	78	607
PM	4:15 PM	3	3	5	45	0	59	42	159	1	3	166	60	546
PM	4:30 PM	3	2	1	42	0	51	69	191	0	4	203	94	660
PM	4:45 PM	0	0	3	47	0	58	46	192	0	2	186	68	602
PM	5:00 PM	3	1	4	31	0	70	51	214	0	6	223	81	684
PM	5:15 PM	1	2	2	31	1	78	65	163	0	3	221	58	625
PM	5:30 PM	0	2	3	25	0	68	64	159	0	5	186	51	563
PM	5:45 PM	1	3	6	45	1	68	49	149	0	2	172	51	547
PM	VOLUMES	13	13	24	298	2	502	454	1,411	2	27	1,547	541	4,834
PM	APPROACH %	26%	26%	48%	37%	0%	63%	24%	76%	0%	1%	73%	26%	
PM	APP/DEPART	50	/	1,010	802	/	22	1,867	/	1,740	2,115	/	2,062	0
PM	BEGIN PEAK HR		4:30 PM											
PM	VOLUMES	7	5	10	151	1	257	231	760	0	15	833	301	2,571
PM	APPROACH %	32%	23%	45%	37%	0%	63%	23%	77%	0%	1%	72%	26%	
PM	PEAK HR FACTOR		0.688			0.930			0.935			0.927		0.940
PM	APP/DEPART	22	/	538	409	/	12	991	/	924	1,149	/	1,097	0

U-TURNS	NB	SB	EB	WB	TTL
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	1	1
7:30 AM	0	0	0	2	2
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	1	1
8:15 AM	0	0	0	1	1
8:30 AM	0	0	0	1	1
8:45 AM	0	0	0	1	1
VOLUMES	0	0	0	7	7
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	2	2
4:30 PM	0	1	0	3	4
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	1	1
5:30 PM	0	0	0	2	2
5:45 PM	0	1	0	1	2
VOLUMES	0	2	0	9	11



		PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
		N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM	7:00 AM	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0
AM	7:15 AM	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0
AM	7:30 AM	2	2	0	0	4	0	0	0	0	0	2	2	0	0	4
AM	7:45 AM	2	3	0	0	5	0	3	0	0	3	2	0	0	0	2
AM	8:00 AM	2	9	0	0	11	1	7	0	0	8	1	2	0	0	3
AM	8:15 AM	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0
AM	8:30 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0
AM	8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AM	TOTAL	7	20	0	0	27	2	16	0	0	18	5	4	0	0	9
PM	4:00 PM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2
PM	4:15 PM	1	2	0	0	3	0	1	0	0	1	1	1	0	0	2
PM	4:30 PM	1	3	0	0	4	0	2	0	0	2	1	1	0	0	2
PM	4:45 PM	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0
PM	5:00 PM	1	3	0	0	4	0	1	0	0	1	1	2	0	0	3
PM	5:15 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1
PM	5:30 PM	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0
PM	5:45 PM	1	4	0	0	5	0	4	0	0	4	1	0	0	0	1
PM	TOTAL	5	17	0	0	22	1	10	0	0	11	4	7	0	0	11

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia — SC0856 — ALL HOURS

SR-57 SB Ramps (north leg)

TOTAL	1,586	822	5	759	1,883
PM	802	502	2	298	1,010
AM	784	320	3	461	873

Orangethorpe (west leg)

TOTAL	3,834	686	2,567	5	3,258
PM	2,062	454	1,411	2	1,867
AM	1,772	232	1,156	3	1,391

Orangethorpe (east leg)

AM	2,084	626	1,443	15	1,661
PM	2,115	541	1,547	27	1,740
TOTAL	4,199	1,167	2,990	42	3,401

SR-57 SB Ramps (south leg)

14	AM	9	15	37	61
22	PM	13	13	24	50
36	TOTAL	22	28	61	111

PEAK HOUR

AM 7:45 AM

PM 4:30 PM

SR-57 SB Ramps (north leg)

TOTAL	864	446	2	416	956
PM	409	257	1	151	538
AM	455	189	1	265	418

Orangethorpe (west leg)

TOTAL	2,131	348	1,382	3	1,733
PM	1,097	231	760	0	991
AM	1,034	117	622	3	742

Orangethorpe (east leg)

AM	1,141	294	840	7	907
PM	1,149	301	833	15	924
TOTAL	2,290	595	1,673	22	1,831

SR-57 SB Ramps (south leg)

8	AM	5	7	17	29
12	PM	7	5	10	22
20	Total	12	12	27	51

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	SR-57 NB Ramps	LOCATION #:	2
	EAST & WEST:	Orangethorpe	CONTROL:	SIGNAL

NOTES:

AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

☑ Add U-Turns to Left Turns

		NORTHBOUND SR-57 NB Ramps			SOUTHBOUND SR-57 NB Ramps			EASTBOUND Orangethorpe			WESTBOUND Orangethorpe				U-TURNS				
		NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
	LANES:	2	0	1	X	X	X	2	3	X	X	3	0		0	0	0	0	
AM	7:00 AM	70	0	122	0	0	0	22	111	0	0	160	46	531	0	0	0	0	0
AM	7:15 AM	50	1	115	0	0	0	32	183	0	0	180	51	612	0	0	0	0	0
AM	7:30 AM	55	0	102	0	0	0	56	154	0	0	180	51	598	0	0	0	0	0
AM	7:45 AM	90	0	113	0	0	0	30	213	0	0	223	42	711	0	0	0	0	0
AM	8:00 AM	91	0	141	0	0	0	29	221	0	0	197	45	724	0	0	0	0	0
AM	8:15 AM	58	0	109	0	0	0	28	180	0	0	226	53	654	0	0	0	0	0
AM	8:30 AM	76	0	99	0	0	0	35	170	0	0	178	50	608	0	0	0	0	0
AM	8:45 AM	63	0	80	0	0	0	17	183	0	0	180	29	552	0	0	0	0	0
AM	VOLUMES	553	1	881	0	0	0	249	1,415	0	0	1,524	367	4,990	0	0	0	0	0
AM	APPROACH %	39%	0%	61%	0%	0%	0%	15%	85%	0%	0%	81%	19%						
AM	APP/DEPART	1,435	/	617	0	/	0	1,664	/	2,296	1,891	/	2,077	0					
AM	BEGIN PEAK HR		7:45 AM																
AM	VOLUMES	315	0	462	0	0	0	122	784	0	0	824	190	2,697					
AM	APPROACH %	41%	0%	59%	0%	0%	0%	13%	87%	0%	0%	81%	19%						
AM	PEAK HR FACTOR		0.837			0.000			0.906			0.909		0.931					
AM	APP/DEPART	777	/	312	0	/	0	906	/	1,246	1,014	/	1,139	0					
PM	4:00 PM	46	0	96	0	0	0	73	143	0	0	218	114	690	0	0	0	0	0
PM	4:15 PM	44	0	73	0	0	0	48	165	0	0	186	88	604	0	0	0	0	0
PM	4:30 PM	52	0	79	0	0	0	58	180	0	0	249	153	771	0	0	0	0	0
PM	4:45 PM	46	1	78	0	0	0	46	197	0	0	211	120	699	0	0	0	0	0
PM	5:00 PM	47	0	105	0	0	0	69	179	0	0	263	133	796	0	0	0	0	0
PM	5:15 PM	49	0	85	0	0	0	51	146	0	0	233	135	699	0	0	0	0	0
PM	5:30 PM	47	0	94	0	0	0	34	157	0	0	194	94	620	0	0	0	0	0
PM	5:45 PM	51	0	103	0	0	0	42	160	0	0	173	89	618	0	0	0	0	0
PM	VOLUMES	382	1	713	0	0	0	421	1,327	0	0	1,727	926	5,497	0	0	0	0	0
PM	APPROACH %	35%	0%	65%	0%	0%	0%	24%	76%	0%	0%	65%	35%						
PM	APP/DEPART	1,096	/	1,348	0	/	0	1,748	/	2,040	2,653	/	2,109	0					
PM	BEGIN PEAK HR		4:30 PM																
PM	VOLUMES	194	1	347	0	0	0	224	702	0	0	956	541	2,965					
PM	APPROACH %	36%	0%	64%	0%	0%	0%	24%	76%	0%	0%	64%	36%						
PM	PEAK HR FACTOR		0.891			0.000			0.933			0.931		0.931					
PM	APP/DEPART	542	/	766	0	/	0	926	/	1,049	1,497	/	1,150	0					

SR-57 NB Ramps

← NORTH SIDE →

Orangethorpe WEST SIDE EAST SIDE **Orangethorpe**

← SOUTH SIDE →

SR-57 NB Ramps

		PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
		N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM	7:00 AM	0	9	1	0	10	0	9	1	0	10	0	0	0	0	0
AM	7:15 AM	1	5	0	0	6	1	5	0	0	6	0	0	0	0	0
AM	7:30 AM	2	3	0	0	5	0	0	0	0	0	2	3	0	0	5
AM	7:45 AM	2	5	0	0	7	1	3	0	0	4	1	2	0	0	3
AM	8:00 AM	0	10	1	0	11	0	8	1	0	9	0	2	0	0	2
AM	8:15 AM	1	1	0	0	2	1	1	0	0	2	0	0	0	0	0
AM	8:30 AM	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0
AM	8:45 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0
AM	TOTAL	6	37	2	0	45	3	30	2	0	35	3	7	0	0	10
PM	4:00 PM	1	5	2	0	8	1	3	2	0	6	0	2	0	0	2
PM	4:15 PM	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1
PM	4:30 PM	2	7	3	0	12	0	5	2	0	7	2	2	1	0	5
PM	4:45 PM	1	1	0	0	2	1	0	0	0	1	0	1	0	0	1
PM	5:00 PM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2
PM	5:15 PM	0	6	0	0	6	0	5	0	0	5	0	1	0	0	1
PM	5:30 PM	0	3	1	0	4	0	3	1	0	4	0	0	0	0	0
PM	5:45 PM	3	5	3	0	11	2	3	3	0	8	1	2	0	0	3
PM	TOTAL	8	29	9	0	46	4	19	8	0	31	4	10	1	0	15

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

SR-57 NB Ramps

TOTAL	**0**	**0**	**0**	**0**	**1,965**
PM	**0**	0	0	0	1,348
AM	**0**	0	0	0	617

Orangethorpe

TOTAL	**4,186**	**670**	**2,742**	**0**	**3,412**
PM	2,109	421	1,327	0	**1,748**
AM	2,077	249	1,415	0	**1,664**

Orangethorpe

AM	**1,891**	367	1,524	0	2,296
PM	**2,653**	926	1,727	0	2,040
TOTAL	**4,544**	**1,293**	**3,251**	**0**	**4,336**

SR-57 NB Ramps

AM	0	553	1	881	**1,435**
PM	0	382	1	713	**1,096**
TOTAL	**0**	**935**	**2**	**1,594**	**2,531**

PEAK HOUR

AM 7:45 AM

PM 4:30 PM

SR-57 NB Ramps

TOTAL	**0**	**0**	**0**	**0**	**1,078**
PM	**0**	0	0	0	766
AM	**0**	0	0	0	312

Orangethorpe

TOTAL	**2,289**	**346**	**1,486**	**0**	**1,832**
PM	1,150	224	702	0	**926**
AM	1,139	122	784	0	**906**

Orangethorpe

AM	**1,014**	190	824	0	1,246
PM	**1,497**	541	956	0	1,049
TOTAL	**2,511**	**731**	**1,780**	**0**	**2,295**

SR-57 NB Ramps

AM	0	315	0	462	**777**
PM	0	194	1	347	**542**
Total	**0**	**509**	**1**	**809**	**1,319**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC0856
Tue, Feb 23, 16	NORTH & SOUTH:	Melrose	LOCATION #:	3
	EAST & WEST:	Orangethorpe	CONTROL:	SIGNAL

NOTES:

AM / PM / MD / OTHER / OTHER

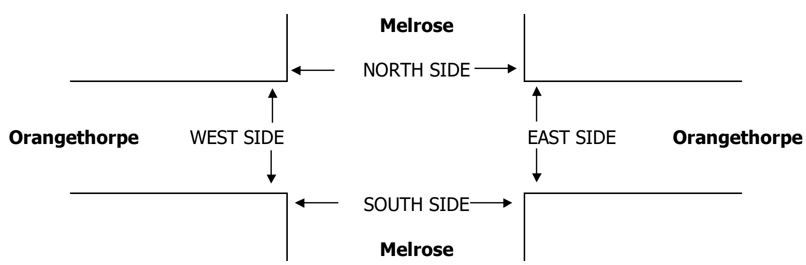
▲ N ◄ W E ► S ▼

☑ Add U-Turns to Left Turns

	NORTHBOUND Melrose			SOUTHBOUND Melrose			EASTBOUND Orangethorpe			WESTBOUND Orangethorpe			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
LANES:	1	2	0	1	2	0	2	3	0	2	3	0	
AM 7:00 AM	41	37	8	12	53	36	28	104	95	8	120	9	551
7:15 AM	44	56	6	11	78	38	40	135	61	13	134	2	618
7:30 AM	49	132	11	13	107	30	56	134	106	13	135	13	799
7:45 AM	61	71	15	22	179	55	37	195	99	11	150	9	904
8:00 AM	51	35	16	15	78	34	52	160	96	10	150	10	707
8:15 AM	70	39	23	9	48	33	30	183	81	10	137	9	672
8:30 AM	51	21	8	9	37	24	29	163	83	4	155	6	590
8:45 AM	61	28	5	10	39	26	35	158	82	8	127	10	589
VOLUMES	428	419	92	101	619	276	307	1,232	703	77	1,108	68	5,430
APPROACH %	46%	45%	10%	10%	62%	28%	14%	55%	31%	6%	88%	5%	
APP/DEPART	939	/	764	996	/	1,399	2,242	/	1,423	1,253	/	1,844	0
BEGIN PEAK HR		7:30 AM											
VOLUMES	231	277	65	59	412	152	175	672	382	44	572	41	3,082
APPROACH %	40%	48%	11%	9%	66%	24%	14%	55%	31%	7%	87%	6%	
PEAK HR FACTOR		0.746			0.608			0.928			0.966		0.852
APP/DEPART	573	/	476	623	/	838	1,229	/	794	657	/	974	0
PM 4:00 PM	114	86	15	11	39	44	43	101	51	11	152	6	673
4:15 PM	111	66	12	13	41	32	46	157	54	6	169	5	712
4:30 PM	121	96	17	7	70	50	38	180	55	6	161	11	812
4:45 PM	117	71	24	9	40	39	47	192	58	13	175	15	800
5:00 PM	88	98	23	9	53	75	86	128	32	8	188	9	797
5:15 PM	104	134	14	14	30	44	56	220	53	15	159	10	853
5:30 PM	104	164	33	20	48	61	56	212	62	10	174	10	954
5:45 PM	98	116	16	19	31	33	40	179	53	8	137	6	736
VOLUMES	857	831	154	102	352	378	412	1,369	418	77	1,315	72	6,337
APPROACH %	47%	45%	8%	12%	42%	45%	19%	62%	19%	5%	90%	5%	
APP/DEPART	1,842	/	1,267	832	/	847	2,199	/	1,623	1,464	/	2,600	0
BEGIN PEAK HR		4:45 PM											
VOLUMES	413	467	94	52	171	219	245	752	205	46	696	44	3,404
APPROACH %	42%	48%	10%	12%	39%	50%	20%	63%	17%	6%	89%	6%	
PEAK HR FACTOR		0.809			0.807			0.911			0.959		0.892
APP/DEPART	974	/	732	442	/	422	1,202	/	896	786	/	1,354	0

U-TURNS

	NB	SB	EB	WB	TTL
LANES	0	0	0	0	
7:00 AM	0	0	1	0	1
7:15 AM	0	0	5	0	5
7:30 AM	0	0	9	0	9
7:45 AM	0	0	2	0	2
8:00 AM	0	2	3	0	5
8:15 AM	0	0	5	0	5
8:30 AM	0	0	5	0	5
8:45 AM	0	0	2	0	2
VOLUMES	0	2	32	0	34
4:00 PM	0	0	9	0	9
4:15 PM	0	0	8	0	8
4:30 PM	0	0	3	0	3
4:45 PM	0	0	9	0	9
5:00 PM	0	0	5	0	5
5:15 PM	0	2	5	0	7
5:30 PM	0	0	7	0	7
5:45 PM	0	0	4	0	4
VOLUMES	0	2	50	0	52



PEDESTRIAN + BIKE CROSSINGS

	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL
AM 7:00 AM	0	2	2	1	5
7:15 AM	0	2	7	7	16
7:30 AM	3	3	3	7	16
7:45 AM	5	4	12	2	23
8:00 AM	1	8	8	1	18
8:15 AM	1	1	0	0	2
8:30 AM	1	3	4	0	8
8:45 AM	1	0	1	0	2
TOTAL	12	23	37	18	90
PM 4:00 PM	3	3	16	2	24
4:15 PM	0	0	3	0	3
4:30 PM	0	1	0	2	3
4:45 PM	1	1	1	8	11
5:00 PM	2	7	4	2	15
5:15 PM	0	5	1	0	6
5:30 PM	0	0	1	0	1
5:45 PM	0	0	0	0	0
TOTAL	6	17	26	14	63

PEDESTRIAN CROSSINGS

	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL
AM 7:00 AM	0	1	1	1	3
7:15 AM	0	1	6	7	14
7:30 AM	1	3	3	6	13
7:45 AM	5	3	12	2	22
8:00 AM	1	8	8	1	18
8:15 AM	1	1	0	0	2
8:30 AM	1	2	2	0	5
8:45 AM	0	0	1	0	1
TOTAL	9	19	33	17	78
PM 4:00 PM	3	2	14	2	21
4:15 PM	0	0	3	0	3
4:30 PM	0	1	0	2	3
4:45 PM	1	0	1	8	10
5:00 PM	1	5	1	1	8
5:15 PM	0	5	0	0	5
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
TOTAL	5	13	19	13	50

BICYCLE CROSSINGS

	NS	SS	ES	WS	TOTAL
AM 7:00 AM	0	1	1	0	2
7:15 AM	0	1	1	0	2
7:30 AM	2	0	0	1	3
7:45 AM	0	1	0	0	1
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	1	2	0	3
8:45 AM	1	0	0	0	1
TOTAL	3	4	4	1	12
PM 4:00 PM	0	1	2	0	3
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	1	0	0	1
5:00 PM	1	2	3	1	7
5:15 PM	0	0	1	0	1
5:30 PM	0	0	1	0	1
5:45 PM	0	0	0	0	0
TOTAL	1	4	7	1	13

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

Melrose (north)

1,828	**654**	**971**	**203**	TOTAL
832	378	352	102	PM
996	276	619	101	AM

TOTAL	**2,031**
PM	1,267
AM	764

Orangethorpe (west)

	TOTAL	PM	AM
	4,444	2,600	1,844
	719	412	307
	2,601	1,369	1,232
	1,121	418	703
	4,441	**2,199**	**2,242**

Orangethorpe (east)

	AM	PM	TOTAL
	1,253	**1,464**	**2,717**
	68	72	**140**
	1,108	1,315	**2,423**
	77	77	**154**
	1,423	1,623	**3,046**

Melrose (south)

1,399	AM	428	419	92	**939**
847	PM	857	831	154	**1,842**
2,246	TOTAL	**1,285**	**1,250**	**246**	**2,781**

Melrose (north)

1,065	**371**	**583**	**111**	TOTAL
442	219	171	52	PM
623	152	412	59	AM

TOTAL	**1,208**
PM	732
AM	476

Orangethorpe (west)

	TOTAL	PM	AM
	2,328	1,354	974
	420	245	175
	1,424	752	672
	587	205	382
	2,431	**1,202**	**1,229**

PEAK HOUR

AM 7:30 AM

PM 4:45 PM

Orangethorpe (east)

	AM	PM	TOTAL
	657	**786**	**1,443**
	41	44	**85**
	572	696	**1,268**
	44	46	**90**
	794	896	**1,690**

Melrose (south)

838	AM	231	277	65	**573**
422	PM	413	467	94	**974**
1,260	Total	**644**	**744**	**159**	**1,547**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:				
Tue, Feb 23, 16	LOCATION: Placentia		PROJECT #:	SC0856
	NORTH & SOUTH: Kraemer		LOCATION #:	11
	EAST & WEST: Orangethorpe		CONTROL:	SIGNAL

NOTES:

AM / PM / MD / OTHER / OTHER

▲ N / ◄ W / E ► / S ▼

☑ Add U-Turns to Left Turns

	NORTHBOUND Kraemer			SOUTHBOUND Kraemer			EASTBOUND Orangethorpe			WESTBOUND Orangethorpe			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
LANES:	1	2	1	1	2	1	2	1	1	1	2	0	
AM 7:00 AM	28	66	3	10	268	70	10	37	74	29	36	8	639
7:15 AM	54	85	7	3	310	59	27	9	80	45	15	12	706
7:30 AM	77	138	7	1	320	59	41	12	94	26	21	18	814
7:45 AM	65	120	3	4	335	63	51	13	105	23	17	9	808
8:00 AM	62	103	4	4	277	55	64	8	114	29	13	20	753
8:15 AM	50	112	8	3	279	77	54	14	103	17	14	9	740
8:30 AM	67	92	8	11	205	55	38	9	104	22	16	12	639
8:45 AM	73	84	5	5	206	60	43	10	116	18	22	3	645
VOLUMES	476	800	45	41	2,200	498	328	112	790	209	154	91	5,744
APPROACH %	36%	61%	3%	1%	80%	18%	27%	9%	64%	46%	34%	20%	
APP/DEPART	1,321	/	1,219	2,739	/	3,199	1,230	/	198	454	/	1,128	0
BEGIN PEAK HR		7:30 AM											
VOLUMES	254	473	22	12	1,211	254	210	47	416	95	65	56	3,115
APPROACH %	34%	63%	3%	1%	82%	17%	31%	7%	62%	44%	30%	26%	
PEAK HR FACTOR		0.843			0.919			0.905			0.831		0.957
APP/DEPART	749	/	739	1,477	/	1,722	673	/	81	216	/	573	0
PM 4:00 PM	118	252	16	10	175	47	58	14	76	10	22	7	805
4:15 PM	84	272	14	9	156	50	87	9	74	13	11	12	791
4:30 PM	116	254	4	18	111	55	131	16	104	9	13	13	844
4:45 PM	84	302	17	13	155	42	106	14	81	17	11	8	850
5:00 PM	96	324	15	5	136	57	123	20	115	10	8	10	919
5:15 PM	82	332	18	15	162	70	158	20	85	25	7	7	981
5:30 PM	83	318	17	6	146	45	140	22	99	26	9	13	924
5:45 PM	87	297	12	13	124	64	124	20	79	10	6	13	849
VOLUMES	750	2,351	113	89	1,165	430	927	135	713	120	87	83	6,963
APPROACH %	23%	73%	4%	5%	69%	26%	52%	8%	40%	41%	30%	29%	
APP/DEPART	3,214	/	3,365	1,684	/	1,998	1,775	/	333	290	/	1,267	0
BEGIN PEAK HR		4:45 PM											
VOLUMES	345	1,276	67	39	599	214	527	76	380	78	35	38	3,674
APPROACH %	20%	76%	4%	5%	70%	25%	54%	8%	39%	52%	23%	25%	
PEAK HR FACTOR		0.970			0.862			0.934			0.786		0.936
APP/DEPART	1,688	/	1,841	852	/	1,057	983	/	182	151	/	594	0

U-TURNS	NB	SB	EB	WB	TTL
LANES	0	0	0	0	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
4:00 PM	0	0	0	0	0
4:15 PM	0	1	0	0	1
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	3	0	0	3
VOLUMES	0	4	0	0	4

Kraemer

← NORTH SIDE →

Orangethorpe WEST SIDE EAST SIDE **Orangethorpe**

← SOUTH SIDE →

Kraemer

	PEDESTRIAN + BIKE CROSSINGS					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	3	0	2	6	11	3	0	2	1	6	0	0	0	5	5
7:15 AM	7	0	2	0	9	6	0	0	0	6	1	0	2	0	3
7:30 AM	5	0	2	3	10	4	0	1	3	8	1	0	1	0	2
7:45 AM	1	3	3	2	9	1	3	1	1	6	0	0	2	1	3
8:00 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2
8:15 AM	3	0	0	1	4	2	0	0	0	2	1	0	0	1	2
8:30 AM	0	0	1	3	4	0	0	0	2	2	0	0	1	1	2
8:45 AM	1	0	0	1	2	1	0	0	1	2	0	0	0	0	0
TOTAL	20	3	10	18	51	17	3	4	8	32	3	0	6	10	19
PM 4:00 PM	1	1	0	5	7	1	1	0	4	6	0	0	0	1	1
4:15 PM	2	0	3	5	10	2	0	0	0	2	0	0	3	5	8
4:30 PM	5	0	0	0	5	5	0	0	0	5	0	0	0	0	0
4:45 PM	0	3	1	4	8	0	2	0	3	5	0	1	1	1	3
5:00 PM	0	1	0	8	9	0	1	0	1	2	0	0	0	7	7
5:15 PM	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	2	1	4	1	8	2	1	4	1	8	0	0	0	0	0
TOTAL	10	9	8	23	50	10	8	4	9	31	0	1	4	14	19

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC0856

ALL HOURS

Kraemer (north)

TOTAL	**4,423**	**928**	**3,365**	**130**
PM	**1,684**	430	1,165	89
AM	**2,739**	498	2,200	41

TOTAL	**4,584**
PM	3,365
AM	1,219

Orangethorpe (west)

TOTAL	**2,395**
PM	1,267
AM	1,128

TOTAL	**1,255**	**247**	**1,503**	**3,005**
PM	927	135	713	**1,775**
AM	328	112	790	**1,230**

Orangethorpe (east)

AM	**454**	91	154	209
PM	**290**	83	87	120
TOTAL	**744**	**174**	**241**	**329**

AM	198
PM	333
TOTAL	**531**

Kraemer (south)

AM	3,199
PM	1,998
TOTAL	**5,197**

AM	476	800	45	**1,321**
PM	750	2,351	113	**3,214**
TOTAL	**1,226**	**3,151**	**158**	**4,535**

PEAK HOUR

AM 7:30 AM

PM 4:45 PM

Kraemer (north)

TOTAL	**2,329**	**468**	**1,810**	**51**
PM	**852**	214	599	39
AM	**1,477**	254	1,211	12

TOTAL	**2,580**
PM	1,841
AM	739

Orangethorpe (west)

TOTAL	**1,167**
PM	594
AM	573

TOTAL	**737**	**123**	**796**	**1,656**
PM	527	76	380	**983**
AM	210	47	416	**673**

Orangethorpe (east)

AM	**216**	56	65	95
PM	**151**	38	35	78
TOTAL	**367**	**94**	**100**	**173**

AM	81
PM	182
TOTAL	**263**

Kraemer (south)

AM	1,722
PM	1,057
Total	**2,779**

AM	254	473	22	**749**
PM	345	1,276	67	**1,688**
Total	**599**	**1,749**	**89**	**2,437**

APPENDIX C

LOS Analysis Worksheets – Existing Year 2016 without Project

APPENDIX C-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Existing Year 2016 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Fullerton

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	61	0	0		----		
SB Thru	48	1	1700	109/1,700=	0.064		
SB Right	139	1	1700	139/1,700=	0.082	< ==	0.082
EB Left	0	0	0		----		
EB Thru	512	2	3400	512/3,400=	0.151		
EB Right	553	1	1700	553/1,700=	0.325		
WB Left	306	1	1700	306/1,700=	0.180		
WB Thru	1799	2	3400	1,799/3,400=	0.529	< ==	
WB Right	0	0	0		----		0.529

Sum of Critical V/C Ratios	0.611
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.661**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Existing Year 2016 w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Fullerton

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	116	0	0		----		
SB Thru	95	1	1700	211/1,700=	0.124	< ==	
SB Right	204	1	1700	204/1,700=	0.120		0.124
EB Left	0	0	0		----		
EB Thru	889	2	3400	889/3,400=	0.261		
EB Right	583	1	1700	583/1,700=	0.343		
WB Left	163	1	1700	163/1,700=	0.096		
WB Thru	1683	2	3400	1,683/3,400=	0.495	< ==	
WB Right	0	0	0		----		0.495

Sum of Critical V/C Ratios	0.619
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.669**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Existing Year 2016 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	964	2	3400	964/3,400=	0.280	< ==	
NB Thru	0	0	0		----		
NB Right	244	1	1700	244/1,700=	0.144		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.280
EB Left	106	1	1700	106/1,700=	0.062	< ==	
EB Thru	468	2	3400	468/3,400=	0.138		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1136	2	3400	1,260/3,400=	0.371	< ==	
WB Right	124	0	0		----		0.433
Sum of Critical V/C Ratios							0.713
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.763**
Level of Service (LOS) - Refer to table below							**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps
Scenario: Existing Year 2016 w/o Project   Peak Hr: 5:00 - 6:00 PM
Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	817	2	3400	817/3,400=	0.240	< ==	
NB Thru	0	0	0		----		
NB Right	407	1	1700	407/1,700=	0.239		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.240
EB Left	153	1	1700	153/1,700=	0.090	< ==	
EB Thru	830	2	3400	830/3,400=	0.244		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1037	2	3400	1,250/3,400=	0.368	< ==	
WB Right	213	0	0		----		0.458

Sum of Critical V/C Ratios	0.698
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.748**
Level of Service (LOS) - Refer to table below	**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Existing Year 2016 w/o Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	340	2	3400	340/3,400=	0.100	< ==	
NB Thru	415	2	3400	484/3,400=	0.140		
NB Right	69	0	0		----		
SB Left	138	1	1700	138/1,700=	0.081		
SB Thru	643	2	3400	834/3,400=	0.245	< ==	
SB Right	191	0	0		----		0.345
EB Left	135	2	3400	135/3,400=	0.040	< ==	
EB Thru	520	2	3400	520/3,400=	0.153		
EB Right	154	1	1700	154/1,700=	0.091		
WB Left	104	1	1700	104/1,700=	0.061		
WB Thru	950	2	3400	950/3,400=	0.279	< ==	
WB Right	49	1	1700	49/1,700=	0.029		0.319

Sum of Critical V/C Ratios	0.664
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.714**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Existing Year 2016 w/o Project   Peak Hr: 4:45 - 5:45 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	494	2	3400	494/3,400=	0.150		
NB Thru	669	2	3400	759/3,400=	0.220	< ==	
NB Right	90	0	0		----		
SB Left	199	1	1700	199/1,700=	0.117	< ==	
SB Thru	437	2	3400	630/3,400=	0.185		
SB Right	193	0	0		----		0.337
EB Left	260	2	3400	260/3,400=	0.076		
EB Thru	801	2	3400	801/3,400=	0.236	< ==	
EB Right	172	1	1700	172/1,700=	0.101		
WB Left	80	1	1700	80/1,700=	0.047	< ==	
WB Thru	700	2	3400	700/3,400=	0.206		
WB Right	116	1	1700	116/1,700=	0.068		0.283

Sum of Critical V/C Ratios	0.620
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.670**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Existing Year 2016 w/o Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	193	1	1700	193/1,700=	0.110	< ==	
NB Thru	350	3	5100	511/5,100=	0.100		
NB Right	161	0	0		----		
SB Left	27	1	1700	27/1,700=	0.016		
SB Thru	1065	3	5100	1,298/5,100=	0.255	< ==	
SB Right	233	0	0		----		0.365
EB Left	177	1	1700	177/1,700=	0.104	< ==	
EB Thru	305	2	3400	305/3,400=	0.090		
EB Right	330	1	1700	330/1,700=	0.194		
WB Left	235	1	1700	235/1,700=	0.138		
WB Thru	478	2	3400	478/3,400=	0.141	< ==	
WB Right	68	1	1700	68/1,700=	0.040		0.245
Sum of Critical V/C Ratios							0.610
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.660**
Level of Service (LOS) - Refer to table below							**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Existing Year 2016 w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	259	1	1700	259/1,700=	0.150		
NB Thru	1323	3	5100	1,552/5,100=	0.300	< ==	
NB Right	229	0	0		----		
SB Left	53	1	1700	53/1,700=	0.031	< ==	
SB Thru	575	3	5100	776/5,100=	0.152		
SB Right	201	0	0		----		0.331
EB Left	238	1	1700	238/1,700=	0.140	< ==	
EB Thru	362	2	3400	362/3,400=	0.106		
EB Right	242	1	1700	242/1,700=	0.142		
WB Left	145	1	1700	145/1,700=	0.085		
WB Thru	339	2	3400	339/3,400=	0.100	< ==	
WB Right	44	1	1700	44/1,700=	0.026		0.240

Sum of Critical V/C Ratios	0.571
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.621**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Existing Year 2016 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	10	1	1700	10/1,700=	0.010	< ==	
NB Thru	524	2	3400	587/3,400=	0.170		
NB Right	63	0	0		----		
SB Left	114	1	1700	114/1,700=	0.067		
SB Thru	818	2	3400	818/3,400=	0.241	< ==	
SB Right	34	1	1700	34/1,700=	0.020		0.251
EB Left	14	1	1700	14/1,700=	0.008		
EB Thru	10	1	1700	31/1,700=	0.018	< ==	
EB Right	21	0	0		----		
WB Left	162	1	1700	162/1,700=	0.095	< ==	
WB Thru	20	1	1700	20/1,700=	0.012		
WB Right	55	1	1700	55/1,700=	0.032		0.113
Sum of Critical V/C Ratios							0.364
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.414**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Existing Year 2016 w/o Project — Peak Hr: 4:30 - 5:30 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	23	1	1700	23/1,700=	0.010		
NB Thru	827	2	3400	925/3,400=	0.270	< ==	
NB Right	98	0	0		----		
SB Left	67	1	1700	67/1,700=	0.039	< ==	
SB Thru	567	2	3400	567/3,400=	0.167		
SB Right	68	1	1700	68/1,700=	0.040		0.309
EB Left	160	1	1700	160/1,700=	0.094		
EB Thru	39	1	1700	188/1,700=	0.111	< ==	
EB Right	149	0	0		----		
WB Left	71	1	1700	71/1,700=	0.042	< ==	
WB Thru	27	1	1700	27/1,700=	0.016		
WB Right	35	1	1700	35/1,700=	0.021		0.153

Sum of Critical V/C Ratios	0.462
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.512**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Existing Year 2016 w/o Project | Peak Hr: 7:15 - 8:15 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	56	1	1700	56/1,700=	0.030	< ==	
NB Thru	290	2	3400	330/3,400=	0.100		
NB Right	40	0	0		----		
SB Left	17	1	1700	17/1,700=	0.010		
SB Thru	428	2	3400	484/3,400=	0.142	< ==	
SB Right	56	0	0		----		0.172
EB Left	11	1	1700	11/1,700=	0.006	< ==	
EB Thru	51	1	1700	51/1,700=	0.030		
EB Right	114	1	1700	114/1,700=	0.067		
WB Left	54	1	1700	54/1,700=	0.032		
WB Thru	136	1	1700	136/1,700=	0.080	< ==	
WB Right	10	1	1700	10/1,700=	0.006		0.086

Sum of Critical V/C Ratios	0.258
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.308**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Existing Year 2016 w/o Project — Peak Hr: 4:30 - 5:30 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	122	1	1700	122/1,700=	0.070		
NB Thru	423	2	3400	460/3,400=	0.140	< ==	
NB Right	37	0	0		----		
SB Left	8	1	1700	8/1,700=	0.005	< ==	
SB Thru	197	2	3400	220/3,400=	0.065		
SB Right	23	0	0		----		0.145
EB Left	21	1	1700	21/1,700=	0.012	< ==	
EB Thru	103	1	1700	103/1,700=	0.061		
EB Right	65	1	1700	65/1,700=	0.038		
WB Left	48	1	1700	48/1,700=	0.028		
WB Thru	140	1	1700	140/1,700=	0.082	< ==	
WB Right	37	1	1700	37/1,700=	0.022		0.094

Sum of Critical V/C Ratios	0.239
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.289**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Existing Year 2016 w/o Project   Peak Hr: 7:15 - 8:15 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	44	1	1700	44/1,700=	0.030	< ==	
NB Thru	649	3	5100	654/5,100=	0.130		
NB Right	5	0	0		----		
SB Left	30	1	1700	30/1,700=	0.018		
SB Thru	1506	2	3400	1,506/3,400=	0.443	< ==	
SB Right	151	1	1700	151/1,700=	0.089		0.473
EB Left	31	1	1700	31/1,700=	0.018		
EB Thru	72	1	1700	115/1,700=	0.068	< ==	
EB Right	43	0	0		----		
WB Left	1	1	1700	1/1,700=	0.001	< ==	
WB Thru	82	1	1700	82/1,700=	0.048		
WB Right	34	1	1700	34/1,700=	0.020		0.069

Sum of Critical V/C Ratios	0.542
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.592**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Existing Year 2016 w/o Project | Peak Hr: 4:45 - 5:45 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	68	1	1700	68/1,700=	0.040		
NB Thru	1731	3	5100	1,733/5,100=	0.340	< ==	
NB Right	2	0	0		----		
SB Left	29	1	1700	29/1,700=	0.017	< ==	
SB Thru	794	2	3400	794/3,400=	0.234		
SB Right	65	1	1700	65/1,700=	0.038		0.357
EB Left	106	1	1700	106/1,700=	0.062	< ==	
EB Thru	122	1	1700	168/1,700=	0.099		
EB Right	46	0	0		----		
WB Left	4	1	1700	4/1,700=	0.002		
WB Thru	102	1	1700	102/1,700=	0.060	< ==	
WB Right	21	1	1700	21/1,700=	0.012		0.122

Sum of Critical V/C Ratios	0.479
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.529**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Existing Year 2016 w/o Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	41	1	1700	41/1,700=	0.020	< ==	
NB Thru	193	2	3400	193/3,400=	0.060		
NB Right	76	1	1700	76/1,700=	0.045		
SB Left	138	2	3400	138/3,400=	0.041		
SB Thru	232	2	3400	444/3,400=	0.131	< ==	
SB Right	212	0	0		----		0.151
EB Left	150	1	1700	150/1,700=	0.088	< ==	
EB Thru	484	3	5100	513/5,100=	0.101		
EB Right	29	0	0		----		
WB Left	106	1	1700	106/1,700=	0.062		
WB Thru	776	3	5100	776/5,100=	0.152	< ==	
WB Right	187	1	1700	187/1,700=	0.110		0.240

Sum of Critical V/C Ratios	0.391
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.441**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia
Scenario: Existing Year 2016 w/o Project — Peak Hr: 5:00 - 6:00 PM
Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	55	1	1700	55/1,700=	0.030	< ==	
NB Thru	314	2	3400	314/3,400=	0.090		
NB Right	93	1	1700	93/1,700=	0.055		
SB Left	255	2	3400	255/3,400=	0.075		
SB Thru	277	2	3400	505/3,400=	0.149	< ==	
SB Right	228	0	0		----		0.179
EB Left	194	1	1700	194/1,700=	0.114	< ==	
EB Thru	666	3	5100	709/5,100=	0.139		
EB Right	43	0	0		----		
WB Left	136	1	1700	136/1,700=	0.080		
WB Thru	830	3	5100	830/5,100=	0.163	< ==	
WB Right	241	1	1700	241/1,700=	0.142		0.277

Sum of Critical V/C Ratios	0.456
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.506**
Level of Service (LOS) - Refer to table below	**A**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Existing Year 2016 w/o Project | Peak Hr: 7:45 - 8:45 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	5	0	0		----		
NB Thru	12	1	1700	12/1,700=	0.010	< ==	
NB Right	17	1	1700	17/1,700=	0.010		
SB Left	265	1	1700	265/1,700=	0.156	< ==	
SB Thru	1	1	1700	190/1,700=	0.112		
SB Right	189	0	0		----		0.166
EB Left	117	2	3400	117/3,400=	0.034	< ==	
EB Thru	622	3	5100	625/5,100=	0.123		
EB Right	3	0	0		----		
WB Left	7	1	1700	7/1,700=	0.004		
WB Thru	840	3	5100	840/5,100=	0.165	< ==	
WB Right	294	1	1700	294/1,700=	0.173		0.199
Sum of Critical V/C Ratios							0.365
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.415**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Existing Year 2016 w/o Project   Peak Hr: 4:30 - 5:30 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	7	0	0		----		
NB Thru	12	1	1700	12/1,700=	0.010	< ==	
NB Right	10	1	1700	10/1,700=	0.006		
SB Left	151	1	1700	151/1,700=	0.089		
SB Thru	1	1	1700	258/1,700=	0.152	< ==	
SB Right	257	0	0		----		0.162
EB Left	231	2	3400	231/3,400=	0.068	< ==	
EB Thru	760	3	5100	760/5,100=	0.149		
EB Right	0	0	0		----		
WB Left	15	1	1700	15/1,700=	0.009		
WB Thru	833	3	5100	833/5,100=	0.163	< ==	
WB Right	301	1	1700	301/1,700=	0.177		0.231

Sum of Critical V/C Ratios	0.393
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.443**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/ Project　　Peak Hr: 7:45 - 8:45 AM

Analyst: GCW　　Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	347	0	0		----		
NB Thru	40	2	3400	387/3,400=	0.114		
NB Right	481	1	1700	481/1,700=	0.283	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.283
EB Left	200	2	3400	200/3,400=	0.059	< ==	
EB Thru	1370	3	5100	1,370/5,100=	0.269		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1346	3	5100	1,583/5,100=	0.310	< ==	
WB Right	237	0	0		----		0.369
Sum of Critical V/C Ratios							0.652
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.702**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/ Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	533	0	0		----		
NB Thru	25	2	3400	558/3,400=	0.164		
NB Right	735	1	1700	735/1,700=	0.432	< ==	
SB Left	0	0	0		----		
SB Thru	22	0	0		----		
SB Right	0	0	0		----		0.432
EB Left	246	2	3400	246/3,400=	0.072	< ==	
EB Thru	1279	3	5100	1,279/5,100=	0.251		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1883	3	5100	2,690/5,100=	0.527	< ==	
WB Right	807	0	0		----		0.599

Sum of Critical V/C Ratios	1.031
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.081**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Existing Year 2016 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	231	1	1700	231/1,700=	0.140	< ==	
NB Thru	277	2	3400	342/3,400=	0.100		
NB Right	65	0	0		----		
SB Left	59	1	1700	59/1,700=	0.035		
SB Thru	412	2	3400	564/3,400=	0.166	< ==	
SB Right	152	0	0		----		0.306
EB Left	175	2	3400	175/3,400=	0.051	< ==	
EB Thru	672	3	5100	1,054/5,100=	0.207		
EB Right	382	0	0		----		
WB Left	44	2	3400	44/3,400=	0.013		
WB Thru	945	3	5100	986/5,100=	0.193	< ==	
WB Right	41	0	0		----		0.244
Sum of Critical V/C Ratios							0.550
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.600**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Existing Year 2016 w/o Project — Peak Hr: 4:45 - 5:45 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	413	1	1700	413/1,700=	0.240	< ==	
NB Thru	467	2	3400	561/3,400=	0.170		
NB Right	94	0	0		----		
SB Left	52	1	1700	52/1,700=	0.031		
SB Thru	171	2	3400	390/3,400=	0.115	< ==	
SB Right	219	0	0		----		0.355
EB Left	245	2	3400	245/3,400=	0.072	< ==	
EB Thru	915	3	5100	1,120/5,100=	0.220		
EB Right	205	0	0		----		
WB Left	46	2	3400	46/3,400=	0.014		
WB Thru	964	3	5100	1,008/5,100=	0.198	< ==	
WB Right	44	0	0		----		0.270

Sum of Critical V/C Ratios	0.625
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.675**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Existing Year 2016 w/o Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	254	1	1700	254/1,700=	0.150	< ==	
NB Thru	473	2	3400	473/3,400=	0.140		
NB Right	22	1	1700	22/1,700=	0.013		
SB Left	12	1	1700	12/1,700=	0.007		
SB Thru	1211	2	3400	1,211/3,400=	0.356	< ==	
SB Right	254	1	1700	254/1,700=	0.149		0.506
EB Left	130	1	1700	130/1,700=	0.076		
EB Thru	469	2	3400	469/3,400=	0.138	< ==	
EB Right	273	1	1700	273/1,700=	0.161		
WB Left	140	1	1700	140/1,700=	0.082	< ==	
WB Thru	682	3	5100	714/5,100=	0.140		
WB Right	32	0	0		----		0.220
Sum of Critical V/C Ratios							0.726
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.776**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe
Scenario: Existing Year 2016 w/o Project | Peak Hr: 4:45 - 5:45 PM
Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	345	1	1700	345/1,700=	0.200		
NB Thru	1276	2	3400	1,276/3,400=	0.380	< ==	
NB Right	67	1	1700	67/1,700=	0.039		
SB Left	39	1	1700	39/1,700=	0.023	< ==	
SB Thru	599	2	3400	599/3,400=	0.176		
SB Right	214	1	1700	214/1,700=	0.126		0.403
EB Left	272	1	1700	272/1,700=	0.160	< ==	
EB Thru	570	2	3400	570/3,400=	0.168		
EB Right	146	1	1700	146/1,700=	0.086		
WB Left	57	1	1700	57/1,700=	0.034		
WB Thru	521	3	5100	542/5,100=	0.106	< ==	
WB Right	21	0	0		----		0.266

Sum of Critical V/C Ratios	0.669
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.719**
Level of Service (LOS) - Refer to table below	**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX C-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	512	553	306	1799	0	0	0	0	61	48	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1848	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1848	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	512	553	306	1799	0	0	0	0	61	48	139
RTOR Reduction (vph)	0	0	264	0	0	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	512	289	306	1799	0	0	0	0	0	109	83
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		44.6	44.6	29.0	77.6						13.4	13.4
Effective Green, g (s)		44.6	44.6	29.0	77.6						13.4	13.4
Actuated g/C Ratio		0.45	0.45	0.29	0.78						0.13	0.13
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1610	720	523	2801						247	216
v/s Ratio Prot		0.14		0.17	c0.50							
v/s Ratio Perm			0.18								0.06	0.05
v/c Ratio		0.32	0.40	0.59	0.64						0.44	0.38
Uniform Delay, d1		17.9	18.7	30.4	5.0						39.9	39.5
Progression Factor		0.36	0.40	0.87	0.80						1.00	1.00
Incremental Delay, d2		0.5	1.6	1.0	0.7						1.3	1.1
Delay (s)		6.9	9.1	27.5	4.7						41.1	40.7
Level of Service		A	A	C	A						D	D
Approach Delay (s)		8.1			8.0			0.0			40.9	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	111.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	889	583	163	1683	0	0	0	0	116	95	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1849	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1849	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	889	583	163	1683	0	0	0	0	116	95	204
RTOR Reduction (vph)	0	0	250	0	0	0	0	0	0	0	0	54
Lane Group Flow (vph)	0	889	333	163	1683	0	0	0	0	0	211	150
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		51.1	51.1	19.0	74.1						16.9	16.9
Effective Green, g (s)		51.1	51.1	19.0	74.1						16.9	16.9
Actuated g/C Ratio		0.51	0.51	0.19	0.74						0.17	0.17
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1844	825	342	2675						312	272
v/s Ratio Prot		0.25		0.09	c0.47							
v/s Ratio Perm			0.21								0.11	0.09
v/c Ratio		0.48	0.40	0.48	0.63						0.68	0.55
Uniform Delay, d1		15.9	15.1	36.1	6.3						39.0	38.1
Progression Factor		0.49	0.12	1.01	1.16						1.00	1.00
Incremental Delay, d2		0.9	1.4	0.6	0.7						5.7	2.4
Delay (s)		8.7	3.2	37.1	8.0						44.7	40.5
Level of Service		A	A	D	A						D	D
Approach Delay (s)		6.5			10.6			0.0			42.6	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	113.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	106	468	0	0	1136	124	964	0	244	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.99		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1805	3610			3557		1715	1638	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1805	3610			3557		1715	1638	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	106	468	0	0	1136	124	964	0	244	0	0	0
RTOR Reduction (vph)	0	0	0	0	8	0	0	41	87	0	0	0
Lane Group Flow (vph)	106	468	0	0	1252	0	492	455	133	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	9.6	58.7			45.1		32.3	32.3	32.3			
Effective Green, g (s)	9.6	58.7			45.1		32.3	32.3	32.3			
Actuated g/C Ratio	0.10	0.59			0.45		0.32	0.32	0.32			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	173	2119			1604		553	529	495			
v/s Ratio Prot	c0.06	0.13			c0.35							
v/s Ratio Perm							c0.29	0.28	0.09			
v/c Ratio	0.61	0.22			0.78		0.89	0.86	0.27			
Uniform Delay, d1	43.4	9.8			23.3		32.2	31.7	25.1			
Progression Factor	1.59	0.08			0.81		1.00	1.00	1.00			
Incremental Delay, d2	6.1	0.2			2.3		16.0	13.4	0.3			
Delay (s)	75.1	1.1			21.1		48.2	45.2	25.4			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		14.7			21.1			42.8			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	111.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	830	0	0	1037	213	817	0	407	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.97		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3518		1715	1630	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3518		1715	1630	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	153	830	0	0	1037	213	817	0	407	0	0	0
RTOR Reduction (vph)	0	0	0	0	16	0	0	42	119	0	0	0
Lane Group Flow (vph)	153	830	0	0	1234	0	433	383	247	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	12.0	61.3			45.3		29.7	29.7	29.7			
Effective Green, g (s)	12.0	61.3			45.3		29.7	29.7	29.7			
Actuated g/C Ratio	0.12	0.61			0.45		0.30	0.30	0.30			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	216	2212			1593		509	484	455			
v/s Ratio Prot	c0.08	0.23			c0.35							
v/s Ratio Perm							c0.25	0.23	0.16			
v/c Ratio	0.71	0.38			0.77		0.85	0.79	0.54			
Uniform Delay, d1	42.3	9.7			23.0		33.1	32.3	29.5			
Progression Factor	1.45	0.12			1.04		1.00	1.00	1.00			
Incremental Delay, d2	9.1	0.4			2.8		12.9	8.6	1.3			
Delay (s)	70.6	1.6			26.9		45.9	40.9	30.8			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		12.4			26.9			39.6			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	113.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	135	520	154	104	950	49	340	415	69	138	643	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3533		1805	3486	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3533		1805	3486	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	135	520	154	104	950	49	340	415	69	138	643	191
RTOR Reduction (vph)	0	0	80	0	0	34	0	14	0	0	29	0
Lane Group Flow (vph)	135	520	74	104	950	15	340	470	0	138	805	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.0	34.1	47.1	9.3	31.4	31.4	13.0	30.9		11.2	29.1	
Effective Green, g (s)	12.0	34.1	47.1	9.3	31.4	31.4	13.0	30.9		11.2	29.1	
Actuated g/C Ratio	0.12	0.34	0.47	0.09	0.31	0.31	0.13	0.31		0.11	0.29	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	420	1231	760	167	1133	507	455	1091		202	1014	
v/s Ratio Prot	0.04	c0.14	0.01	0.06	c0.26		c0.10	0.13		0.08	c0.23	
v/s Ratio Perm			0.03			0.01						
v/c Ratio	0.32	0.42	0.10	0.62	0.84	0.03	0.75	0.43		0.68	0.79	
Uniform Delay, d1	40.3	25.4	14.7	43.7	31.9	23.8	41.9	27.5		42.7	32.7	
Progression Factor	0.86	0.77	0.36	1.00	1.00	1.00	1.05	0.91		1.00	1.00	
Incremental Delay, d2	0.2	1.0	0.0	5.1	7.5	0.1	5.8	0.4		7.4	4.6	
Delay (s)	35.0	20.5	5.4	48.8	39.4	23.9	49.8	25.5		50.1	37.3	
Level of Service	C	C	A	D	D	C	D	C		D	D	
Approach Delay (s)		20.1			39.6			35.5			39.1	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	260	801	172	80	700	116	494	669	90	199	437	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3546		1805	3444	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3546		1805	3444	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	260	801	172	80	700	116	494	669	90	199	437	193
RTOR Reduction (vph)	0	0	65	0	0	62	0	10	0	0	52	0
Lane Group Flow (vph)	260	801	107	80	700	54	494	749	0	199	578	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.6	38.1	55.1	7.4	32.9	32.9	17.0	25.9		14.1	23.0	
Effective Green, g (s)	12.6	38.1	55.1	7.4	32.9	32.9	17.0	25.9		14.1	23.0	
Actuated g/C Ratio	0.13	0.38	0.55	0.07	0.33	0.33	0.17	0.26		0.14	0.23	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	441	1375	889	133	1187	531	595	918		254	792	
v/s Ratio Prot	0.07	c0.22	0.02	0.04	c0.19		c0.14	c0.21		0.11	0.17	
v/s Ratio Perm			0.05			0.03						
v/c Ratio	0.59	0.58	0.12	0.60	0.59	0.10	0.83	0.82		0.78	0.73	
Uniform Delay, d1	41.3	24.6	10.8	44.9	27.9	23.3	40.1	34.8		41.5	35.6	
Progression Factor	0.90	0.85	0.67	1.00	1.00	1.00	0.95	0.92		1.00	1.00	
Incremental Delay, d2	1.2	1.6	0.0	5.2	2.2	0.4	9.0	5.8		13.5	3.7	
Delay (s)	38.4	22.5	7.3	50.0	30.1	23.7	47.0	37.8		55.0	39.3	
Level of Service	D	C	A	D	C	C	D	D		D	D	
Approach Delay (s)		23.7			31.0			41.4			43.1	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	177	305	330	235	478	68	193	350	161	27	1065	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	4942		1805	5047	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	4942		1805	5047	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	177	305	330	235	478	68	193	350	161	27	1065	233
RTOR Reduction (vph)	0	0	212	0	0	56	0	71	0	0	33	0
Lane Group Flow (vph)	177	305	118	235	478	12	193	440	0	27	1265	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	12.3	14.1	14.1	15.6	17.4	17.4	13.1	47.4		4.6	38.9	
Effective Green, g (s)	12.3	14.1	14.1	15.6	17.4	17.4	13.1	47.4		4.6	38.9	
Actuated g/C Ratio	0.13	0.14	0.14	0.16	0.18	0.18	0.13	0.49		0.05	0.40	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	227	520	233	288	642	287	242	2397		84	2009	
v/s Ratio Prot	0.10	0.08		c0.13	c0.13		c0.11	0.09		0.01	c0.25	
v/s Ratio Perm			0.07			0.01						
v/c Ratio	0.78	0.59	0.51	0.82	0.74	0.04	0.80	0.18		0.32	0.63	
Uniform Delay, d1	41.4	39.1	38.6	39.7	38.0	33.2	41.0	14.2		45.0	23.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.5	1.7	1.7	16.1	4.7	0.1	16.5	0.2		2.2	1.5	
Delay (s)	56.9	40.8	40.3	55.8	42.7	33.3	57.5	14.4		47.3	25.1	
Level of Service	E	D	D	E	D	C	E	B		D	C	
Approach Delay (s)		44.1			45.8			26.2			25.6	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	97.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	238	362	242	145	339	44	259	1323	229	53	575	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4985	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4985	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	238	362	242	145	339	44	259	1323	229	53	575	201
RTOR Reduction (vph)	0	0	194	0	0	37	0	21	0	0	58	0
Lane Group Flow (vph)	238	362	48	145	339	7	259	1531	0	53	718	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	16.4	17.7	17.7	11.9	13.2	13.2	17.3	37.9		5.2	25.8	
Effective Green, g (s)	16.4	17.7	17.7	11.9	13.2	13.2	17.3	37.9		5.2	25.8	
Actuated g/C Ratio	0.18	0.20	0.20	0.13	0.15	0.15	0.20	0.43		0.06	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	333	720	322	242	537	240	352	2167		105	1449	
v/s Ratio Prot	c0.13	0.10		0.08	c0.09		c0.14	c0.30		0.03	0.14	
v/s Ratio Perm			0.03			0.00						
v/c Ratio	0.71	0.50	0.15	0.60	0.63	0.03	0.74	0.71		0.50	0.50	
Uniform Delay, d1	34.0	31.6	29.3	36.2	35.5	32.3	33.6	20.8		40.5	26.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.1	0.6	0.2	4.0	2.4	0.0	7.8	2.0		3.8	1.2	
Delay (s)	41.1	32.1	29.5	40.1	37.9	32.3	41.3	22.8		44.3	27.3	
Level of Service	D	C	C	D	D	C	D	C		D	C	
Approach Delay (s)		33.9			38.0			25.5			28.4	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	10	21	162	20	55	10	524	63	114	818	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1707		1805	1900	1615	1805	3552		1805	3610	1615
Flt Permitted	0.74	1.00		0.74	1.00	1.00	0.33	1.00		0.42	1.00	1.00
Satd. Flow (perm)	1414	1707		1400	1900	1615	619	3552		805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	10	21	162	20	55	10	524	63	114	818	34
RTOR Reduction (vph)	0	17	0	0	0	46	0	5	0	0	0	9
Lane Group Flow (vph)	14	14	0	162	20	9	10	582	0	114	818	26
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	17.0	17.0		17.0	17.0	17.0	75.0	75.0		75.0	75.0	75.0
Effective Green, g (s)	17.0	17.0		17.0	17.0	17.0	75.0	75.0		75.0	75.0	75.0
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.75	0.75		0.75	0.75	0.75
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	240	290		238	323	274	464	2664		603	2707	1211
v/s Ratio Prot		0.01			0.01			0.16			c0.23	
v/s Ratio Perm	0.01			c0.12		0.01	0.02			0.14		0.02
v/c Ratio	0.06	0.05		0.68	0.06	0.03	0.02	0.22		0.19	0.30	0.02
Uniform Delay, d1	34.8	34.7		39.0	34.8	34.6	3.2	3.7		3.6	4.0	3.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.19	0.18	0.00
Incremental Delay, d2	0.1	0.1		7.8	0.1	0.1	0.1	0.2		0.6	0.2	0.0
Delay (s)	34.9	34.8		46.7	34.9	34.7	3.3	3.9		1.3	1.0	0.0
Level of Service	C	C		D	C	C	A	A		A	A	A
Approach Delay (s)		34.8			42.9			3.9			1.0	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	39	149	71	27	35	23	827	98	67	567	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.88		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1674		1805	1900	1615	1805	3553		1805	3610	1615
Flt Permitted	0.74	1.00		0.42	1.00	1.00	0.43	1.00		0.29	1.00	1.00
Satd. Flow (perm)	1405	1674		805	1900	1615	824	3553		546	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	160	39	149	71	27	35	23	827	98	67	567	68
RTOR Reduction (vph)	0	124	0	0	0	29	0	5	0	0	0	17
Lane Group Flow (vph)	160	64	0	71	27	6	23	920	0	67	567	51
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	16.9	16.9		16.9	16.9	16.9	75.1	75.1		75.1	75.1	75.1
Effective Green, g (s)	16.9	16.9		16.9	16.9	16.9	75.1	75.1		75.1	75.1	75.1
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.75	0.75		0.75	0.75	0.75
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	237	282		136	321	272	618	2668		410	2711	1212
v/s Ratio Prot		0.04			0.01			c0.26			0.16	
v/s Ratio Perm	c0.11			0.09		0.00	0.03			0.12		0.03
v/c Ratio	0.68	0.23		0.52	0.08	0.02	0.04	0.34		0.16	0.21	0.04
Uniform Delay, d1	39.0	35.9		37.9	35.0	34.7	3.2	4.2		3.5	3.7	3.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.23	0.23	0.00
Incremental Delay, d2	7.4	0.4		3.6	0.1	0.0	0.1	0.4		0.7	0.2	0.1
Delay (s)	46.4	36.3		41.5	35.1	34.7	3.3	4.5		1.6	1.0	0.1
Level of Service	D	D		D	D	C	A	A		A	A	A
Approach Delay (s)		40.9			38.4			4.5			1.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	51	114	54	136	10	56	290	40	17	428	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3544		1805	3547	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3544		1805	3547	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	51	114	54	136	10	56	290	40	17	428	56
RTOR Reduction (vph)	0	0	97	0	0	8	0	7	0	0	7	0
Lane Group Flow (vph)	11	51	17	54	136	2	56	323	0	17	477	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	1.2	11.0	11.0	4.7	14.5	14.5	4.8	42.5		1.2	38.9	
Effective Green, g (s)	1.2	11.0	11.0	4.7	14.5	14.5	4.8	42.5		1.2	38.9	
Actuated g/C Ratio	0.02	0.15	0.15	0.06	0.19	0.19	0.06	0.56		0.02	0.52	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	28	277	235	112	365	310	114	1997		28	1829	
v/s Ratio Prot	0.01	0.03		c0.03	c0.07		c0.03	c0.09		0.01	c0.13	
v/s Ratio Perm			0.01			0.00						
v/c Ratio	0.39	0.18	0.07	0.48	0.37	0.01	0.49	0.16		0.61	0.26	
Uniform Delay, d1	36.7	28.3	27.8	34.2	26.5	24.6	34.1	7.9		36.9	10.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.9	0.3	0.1	3.2	0.6	0.0	3.3	0.2		32.0	0.3	
Delay (s)	45.6	28.6	27.9	37.4	27.1	24.6	37.4	8.1		68.8	10.6	
Level of Service	D	C	C	D	C	C	D	A		E	B	
Approach Delay (s)		29.2			29.8			12.3			12.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	75.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	103	65	48	140	37	122	423	37	8	197	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3566		1805	3553	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3566		1805	3553	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	21	103	65	48	140	37	122	423	37	8	197	23
RTOR Reduction (vph)	0	0	56	0	0	31	0	4	0	0	7	0
Lane Group Flow (vph)	21	103	9	48	140	6	122	456	0	8	213	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	2.6	11.0	11.0	4.7	13.1	13.1	8.7	44.6		1.1	37.0	
Effective Green, g (s)	2.6	11.0	11.0	4.7	13.1	13.1	8.7	44.6		1.1	37.0	
Actuated g/C Ratio	0.03	0.14	0.14	0.06	0.17	0.17	0.11	0.58		0.01	0.48	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	60	270	229	109	321	273	202	2054		25	1698	
v/s Ratio Prot	0.01	0.05		c0.03	c0.07		c0.07	c0.13		0.00	0.06	
v/s Ratio Perm			0.01			0.00						
v/c Ratio	0.35	0.38	0.04	0.44	0.44	0.02	0.60	0.22		0.32	0.13	
Uniform Delay, d1	36.6	30.1	28.6	35.1	28.8	26.8	32.7	8.0		37.8	11.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.5	0.9	0.1	2.8	1.0	0.0	5.0	0.2		7.3	0.2	
Delay (s)	40.1	31.0	28.7	37.9	29.8	26.8	37.7	8.2		45.1	11.4	
Level of Service	D	C	C	D	C	C	D	A		D	B	
Approach Delay (s)		31.2			31.0			14.4			12.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	77.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	72	43	1	82	34	44	649	5	30	1506	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1793		1805	1900	1615	1805	5181		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1793		1805	1900	1615	1805	5181		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	72	43	1	82	34	44	649	5	30	1506	151
RTOR Reduction (vph)	0	25	0	0	0	30	0	0	0	0	0	50
Lane Group Flow (vph)	31	90	0	1	82	4	44	654	0	30	1506	101
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	2.7	10.2		0.9	8.4	8.4	4.5	44.3		2.6	42.4	42.4
Effective Green, g (s)	2.7	10.2		0.9	8.4	8.4	4.5	44.3		2.6	42.4	42.4
Actuated g/C Ratio	0.04	0.14		0.01	0.11	0.11	0.06	0.60		0.04	0.57	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	65	247		21	215	183	109	3101		63	2068	925
v/s Ratio Prot	c0.02	c0.05		0.00	0.04		c0.02	0.13		0.02	c0.42	
v/s Ratio Perm						0.00						0.06
v/c Ratio	0.48	0.36		0.05	0.38	0.02	0.40	0.21		0.48	0.73	0.11
Uniform Delay, d1	35.0	29.0		36.1	30.4	29.1	33.5	6.8		35.0	11.6	7.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	5.4	0.9		0.9	1.1	0.0	2.4	0.2		5.6	2.3	0.2
Delay (s)	40.4	29.9		37.1	31.5	29.2	35.9	7.0		40.6	13.9	7.4
Level of Service	D	C		D	C	C	D	A		D	B	A
Approach Delay (s)		32.1			30.9			8.8			13.8	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	106	122	46	4	102	21	68	1731	2	29	794	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1822		1805	1900	1615	1805	5186		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1822		1805	1900	1615	1805	5186		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	106	122	46	4	102	21	68	1731	2	29	794	65
RTOR Reduction (vph)	0	14	0	0	0	18	0	0	0	0	0	33
Lane Group Flow (vph)	106	154	0	4	102	3	68	1733	0	29	794	32
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	7.6	19.1		1.1	12.6	12.6	6.8	44.4		2.9	40.5	40.5
Effective Green, g (s)	7.6	19.1		1.1	12.6	12.6	6.8	44.4		2.9	40.5	40.5
Actuated g/C Ratio	0.09	0.23		0.01	0.15	0.15	0.08	0.53		0.03	0.49	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	164	416		23	286	243	146	2757		62	1750	783
v/s Ratio Prot	c0.06	c0.08		0.00	0.05		c0.04	c0.33		0.02	0.22	
v/s Ratio Perm						0.00						0.02
v/c Ratio	0.65	0.37		0.17	0.36	0.01	0.47	0.63		0.47	0.45	0.04
Uniform Delay, d1	36.7	27.1		40.8	31.8	30.2	36.6	13.8		39.5	14.2	11.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.5	0.6		3.6	0.8	0.0	2.3	1.1		5.5	0.9	0.1
Delay (s)	45.1	27.7		44.3	32.6	30.2	39.0	14.8		45.0	15.0	11.4
Level of Service	D	C		D	C	C	D	B		D	B	B
Approach Delay (s)		34.4			32.6			15.8			15.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	83.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	484	29	106	776	187	41	193	76	138	232	212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3351	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3351	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	150	484	29	106	776	187	41	193	76	138	232	212
RTOR Reduction (vph)	0	6	0	0	0	136	0	0	55	0	151	0
Lane Group Flow (vph)	150	507	0	106	776	51	41	193	21	138	293	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	20.5	36.0		14.5	30.0	30.0	10.5	30.0	30.0	10.5	30.0	
Effective Green, g (s)	20.5	36.0		14.5	30.0	30.0	10.5	30.0	30.0	10.5	30.0	
Actuated g/C Ratio	0.19	0.33		0.13	0.27	0.27	0.10	0.27	0.27	0.10	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	336	1683		237	1414	440	172	984	440	334	913	
v/s Ratio Prot	c0.08	0.10		0.06	c0.15		0.02	0.05		c0.04	c0.09	
v/s Ratio Perm						0.03			0.01			
v/c Ratio	0.45	0.30		0.45	0.55	0.12	0.24	0.20	0.05	0.41	0.32	
Uniform Delay, d1	39.7	27.6		44.1	34.2	30.0	46.0	30.7	29.5	46.8	31.9	
Progression Factor	0.69	0.51		0.52	0.69	1.51	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.8	0.4		5.8	1.5	0.5	3.2	0.4	0.2	3.7	0.9	
Delay (s)	31.2	14.5		28.9	25.0	45.8	49.3	31.2	29.7	50.6	32.8	
Level of Service	C	B		C	C	D	D	C	C	D	C	
Approach Delay (s)		18.3			29.0			33.2			37.0	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	194	666	43	136	830	241	55	314	93	255	277	228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3366	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3366	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	194	666	43	136	830	241	55	314	93	255	277	228
RTOR Reduction (vph)	0	6	0	0	0	153	0	0	78	0	147	0
Lane Group Flow (vph)	194	703	0	136	830	88	55	314	15	255	358	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	21.5	48.6		12.9	40.0	40.0	7.3	17.2	17.2	12.3	22.2	
Effective Green, g (s)	21.5	48.6		12.9	40.0	40.0	7.3	17.2	17.2	12.3	22.2	
Actuated g/C Ratio	0.20	0.44		0.12	0.36	0.36	0.07	0.16	0.16	0.11	0.20	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	352	2270		211	1886	587	119	564	252	391	679	
v/s Ratio Prot	c0.11	0.14		c0.08	c0.16		0.03	0.09		c0.07	c0.11	
v/s Ratio Perm						0.05			0.01			
v/c Ratio	0.55	0.31		0.64	0.44	0.15	0.46	0.56	0.06	0.65	0.53	
Uniform Delay, d1	39.9	19.9		46.4	26.5	23.6	49.5	42.9	39.5	46.8	39.2	
Progression Factor	1.23	1.25		0.60	0.67	1.18	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.6	0.3		6.4	0.7	0.5	2.8	1.2	0.1	3.9	0.7	
Delay (s)	50.6	25.1		34.4	18.5	28.4	52.3	44.1	39.6	50.7	40.0	
Level of Service	D	C		C	B	C	D	D	D	D	D	
Approach Delay (s)		30.6			22.2			44.1			43.6	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	32.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	622	3	7	840	294	5	12	17	265	1	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	0.99	
Satd. Flow (prot)	3502	5183		1805	5187	1615		1872	1615	1715	1559	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	0.99	
Satd. Flow (perm)	3502	5183		1805	5187	1615		1872	1615	1715	1559	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	117	622	3	7	840	294	5	12	17	265	1	189
RTOR Reduction (vph)	0	0	0	0	0	140	0	0	16	0	152	0
Lane Group Flow (vph)	117	625	0	7	840	154	0	17	1	238	65	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	8.9	64.9		2.3	57.8	57.8		4.3	4.3	21.7	21.7	
Effective Green, g (s)	8.9	64.9		2.3	57.8	57.8		4.3	4.3	21.7	21.7	
Actuated g/C Ratio	0.08	0.59		0.02	0.53	0.53		0.04	0.04	0.20	0.20	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	283	3057		37	2725	848		73	63	338	307	
v/s Ratio Prot	c0.03	0.12		0.00	c0.16			c0.01		c0.14	0.04	
v/s Ratio Perm						0.10			0.00			
v/c Ratio	0.41	0.20		0.19	0.31	0.18		0.23	0.01	0.70	0.21	
Uniform Delay, d1	48.1	10.5		52.9	14.8	13.7		51.3	50.8	41.2	37.0	
Progression Factor	0.86	0.40		0.93	0.80	2.15		1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.1		2.4	0.3	0.5		1.6	0.1	6.5	0.3	
Delay (s)	42.3	4.3		51.5	12.2	29.9		52.9	50.9	47.7	37.3	
Level of Service	D	A		D	B	C		D	D	D	D	
Approach Delay (s)		10.3			17.0			51.9			42.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	231	760	0	15	833	301	7	12	10	151	1	257
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5187		1805	5187	1615		1866	1615	1715	1546	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5187		1805	5187	1615		1866	1615	1715	1546	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	231	760	0	15	833	301	7	12	10	151	1	257
RTOR Reduction (vph)	0	0	0	0	0	139	0	0	10	0	218	0
Lane Group Flow (vph)	231	760	0	15	833	162	0	19	0	136	55	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	12.3	67.4		4.6	59.2	59.2		4.4	4.4	16.8	16.8	
Effective Green, g (s)	12.3	67.4		4.6	59.2	59.2		4.4	4.4	16.8	16.8	
Actuated g/C Ratio	0.11	0.61		0.04	0.54	0.54		0.04	0.04	0.15	0.15	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	391	3178		75	2791	869		74	64	261	236	
v/s Ratio Prot	c0.07	0.15		0.01	c0.16			c0.01		c0.08	0.04	
v/s Ratio Perm						0.10			0.00			
v/c Ratio	0.59	0.24		0.20	0.30	0.19		0.26	0.01	0.52	0.23	
Uniform Delay, d1	46.5	9.7		50.9	14.0	13.0		51.2	50.7	42.9	40.9	
Progression Factor	0.63	0.36		1.14	1.11	2.85		1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.3	0.2		1.2	0.3	0.4		1.8	0.0	1.9	0.5	
Delay (s)	31.7	3.7		59.5	15.8	37.6		53.1	50.7	44.8	41.5	
Level of Service	C	A		E	B	D		D	D	D	D	
Approach Delay (s)		10.2			22.1			52.3			42.6	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	784	0	0	824	190	315	0	462	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			5041		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			5041		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	122	784	0	0	824	190	315	0	462	0	0	0
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	77	0	0	0
Lane Group Flow (vph)	122	784	0	0	989	0	157	158	385	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	9.2	67.4			54.7		32.8	32.8	32.8			
Effective Green, g (s)	9.2	67.4			54.7		32.8	32.8	32.8			
Actuated g/C Ratio	0.08	0.61			0.50		0.30	0.30	0.30			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	292	3178			2506		511	511	481			
v/s Ratio Prot	c0.03	0.15			c0.20							
v/s Ratio Perm							0.09	0.09	c0.24			
v/c Ratio	0.42	0.25			0.39		0.31	0.31	0.80			
Uniform Delay, d1	47.9	9.7			17.3		29.8	29.8	35.6			
Progression Factor	1.15	1.12			0.36		1.00	1.00	1.00			
Incremental Delay, d2	1.0	0.2			0.4		0.3	0.3	9.2			
Delay (s)	55.9	11.1			6.7		30.2	30.2	44.8			
Level of Service	E	B			A		C	C	D			
Approach Delay (s)		17.1			6.7			38.9			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	224	702	0	0	956	541	194	0	347	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			4906		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			4906		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	224	702	0	0	956	541	194	0	347	0	0	0
RTOR Reduction (vph)	0	0	0	0	63	0	0	0	189	0	0	0
Lane Group Flow (vph)	224	702	0	0	1434	0	97	97	158	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	12.3	82.9			67.1		17.3	17.3	17.3			
Effective Green, g (s)	12.3	82.9			67.1		17.3	17.3	17.3			
Actuated g/C Ratio	0.11	0.75			0.61		0.16	0.16	0.16			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	391	3909			2992		269	269	253			
v/s Ratio Prot	c0.06	0.14			c0.29							
v/s Ratio Perm							0.06	0.06	c0.10			
v/c Ratio	0.57	0.18			0.48		0.36	0.36	0.63			
Uniform Delay, d1	46.4	3.9			11.8		41.4	41.4	43.3			
Progression Factor	0.92	1.69			0.41		1.00	1.00	1.00			
Incremental Delay, d2	2.0	0.1			0.4		0.8	0.8	4.8			
Delay (s)	44.9	6.6			5.3		42.2	42.2	48.1			
Level of Service	D	A			A		D	D	D			
Approach Delay (s)		15.9			5.3			46.0			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	672	382	44	945	41	231	277	65	59	412	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	4905		3502	5155		1805	3507		1805	3464	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	4905		3502	5155		1805	3507		1805	3464	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	175	672	382	44	945	41	231	277	65	59	412	152
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	175	1054	0	44	986	0	231	342	0	59	564	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.5	44.8		5.7	38.0		18.6	34.7		7.8	23.9	
Effective Green, g (s)	12.5	44.8		5.7	38.0		18.6	34.7		7.8	23.9	
Actuated g/C Ratio	0.11	0.41		0.05	0.35		0.17	0.32		0.07	0.22	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	397	1997		181	1780		305	1106		127	752	
v/s Ratio Prot	0.05	c0.21		0.01	c0.19		c0.13	0.10		0.03	c0.16	
v/s Ratio Perm												
v/c Ratio	0.44	0.53		0.24	0.55		0.76	0.31		0.46	0.75	
Uniform Delay, d1	45.5	24.6		50.1	29.1		43.5	28.6		49.1	40.3	
Progression Factor	0.93	0.93		1.49	0.66		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.9		0.5	0.8		10.3	0.2		2.7	4.2	
Delay (s)	43.3	24.0		74.9	20.2		53.8	28.7		51.8	44.5	
Level of Service	D	C		E	C		D	C		D	D	
Approach Delay (s)		26.7			22.5			38.8			45.2	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	245	915	205	46	964	44	413	467	94	52	171	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	5045		3502	5153		1805	3519		1805	3306	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	5045		3502	5153		1805	3519		1805	3306	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	245	915	205	46	964	44	413	467	94	52	171	219
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	245	1120	0	46	1008	0	413	561	0	52	390	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.6	39.2		5.8	32.4		28.0	40.6		7.4	20.0	
Effective Green, g (s)	12.6	39.2		5.8	32.4		28.0	40.6		7.4	20.0	
Actuated g/C Ratio	0.11	0.36		0.05	0.29		0.25	0.37		0.07	0.18	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	401	1797		184	1517		459	1298		121	601	
v/s Ratio Prot	0.07	c0.22		0.01	c0.20		c0.23	0.16		0.03	c0.12	
v/s Ratio Perm												
v/c Ratio	0.61	0.62		0.25	0.66		0.90	0.43		0.43	0.65	
Uniform Delay, d1	46.4	29.3		50.0	34.0		39.6	26.0		49.3	41.7	
Progression Factor	0.90	0.88		1.31	0.83		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.7	1.6		0.6	1.8		20.1	0.2		2.4	2.4	
Delay (s)	44.6	27.5		66.1	30.1		59.7	26.3		51.7	44.2	
Level of Service	D	C		E	C		E	C		D	D	
Approach Delay (s)		30.6			31.6			40.5			45.1	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	469	273	140	682	32	254	473	22	12	1211	254
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	130	469	273	140	682	32	254	473	22	12	1211	254
RTOR Reduction (vph)	0	0	209	0	5	0	0	0	10	0	0	137
Lane Group Flow (vph)	130	469	64	140	709	0	254	473	12	12	1211	117
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	10.5	21.1	21.1	10.7	21.3		19.0	60.7	60.7	1.5	43.2	43.2
Effective Green, g (s)	10.5	21.1	21.1	10.7	21.3		19.0	60.7	60.7	1.5	43.2	43.2
Actuated g/C Ratio	0.10	0.19	0.19	0.10	0.19		0.17	0.55	0.55	0.01	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	172	692	309	175	997		311	1992	891	24	1417	634
v/s Ratio Prot	0.07	0.13		c0.08	c0.14		c0.14	0.13		0.01	c0.34	
v/s Ratio Perm			0.04						0.01			0.07
v/c Ratio	0.76	0.68	0.21	0.80	0.71		0.82	0.24	0.01	0.50	0.85	0.18
Uniform Delay, d1	48.5	41.3	37.4	48.6	41.5		43.8	12.7	11.1	53.9	30.5	21.9
Progression Factor	1.13	1.49	4.82	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.8	2.4	0.3	22.4	2.4		15.2	0.3	0.0	15.4	6.8	0.6
Delay (s)	70.4	64.1	180.8	71.0	43.9		59.0	13.0	11.2	69.3	37.3	22.5
Level of Service	E	E	F	E	D		E	B	B	E	D	C
Approach Delay (s)		101.6			48.3			28.5			35.0	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	51.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	272	570	146	57	521	21	345	1276	67	39	599	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5157		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5157		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	272	570	146	57	521	21	345	1276	67	39	599	214
RTOR Reduction (vph)	0	0	109	0	4	0	0	0	35	0	0	150
Lane Group Flow (vph)	272	570	37	57	538	0	345	1276	32	39	599	64
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	17.0	28.2	28.2	7.5	18.7		25.4	52.9	52.9	5.4	32.9	32.9
Effective Green, g (s)	17.0	28.2	28.2	7.5	18.7		25.4	52.9	52.9	5.4	32.9	32.9
Actuated g/C Ratio	0.15	0.26	0.26	0.07	0.17		0.23	0.48	0.48	0.05	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	925	414	123	876		416	1736	776	88	1079	483
v/s Ratio Prot	c0.15	c0.16		0.03	0.10		c0.19	c0.35		0.02	0.17	
v/s Ratio Perm			0.02						0.02			0.04
v/c Ratio	0.98	0.62	0.09	0.46	0.61		0.83	0.74	0.04	0.44	0.56	0.13
Uniform Delay, d1	46.3	36.1	31.1	49.3	42.3		40.2	22.9	15.1	50.8	32.4	28.1
Progression Factor	1.10	1.56	5.55	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	42.9	1.0	0.1	2.7	1.3		12.8	2.8	0.1	3.5	2.1	0.6
Delay (s)	94.0	57.5	173.0	52.1	43.6		53.1	25.7	15.2	54.4	34.5	28.7
Level of Service	F	E	F	D	D		D	C	B	D	C	C
Approach Delay (s)		84.6			44.4			30.9			33.9	
Approach LOS		F			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	46.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX D

Existing Driveway Turning Movement Counts

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC1603
Wed, Mar 2, 16	NORTH & SOUTH:	Driveway	LOCATION #:	1
	EAST & WEST:	Crowther	CONTROL:	STOP N

NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W
E ►
S ▼

Add U-Turns to Left Turns

	NORTHBOUND Driveway			SOUTHBOUND Driveway			EASTBOUND Crowther			WESTBOUND Crowther				U-TURNS				
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
LANES:	0	1	0	0	0	0	0	2	0	0	1	0		X	X	X	X	
AM 7:00 AM	0	0	0	0	0	0	0	40	0	0	46	0	86	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	52	0	1	47	0	100	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	62	0	0	63	0	125	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	1	42	0	0	58	0	101	0	0	0	0	0
8:00 AM	0	0	0	1	0	0	0	29	0	1	51	0	82	0	0	0	0	0
8:15 AM	0	0	1	0	0	0	1	41	0	1	39	1	84	0	0	0	0	0
8:30 AM	0	0	2	1	0	0	0	34	0	0	44	0	81	0	0	0	0	0
8:45 AM	0	0	0	0	0	1	0	33	1	0	36	0	71	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	3	2	0	1	2	333	1	3	384	1	730	0	0	0	0	0
APPROACH %	0%	0%	100%	67%	0%	33%	1%	99%	0%	1%	99%	0%						
APP/DEPART	3	/	3	3	/	4	336	/	338	388	/	385	0					
BEGIN PEAK HR		7:00 AM																
VOLUMES	0	0	0	0	0	0	1	196	0	1	214	0	412					
APPROACH %	0%	0%	0%	0%	0%	0%	1%	99%	0%	0%	100%	0%						
PEAK HR FACTOR		0.000			0.000			0.794			0.853		0.824					
APP/DEPART	0	/	1	0	/	1	197	/	196	215	/	214	0					
PM 03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	1	0	51	0	1	59	1	113	0	0	0	0	0
4:15 PM	1	0	0	0	0	0	1	43	0	0	66	2	113	0	0	0	0	0
4:30 PM	1	0	0	0	0	0	1	36	0	0	76	1	115	0	0	0	0	0
4:45 PM	0	0	0	1	0	0	0	48	0	0	71	1	121	0	0	0	0	0
5:00 PM	0	0	1	1	0	1	0	46	0	0	74	1	124	0	0	0	0	0
5:15 PM	0	0	0	1	0	0	0	49	0	0	66	0	116	0	0	0	0	0
5:30 PM	0	0	0	2	0	1	1	36	0	0	62	0	102	0	0	1	0	1
5:45 PM	0	0	0	0	0	0	0	42	0	0	42	1	85	0	0	0	0	0
VOLUMES	2	0	1	5	0	3	3	351	0	1	516	7	889	0	0	1	0	1
APPROACH %	67%	0%	33%	63%	0%	38%	1%	99%	0%	0%	98%	1%						
APP/DEPART	3	/	9	8	/	1	354	/	357	524	/	522	0					
BEGIN PEAK HR		4:30 PM																
VOLUMES	1	0	1	3	0	1	1	179	0	0	287	3	476					
APPROACH %	50%	0%	50%	75%	0%	25%	1%	99%	0%	0%	99%	1%						
PEAK HR FACTOR		0.500			0.500			0.918			0.942		0.960					
APP/DEPART	2	/	4	4	/	0	180	/	183	290	/	289	0					

Driveway

NORTH SIDE

Crowther WEST SIDE EAST SIDE **Crowther**

SOUTH SIDE

Driveway

	ALL PED AND BIKE					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM 3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC1603

ALL HOURS

Driveway

TOTAL	**11**	**4**	**0**	**7**	**12**
PM	**8**	3	0	5	9
AM	**3**	1	0	2	3

Crowther (west)

TOTAL	**907**	**5**	**684**	**1**	**690**
PM	522	3	351	0	**354**
AM	385	2	333	1	**336**

Crowther (east)

AM	**388**	1	384	3	338
PM	**524**	7	516	1	357
TOTAL	**912**	**8**	**900**	**4**	**695**

Driveway

AM	4	0	0	3	**3**
PM	1	2	0	1	**3**
TOTAL	**5**	**2**	**0**	**4**	**6**

PEAK HOUR

AM 7:00 AM

PM 4:30 PM

Driveway

TOTAL	**4**	**1**	**0**	**3**	**5**
PM	**4**	1	0	3	4
AM	**0**	0	0	0	1

Crowther (west)

TOTAL	**503**	**2**	**375**	**0**	**377**
PM	289	1	179	0	**180**
AM	214	1	196	0	**197**

Crowther (east)

AM	**215**	0	214	1	196
PM	**290**	3	287	0	183
TOTAL	**505**	**3**	**501**	**1**	**379**

Driveway

AM	1	0	0	0	**0**
PM	0	1	0	1	**2**
Total	**1**	**1**	**0**	**1**	**2**

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC1603
Wed, Mar 2, 16	NORTH & SOUTH:	Driveway 2	LOCATION #:	2
	EAST & WEST:	Crowther	CONTROL:	STOP N

NOTES:

AM
PM
MD
OTHER
OTHER

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Add U-Turns to Left Turns

	NORTHBOUND Driveway 2			SOUTHBOUND Driveway 2			EASTBOUND Crowther			WESTBOUND Crowther				U-TURNS				
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL	NB	SB	EB	WB	TTL
LANES:	0	1	0	0	X	0	0	2	0	0	1	0		X	X	X	X	
AM 7:00 AM	2	0	0	0	0	0	0	31	0	1	42	1	77	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	1	54	0	3	42	0	100	0	0	0	0	0
7:30 AM	1	0	1	0	0	0	0	51	0	0	62	0	115	0	0	0	0	0
7:45 AM	1	0	0	0	0	0	0	54	1	0	57	0	113	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	37	0	1	54	0	92	0	0	0	0	0
8:15 AM	1	0	0	0	0	0	1	37	0	0	48	0	87	0	0	0	0	0
8:30 AM	0	0	1	0	0	1	1	39	2	2	41	1	88	0	0	0	2	2
8:45 AM	0	0	0	1	0	0	0	32	0	0	38	0	71	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VOLUMES	5	0	2	1	0	1	3	335	3	7	384	2	743	0	0	0	2	2
APPROACH %	71%	0%	29%	50%	0%	50%	1%	98%	1%	2%	98%	1%						
APP/DEPART	7	/	5	2	/	8	341	/	340	393	/	390	0					
BEGIN PEAK HR		7:15 AM																
VOLUMES	2	0	1	0	0	0	1	196	1	4	215	0	420					
APPROACH %	67%	0%	33%	0%	0%	0%	1%	99%	1%	2%	98%	0%						
PEAK HR FACTOR		0.375			0.000			0.900			0.883		0.913					
APP/DEPART	3	/	1	0	/	5	198	/	197	219	/	217	0					
PM 03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	1	0	1	0	0	0	0	54	4	1	67	0	128	0	0	0	0	0
4:15 PM	0	0	3	0	0	0	0	47	1	2	51	0	104	0	0	0	0	0
4:30 PM	0	0	4	0	0	0	0	38	1	2	70	0	115	0	0	0	0	0
4:45 PM	2	0	1	1	0	0	0	30	0	2	59	1	96	0	0	0	1	1
5:00 PM	1	0	0	1	0	0	0	50	1	0	86	0	139	0	0	0	0	0
5:15 PM	1	0	1	0	0	0	0	46	1	2	70	0	121	0	0	0	0	0
5:30 PM	3	0	1	0	0	0	0	42	0	0	52	0	98	0	0	0	0	0
5:45 PM	1	0	0	1	0	0	1	47	0	0	55	0	105	0	0	1	0	1
VOLUMES	9	0	11	3	0	0	1	354	8	9	510	1	906	0	0	1	1	2
APPROACH %	45%	0%	55%	100%	0%	0%	0%	98%	2%	2%	98%	0%						
APP/DEPART	20	/	1	3	/	16	363	/	369	520	/	520	0					
BEGIN PEAK HR		4:30 PM																
VOLUMES	4	0	6	2	0	0	0	164	3	6	285	1	471					
APPROACH %	40%	0%	60%	100%	0%	0%	0%	98%	2%	2%	98%	0%						
PEAK HR FACTOR		0.625			0.500			0.819			0.849		0.847					
APP/DEPART	10	/	1	2	/	8	167	/	173	292	/	289	0					

Driveway 2

NORTH SIDE

Crowther WEST SIDE EAST SIDE **Crowther**

SOUTH SIDE

Driveway 2

	ALL PED AND BIKE					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM 3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC1603

ALL HOURS

Driveway 2 (north leg)

						Departure
TOTAL	5	1	0	4	TOTAL	6
PM	3	0	0	3	PM	1
AM	2	1	0	1	AM	5

Crowther (west leg)

	TOTAL	PM	AM
Departure	910	520	390
	4	1	3
	689	354	335
	11	8	3
	704	363	341

Crowther (east leg)

	AM	PM	TOTAL
	393	520	913
	2	1	3
	384	510	894
	7	9	16
Departure	340	369	709

Driveway 2 (south leg)

Departure						
8	AM	5	0	2	7
16	PM	9	0	11	20
24	TOTAL	14	0	13	27

PEAK HOUR

AM 7:15 AM

PM 4:30 PM

Driveway 2 (north leg)

						Departure
TOTAL	2	0	0	2	TOTAL	2
PM	2	0	0	2	PM	1
AM	0	0	0	0	AM	1

Crowther (west leg)

	TOTAL	PM	AM
Departure	506	289	217
	1	0	1
	360	164	196
	4	3	1
	365	167	198

Crowther (east leg)

	AM	PM	TOTAL
	219	292	511
	0	1	1
	215	285	500
	4	6	10
Departure	197	173	370

Driveway 2 (south leg)

Departure						
5	AM	2	0	1	3
8	PM	4	0	6	10
13	Total	6	0	7	13

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC1603
Wed, Mar 2, 16	NORTH & SOUTH:	Goetz	LOCATION #:	3
	EAST & WEST:	Crowther	CONTROL:	STOP N/S

NOTES:

AM PM MD OTHER OTHER

▲ N ◄ W E ► S ▼

Add U-Turns to Left Turns

	NORTHBOUND Goetz			SOUTHBOUND Goetz			EASTBOUND Crowther			WESTBOUND Crowther			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0	1	0	1	2	0	0	1	0	
AM													
7:00 AM	0	0	0	0	0	0	1	29	1	0	44	2	77
7:15 AM	2	0	1	4	0	0	0	53	1	0	43	0	104
7:30 AM	0	0	0	0	0	0	0	52	0	0	62	0	114
7:45 AM	0	0	0	0	0	1	0	54	0	0	56	0	111
8:00 AM	0	0	0	1	0	0	0	35	2	4	55	0	97
8:15 AM	0	0	0	0	0	0	0	37	0	3	47	0	87
8:30 AM	1	0	0	0	0	0	0	41	1	0	44	0	87
8:45 AM	0	0	0	0	0	0	0	31	2	0	38	1	72
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
VOLUMES	3	0	1	5	0	1	1	332	7	7	389	3	749
APPROACH %	75%	0%	25%	83%	0%	17%	0%	98%	2%	2%	97%	1%	
APP/DEPART	4	/	4	6	/	14	340	/	338	399	/	393	0
BEGIN PEAK HR		7:15 AM											
VOLUMES	2	0	1	5	0	1	0	194	3	4	216	0	426
APPROACH %	67%	0%	33%	83%	0%	17%	0%	98%	2%	2%	98%	0%	
PEAK HR FACTOR		0.250			0.375			0.912			0.887		0.934
APP/DEPART	3	/	0	6	/	7	197	/	200	220	/	219	0
PM													
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	2	0	2	1	0	2	1	52	2	1	64	1	128
4:15 PM	1	0	1	0	0	0	0	50	0	0	52	1	105
4:30 PM	2	0	0	0	0	0	0	42	0	0	70	0	114
4:45 PM	2	0	1	1	0	0	0	32	1	0	60	0	97
5:00 PM	1	0	1	0	0	0	0	51	0	1	85	0	139
5:15 PM	0	0	4	1	0	1	0	47	0	0	71	3	127
5:30 PM	0	0	1	2	0	0	0	43	0	0	52	2	100
5:45 PM	0	0	1	1	0	1	1	46	1	0	54	1	106
VOLUMES	8	0	11	6	0	4	2	363	4	2	508	8	916
APPROACH %	42%	0%	58%	60%	0%	40%	1%	98%	1%	0%	98%	2%	
APP/DEPART	19	/	10	10	/	6	369	/	380	518	/	520	0
BEGIN PEAK HR		4:30 PM											
VOLUMES	5	0	6	2	0	1	0	172	1	1	286	3	477
APPROACH %	45%	0%	55%	67%	0%	33%	0%	99%	1%	0%	99%	1%	
PEAK HR FACTOR		0.688			0.375			0.848			0.843		0.858
APP/DEPART	11	/	3	3	/	2	173	/	180	290	/	292	0

U-TURNS

	NB	SB	EB	WB	TTL
	X	X	X	X	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
9:00 AM	0	0	0	0	0
9:15 AM	0	0	0	0	0
9:30 AM	0	0	0	0	0
9:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
03:00 PM	0	0	0	0	0
3:15 PM	0	0	0	0	0
3:30 PM	0	0	0	0	0
3:45 PM	0	0	0	0	0
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
VOLUMES	0	0	0	0	0

Goetz

NORTH SIDE

Crowther WEST SIDE EAST SIDE **Crowther**

SOUTH SIDE

Goetz

	ALL PED AND BIKE					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM															
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM															
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia

SC1603

ALL HOURS

Goetz (north)

16	**5**	**0**	**11**	**TOTAL**	**14**	
10	4	0	6	**PM**	10	
6	1	0	5	**AM**	4	

Crowther (west)

TOTAL	**913**	**3**	**695**	**11**	**709**
PM	520	2	363	4	**369**
AM	393	1	332	7	**340**

Crowther (east)

AM	**399**	3	389	7	338
PM	**518**	8	508	2	380
TOTAL	**917**	**11**	**897**	**9**	**718**

Goetz (south)

14	**AM**	3	0	1	**4**
6	**PM**	8	0	11	**19**
20	**TOTAL**	**11**	**0**	**12**	**23**

Goetz

PEAK HOUR

AM 7:15 AM

PM 4:30 PM

Goetz (north)

9	**2**	**0**	**7**	**TOTAL**	**3**	
3	1	0	2	**PM**	3	
6	1	0	5	**AM**	0	

Crowther (west)

TOTAL	**511**	**0**	**366**	**4**	**370**
PM	292	0	172	1	**173**
AM	219	0	194	3	**197**

Crowther (east)

AM	**220**	0	216	4	200
PM	**290**	3	286	1	180
TOTAL	**510**	**3**	**502**	**5**	**380**

Goetz (south)

7	**AM**	2	0	1	**3**
2	**PM**	5	0	6	**11**
9	**Total**	**7**	**0**	**7**	**14**

Goetz

INTERSECTION TURNING MOVEMENT COUNTS

PREPARED BY: AimTD LLC. tel: 714 253 7888 pacific@aimtd.com

DATE:	LOCATION:	Placentia	PROJECT #:	SC1603
Wed, Mar 2, 16	NORTH & SOUTH:	Evelyn	LOCATION #:	4
	EAST & WEST:	Crowther	CONTROL:	STOP N/S

NOTES:

AM
PM
MD
OTHER
OTHER

▲ N
◄ W
E ►
S ▼

Add U-Turns to Left Turns

	NORTHBOUND Evelyn			SOUTHBOUND Evelyn			EASTBOUND Crowther			WESTBOUND Crowther			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
LANES:	0	1	0	0	1	0	0	2	0	0	1	0	
AM 7:00 AM	0	0	1	1	0	0	0	28	0	1	45	0	76
7:15 AM	0	0	2	0	0	0	0	58	0	0	43	0	103
7:30 AM	0	0	0	1	0	0	0	50	0	1	61	2	115
7:45 AM	0	0	3	0	0	0	0	54	0	0	55	1	113
8:00 AM	0	0	3	1	0	0	0	35	1	0	60	0	100
8:15 AM	0	0	2	0	0	0	1	36	0	1	49	1	90
8:30 AM	0	0	2	0	0	1	0	41	0	0	42	1	87
8:45 AM	0	0	1	1	0	0	0	30	1	0	39	0	72
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
VOLUMES	0	0	14	4	0	1	1	332	2	3	394	5	756
APPROACH %	0%	0%	100%	80%	0%	20%	0%	99%	1%	1%	98%	1%	
APP/DEPART	14	/	6	5	/	5	335	/	350	402	/	395	0
BEGIN PEAK HR		7:15 AM											
VOLUMES	0	0	8	2	0	0	0	197	1	1	219	3	431
APPROACH %	0%	0%	100%	100%	0%	0%	0%	99%	1%	0%	98%	1%	
PEAK HR FACTOR		0.667			0.500			0.853			0.871		0.937
APP/DEPART	8	/	3	2	/	2	198	/	207	223	/	219	0
PM 03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	1	0	53	0	2	65	2	123
4:15 PM	0	0	1	0	0	0	0	48	2	0	54	1	106
4:30 PM	0	0	2	1	0	0	0	42	0	2	70	2	119
4:45 PM	0	0	0	0	0	0	0	33	1	2	69	1	106
5:00 PM	0	0	1	0	0	0	0	53	1	1	74	1	131
5:15 PM	0	0	3	0	0	0	0	53	0	3	73	1	133
5:30 PM	0	0	0	0	0	0	0	45	0	1	54	0	100
5:45 PM	0	0	1	0	0	0	0	48	0	1	56	0	106
VOLUMES	0	0	8	1	0	1	0	375	4	12	515	8	924
APPROACH %	0%	0%	100%	50%	0%	50%	0%	99%	1%	2%	96%	1%	
APP/DEPART	8	/	8	2	/	16	379	/	384	535	/	516	0
BEGIN PEAK HR		4:30 PM											
VOLUMES	0	0	6	1	0	0	0	181	2	8	286	5	489
APPROACH %	0%	0%	100%	100%	0%	0%	0%	99%	1%	3%	96%	2%	
PEAK HR FACTOR		0.500			0.250			0.847			0.971		0.919
APP/DEPART	6	/	5	1	/	10	183	/	188	299	/	286	0

U-TURNS

	NB	SB	EB	WB	TTL
	X	X	X	X	
7:00 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0
7:30 AM	0	0	0	0	0
7:45 AM	0	0	0	0	0
8:00 AM	0	0	0	0	0
8:15 AM	0	0	0	0	0
8:30 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0
9:00 AM	0	0	0	0	0
9:15 AM	0	0	0	0	0
9:30 AM	0	0	0	0	0
9:45 AM	0	0	0	0	0
VOLUMES	0	0	0	0	0
03:00 PM	0	0	0	0	0
3:15 PM	0	0	0	0	0
3:30 PM	0	0	0	0	0
3:45 PM	0	0	0	0	0
4:00 PM	0	0	0	0	0
4:15 PM	0	0	0	0	0
4:30 PM	0	0	0	0	0
4:45 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0
5:30 PM	0	0	0	0	0
5:45 PM	0	0	0	0	0
VOLUMES	0	0	0	0	0

Evelyn

NORTH SIDE

Crowther WEST SIDE

EAST SIDE **Crowther**

SOUTH SIDE

Evelyn

	ALL PED AND BIKE					PEDESTRIAN CROSSINGS					BICYCLE CROSSINGS				
	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	N SIDE	S SIDE	E SIDE	W SIDE	TOTAL	NS	SS	ES	WS	TOTAL
AM 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PM 3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

AimTD LLC

TURNING MOVEMENT COUNTS

Placentia
SC1603
ALL HOURS

Evelyn (north leg)

TOTAL	7	2	0	5
PM	2	1	0	1
AM	5	1	0	4

TOTAL	14
PM	8
AM	6

Crowther (west leg)

TOTAL	911
PM	516
AM	395

TOTAL	1	707	6	714
PM	0	375	4	379
AM	1	332	2	335

Crowther (east leg)

AM	402	5	394	3
PM	535	8	515	12
TOTAL	937	13	909	15

AM	350
PM	384
TOTAL	734

Evelyn (south leg)

AM	5
PM	16
TOTAL	21

AM	0	0	14	14
PM	0	0	8	8
TOTAL	0	0	22	22

PEAK HOUR

AM 7:15 AM

PM 4:30 PM

Evelyn (north leg)

TOTAL	3	0	0	3
PM	1	0	0	1
AM	2	0	0	2

TOTAL	8
PM	5
AM	3

Crowther (west leg)

TOTAL	505
PM	286
AM	219

TOTAL	0	378	3	381
PM	0	181	2	183
AM	0	197	1	198

Crowther (east leg)

AM	223	3	219	1
PM	299	5	286	8
TOTAL	522	8	505	9

AM	207
PM	188
TOTAL	395

Evelyn (south leg)

AM	2
PM	10
Total	12

AM	0	0	8	8
PM	0	0	6	6
Total	0	0	14	14

APPENDIX E

LOS Analysis Worksheets – Existing Year 2016 with Project

APPENDIX E-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	57	0	0		----		
SB Thru	48	1	1700	105/1,700=	0.062		
SB Right	139	1	1700	139/1,700=	0.082	< ==	0.082
EB Left	0	0	0		----		
EB Thru	512	2	3400	512/3,400=	0.151		
EB Right	553	1	1700	553/1,700=	0.325		
WB Left	306	1	1700	306/1,700=	0.180		
WB Thru	1799	2	3400	1,799/3,400=	0.529	< ==	
WB Right	0	0	0		----		0.529

Sum of Critical V/C Ratios	0.611
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.661**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Existing Year 2016 w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	129	0	0		----		
SB Thru	95	1	1700	224/1,700=	0.132	< ==	
SB Right	204	1	1700	204/1,700=	0.120		0.132
EB Left	0	0	0		----		
EB Thru	889	2	3400	889/3,400=	0.261		
EB Right	583	1	1700	583/1,700=	0.343		
WB Left	163	1	1700	163/1,700=	0.096		
WB Thru	1683	2	3400	1,683/3,400=	0.495	< ==	
WB Right	0	0	0		----		0.495

Sum of Critical V/C Ratios	0.627
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.677**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	964	2	3400	964/3,400=	0.280	< ==	
NB Thru	0	0	0		----		
NB Right	244	1	1700	244/1,700=	0.144		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.280
EB Left	106	1	1700	106/1,700=	0.062	< ==	
EB Thru	464	2	3400	464/3,400=	0.136		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1136	2	3400	1,273/3,400=	0.374	< ==	
WB Right	137	0	0		----		0.436
Sum of Critical V/C Ratios							0.716
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.766**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Existing Year 2016 w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	817	2	3400	817/3,400=	0.240	< ==	
NB Thru	0	0	0		----		
NB Right	407	1	1700	407/1,700=	0.239		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.240
EB Left	153	1	1700	153/1,700=	0.090	< ==	
EB Thru	843	2	3400	843/3,400=	0.248		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1037	2	3400	1,253/3,400=	0.369	< ==	
WB Right	216	0	0		----		0.459

Sum of Critical V/C Ratios	0.699
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.749**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	353	2	3400	353/3,400=	0.100	< ==	
NB Thru	441	2	3400	510/3,400=	0.150		
NB Right	69	0	0		----		
SB Left	138	1	1700	138/1,700=	0.081		
SB Thru	636	2	3400	827/3,400=	0.243	< ==	
SB Right	191	0	0		----		0.343
EB Left	135	2	3400	135/3,400=	0.040	< ==	
EB Thru	520	2	3400	520/3,400=	0.153		
EB Right	150	1	1700	150/1,700=	0.088		
WB Left	104	1	1700	104/1,700=	0.061		
WB Thru	950	2	3400	950/3,400=	0.279	< ==	
WB Right	49	1	1700	49/1,700=	0.029		0.319
Sum of Critical V/C Ratios							0.662
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.712**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Existing Year 2016 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	497	2	3400	497/3,400= 0.150		
NB Thru	675	2	3400	765/3,400= 0.230	< ==	
NB Right	90	0	0	----		
SB Left	199	1	1700	199/1,700= 0.117	< ==	
SB Thru	463	2	3400	656/3,400= 0.193		
SB Right	193	0	0	----		0.347
EB Left	260	2	3400	260/3,400= 0.076		
EB Thru	801	2	3400	801/3,400= 0.236	< ==	
EB Right	185	1	1700	185/1,700= 0.109		
WB Left	80	1	1700	80/1,700= 0.047	< ==	
WB Thru	700	2	3400	700/3,400= 0.206		
WB Right	116	1	1700	116/1,700= 0.068		0.283

Sum of Critical V/C Ratios	0.630
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.680**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	193	1	1700	193/1,700=	0.110	< ==	
NB Thru	363	3	5100	524/5,100=	0.100		
NB Right	161	0	0		----		
SB Left	27	1	1700	27/1,700=	0.016		
SB Thru	1061	3	5100	1,294/5,100=	0.254	< ==	
SB Right	233	0	0		----		0.364
EB Left	177	1	1700	177/1,700=	0.104	< ==	
EB Thru	305	2	3400	305/3,400=	0.090		
EB Right	330	1	1700	330/1,700=	0.194		
WB Left	235	1	1700	235/1,700=	0.138		
WB Thru	478	2	3400	478/3,400=	0.141	< ==	
WB Right	68	1	1700	68/1,700=	0.040		0.245

Sum of Critical V/C Ratios	0.609
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.659**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Existing Year 2016 w/ Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	259	1	1700	259/1,700=	0.150		
NB Thru	1326	3	5100	1,555/5,100=	0.300	< ==	
NB Right	229	0	0		----		
SB Left	53	1	1700	53/1,700=	0.031	< ==	
SB Thru	588	3	5100	789/5,100=	0.155		
SB Right	201	0	0		----		0.331
EB Left	238	1	1700	238/1,700=	0.140	< ==	
EB Thru	362	2	3400	362/3,400=	0.106		
EB Right	242	1	1700	242/1,700=	0.142		
WB Left	145	1	1700	145/1,700=	0.085		
WB Thru	339	2	3400	339/3,400=	0.100	< ==	
WB Right	44	1	1700	44/1,700=	0.026		0.240

Sum of Critical V/C Ratios	0.571
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.621**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Existing Year 2016 w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	10	1	1700	10/1,700=	0.010	< ==	
NB Thru	524	2	3400	571/3,400=	0.170		
NB Right	47	0	0		----		
SB Left	107	1	1700	107/1,700=	0.063		
SB Thru	818	2	3400	818/3,400=	0.241	< ==	
SB Right	34	1	1700	34/1,700=	0.020		0.251
EB Left	14	1	1700	14/1,700=	0.008		
EB Thru	10	1	1700	31/1,700=	0.018	< ==	
EB Right	21	0	0		----		
WB Left	227	1	1700	227/1,700=	0.134	< ==	
WB Thru	20	1	1700	20/1,700=	0.012		
WB Right	81	1	1700	81/1,700=	0.048		0.152
Sum of Critical V/C Ratios							0.403
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.453**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Existing Year 2016 w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	23	1	1700	23/1,700=	0.010		
NB Thru	827	2	3400	991/3,400=	0.290	< ==	
NB Right	164	0	0		----		
SB Left	93	1	1700	93/1,700=	0.055	< ==	
SB Thru	567	2	3400	567/3,400=	0.167		
SB Right	68	1	1700	68/1,700=	0.040		0.345
EB Left	160	1	1700	160/1,700=	0.094		
EB Thru	39	1	1700	188/1,700=	0.111	< ==	
EB Right	149	0	0		----		
WB Left	86	1	1700	86/1,700=	0.051	< ==	
WB Thru	27	1	1700	27/1,700=	0.016		
WB Right	41	1	1700	41/1,700=	0.024		0.162

Sum of Critical V/C Ratios	0.507
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.557**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Existing Year 2016 w/ Project   Peak Hr: 7:15 - 8:15 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	43	1	1700	43/1,700=	0.030	< ==	
NB Thru	290	2	3400	320/3,400=	0.090		
NB Right	30	0	0		----		
SB Left	15	1	1700	15/1,700=	0.009		
SB Thru	428	2	3400	482/3,400=	0.142	< ==	
SB Right	54	0	0		----		0.172
EB Left	15	1	1700	15/1,700=	0.009	< ==	
EB Thru	61	1	1700	61/1,700=	0.036		
EB Right	142	1	1700	142/1,700=	0.084		
WB Left	116	1	1700	116/1,700=	0.068		
WB Thru	189	1	1700	189/1,700=	0.111	< ==	
WB Right	19	1	1700	19/1,700=	0.011		0.120

Sum of Critical V/C Ratios	0.292
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.342**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection:	Melrose St at Crowther		
Scenario:	Existing Year 2016 w/ Project	Peak Hr:	5:00 - 6:00 PM
Analyst:	GCW	Agency:	Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	151	1	1700	151/1,700=	0.090		
NB Thru	423	2	3400	522/3,400=	0.150	< ==	
NB Right	99	0	0		----		
SB Left	17	1	1700	17/1,700=	0.010	< ==	
SB Thru	197	2	3400	224/3,400=	0.066		
SB Right	27	0	0		----		0.160
EB Left	31	1	1700	31/1,700=	0.018		
EB Thru	168	1	1700	168/1,700=	0.099	< ==	
EB Right	68	1	1700	68/1,700=	0.040		
WB Left	65	1	1700	65/1,700=	0.038	< ==	
WB Thru	178	1	1700	178/1,700=	0.105		
WB Right	39	1	1700	39/1,700=	0.023		0.137

Sum of Critical V/C Ratios	0.297
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.347**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther
Scenario: Existing Year 2016 w/ Project — Peak Hr: 7:15 - 8:15 AM
Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	37	1	1700	37/1,700=	0.020	< ==	
NB Thru	649	3	5100	654/5,100=	0.130		
NB Right	5	0	0		----		
SB Left	30	1	1700	30/1,700=	0.018		
SB Thru	1506	2	3400	1,506/3,400=	0.443	< ==	
SB Right	147	1	1700	147/1,700=	0.086		0.463
EB Left	44	1	1700	44/1,700=	0.026		
EB Thru	98	1	1700	167/1,700=	0.098	< ==	
EB Right	69	0	0		----		
WB Left	1	1	1700	1/1,700=	0.001	< ==	
WB Thru	73	1	1700	73/1,700=	0.043		
WB Right	34	1	1700	34/1,700=	0.020		0.099

Sum of Critical V/C Ratios	0.562
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.612**
Level of Service (LOS) - Refer to table below	**B**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Existing Year 2016 w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	94	1	1700	94/1,700=	0.060		
NB Thru	1731	3	5100	1,733/5,100=	0.340	< ==	
NB Right	2	0	0		----		
SB Left	29	1	1700	29/1,700=	0.017	< ==	
SB Thru	794	2	3400	794/3,400=	0.234		
SB Right	78	1	1700	78/1,700=	0.046		0.357
EB Left	109	1	1700	109/1,700=	0.064	< ==	
EB Thru	128	1	1700	180/1,700=	0.106		
EB Right	52	0	0		----		
WB Left	4	1	1700	4/1,700=	0.002		
WB Thru	128	1	1700	128/1,700=	0.075	< ==	
WB Right	21	1	1700	21/1,700=	0.012		0.139

Sum of Critical V/C Ratios	0.496
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.546**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Existing Year 2016 w/ Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	41	1	1700	41/1,700=	0.020	< ==	
NB Thru	186	2	3400	186/3,400=	0.050		
NB Right	76	1	1700	76/1,700=	0.045		
SB Left	138	2	3400	138/3,400=	0.041		
SB Thru	258	2	3400	509/3,400=	0.150	< ==	
SB Right	251	0	0		----		0.170
EB Left	139	1	1700	139/1,700=	0.082	< ==	
EB Thru	482	3	5100	511/5,100=	0.100		
EB Right	29	0	0		----		
WB Left	106	1	1700	106/1,700=	0.062		
WB Thru	786	3	5100	786/5,100=	0.154	< ==	
WB Right	187	1	1700	187/1,700=	0.110		0.236
Sum of Critical V/C Ratios							0.406
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.456**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Existing Year 2016 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	55	1	1700	55/1,700=	0.030	< ==	
NB Thru	340	2	3400	340/3,400=	0.100		
NB Right	93	1	1700	93/1,700=	0.055		
SB Left	255	2	3400	255/3,400=	0.075		
SB Thru	283	2	3400	520/3,400=	0.153	< ==	
SB Right	237	0	0		----		0.183
EB Left	233	1	1700	233/1,700=	0.137	< ==	
EB Thru	676	3	5100	719/5,100=	0.141		
EB Right	43	0	0		----		
WB Left	136	1	1700	136/1,700=	0.080		
WB Thru	832	3	5100	832/5,100=	0.163	< ==	
WB Right	241	1	1700	241/1,700=	0.142		0.300

Sum of Critical V/C Ratios	0.483
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.533**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Existing Year 2016 w/ Project — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	5	0	0	----		
NB Thru	7	1	1700	7/1,700= ----		
NB Right	17	1	1700	17/1,700= 0.010		
SB Left	261	1	1700	261/1,700= 0.154	< ==	
SB Thru	1	1	1700	190/1,700= 0.112		
SB Right	189	0	0	----		0.154
EB Left	117	2	3400	117/3,400= 0.034		
EB Thru	620	3	5100	623/5,100= 0.122		
EB Right	3	0	0	----		
WB Left	7	1	1700	7/1,700= 0.004		
WB Thru	850	3	5100	850/5,100= 0.167		
WB Right	341	1	1700	341/1,700= 0.201	< ==	0.235

Sum of Critical V/C Ratios	0.389
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.439**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Existing Year 2016 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	7	0	0		----		
NB Thru	5	1	1700	5/1,700=	----		
NB Right	10	1	1700	10/1,700=	0.006		
SB Left	164	1	1700	164/1,700=	0.096		
SB Thru	1	1	1700	258/1,700=	0.152	< ==	
SB Right	257	0	0		----		0.152
EB Left	231	2	3400	231/3,400=	0.068	< ==	
EB Thru	770	3	5100	770/5,100=	0.151		
EB Right	0	0	0		----		
WB Left	15	1	1700	15/1,700=	0.009		
WB Thru	835	3	5100	835/5,100=	0.164	< ==	
WB Right	312	1	1700	312/1,700=	0.184		0.232

Sum of Critical V/C Ratios	0.384
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.434**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:45 - 8:45 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	315	2	3400	315/3,400=	0.090		
NB Thru	0	0	0		----		
NB Right	450	1	1700	450/1,700=	0.265	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.265
EB Left	122	2	3400	122/3,400=	0.036	< ==	
EB Thru	778	3	5100	778/5,100=	0.153		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	881	3	5100	1,084/5,100=	0.213	< ==	
WB Right	203	0	0		----		0.249
Sum of Critical V/C Ratios							0.514
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.564**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Existing Year 2016 w/ Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	194	2	3400	194/3,400=	0.060		
NB Thru	0	0	0		----		
NB Right	394	1	1700	394/1,700=	0.232	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.232
EB Left	224	2	3400	224/3,400=	0.066	< ==	
EB Thru	725	3	5100	725/5,100=	0.142		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	969	3	5100	1,511/5,100=	0.296	< ==	
WB Right	542	0	0		----		0.362

Sum of Critical V/C Ratios	0.594
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.644**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	231	1	1700	231/1,700=	0.140	< ==	
NB Thru	272	2	3400	337/3,400=	0.100		
NB Right	65	0	0		----		
SB Left	59	1	1700	59/1,700=	0.035		
SB Thru	432	2	3400	654/3,400=	0.192	< ==	
SB Right	222	0	0		----		0.332
EB Left	157	2	3400	157/3,400=	0.046	< ==	
EB Thru	672	3	5100	1,054/5,100=	0.207		
EB Right	382	0	0		----		
WB Left	44	2	3400	44/3,400=	0.013		
WB Thru	945	3	5100	986/5,100=	0.193	< ==	
WB Right	41	0	0		----		0.239

Sum of Critical V/C Ratios	0.571
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.621**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Existing Year 2016 w/ Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	413	1	1700	413/1,700=	0.240	< ==	
NB Thru	488	2	3400	582/3,400=	0.170		
NB Right	94	0	0		----		
SB Left	52	1	1700	52/1,700=	0.031		
SB Thru	176	2	3400	411/3,400=	0.121	< ==	
SB Right	235	0	0		----		0.361
EB Left	315	2	3400	315/3,400=	0.093	< ==	
EB Thru	915	3	5100	1,120/5,100=	0.220		
EB Right	205	0	0		----		
WB Left	46	2	3400	46/3,400=	0.014		
WB Thru	964	3	5100	1,008/5,100=	0.198	< ==	
WB Right	44	0	0		----		0.291

Sum of Critical V/C Ratios	0.652
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.702**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Existing Year 2016 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	254	1	1700	254/1,700=	0.150	< ==	
NB Thru	466	2	3400	466/3,400=	0.140		
NB Right	22	1	1700	22/1,700=	0.013		
SB Left	12	1	1700	12/1,700=	0.007		
SB Thru	1237	2	3400	1,237/3,400=	0.364	< ==	
SB Right	254	1	1700	254/1,700=	0.149		0.514
EB Left	130	1	1700	130/1,700=	0.076		
EB Thru	469	2	3400	469/3,400=	0.138	< ==	
EB Right	273	1	1700	273/1,700=	0.161		
WB Left	140	1	1700	140/1,700=	0.082	< ==	
WB Thru	682	3	5100	714/5,100=	0.140		
WB Right	32	0	0		----		0.220
Sum of Critical V/C Ratios							0.734
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.784**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe
Scenario: Existing Year 2016 w/ Project Peak Hr: 5:00 - 6:00 PM
Analyst: GCW Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	345	1	1700	345/1,700=	0.200		
NB Thru	1302	2	3400	1,302/3,400=	0.380	< ==	
NB Right	67	1	1700	67/1,700=	0.039		
SB Left	39	1	1700	39/1,700=	0.023	< ==	
SB Thru	605	2	3400	605/3,400=	0.178		
SB Right	214	1	1700	214/1,700=	0.126		0.403
EB Left	272	1	1700	272/1,700=	0.160	< ==	
EB Thru	570	2	3400	570/3,400=	0.168		
EB Right	146	1	1700	146/1,700=	0.086		
WB Left	57	1	1700	57/1,700=	0.034		
WB Thru	521	3	5100	542/5,100=	0.106	< ==	
WB Right	21	0	0		----		0.266

Sum of Critical V/C Ratios	0.669
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.719**
Level of Service (LOS) - Refer to table below	**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX E-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	512	553	306	1799	0	0	0	0	57	48	139
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1850	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1850	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	512	553	306	1799	0	0	0	0	57	48	139
RTOR Reduction (vph)	0	0	263	0	0	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	512	290	306	1799	0	0	0	0	0	105	83
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		44.7	44.7	29.0	77.7						13.3	13.3
Effective Green, g (s)		44.7	44.7	29.0	77.7						13.3	13.3
Actuated g/C Ratio		0.45	0.45	0.29	0.78						0.13	0.13
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1613	721	523	2804						246	214
v/s Ratio Prot		0.14		0.17	c0.50							
v/s Ratio Perm			0.18								0.06	0.05
v/c Ratio		0.32	0.40	0.59	0.64						0.43	0.39
Uniform Delay, d1		17.8	18.6	30.4	5.0						39.8	39.6
Progression Factor		0.36	0.40	0.87	0.80						1.00	1.00
Incremental Delay, d2		0.5	1.6	1.0	0.7						1.2	1.2
Delay (s)		6.9	9.1	27.4	4.6						41.0	40.8
Level of Service		A	A	C	A						D	D
Approach Delay (s)		8.0			8.0			0.0			40.9	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	112.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	889	583	163	1683	0	0	0	0	129	95	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1847	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1847	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	889	583	163	1683	0	0	0	0	129	95	204
RTOR Reduction (vph)	0	0	258	0	0	0	0	0	0	0	0	54
Lane Group Flow (vph)	0	889	325	163	1683	0	0	0	0	0	224	150
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		50.5	50.5	19.0	73.5						17.5	17.5
Effective Green, g (s)		50.5	50.5	19.0	73.5						17.5	17.5
Actuated g/C Ratio		0.50	0.50	0.19	0.74						0.18	0.18
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1823	815	342	2653						323	282
v/s Ratio Prot		0.25		0.09	c0.47							
v/s Ratio Perm			0.20								0.12	0.09
v/c Ratio		0.49	0.40	0.48	0.63						0.69	0.53
Uniform Delay, d1		16.3	15.3	36.1	6.6						38.7	37.5
Progression Factor		0.50	0.13	1.01	1.14						1.00	1.00
Incremental Delay, d2		0.9	1.4	0.6	0.7						6.3	1.9
Delay (s)		9.0	3.4	37.1	8.2						45.0	39.5
Level of Service		A	A	D	A						D	D
Approach Delay (s)		6.8			10.8			0.0			42.4	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	113.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	106	464	0	0	1136	137	964	0	244	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1805	3610			3552		1715	1638	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1805	3610			3552		1715	1638	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	106	464	0	0	1136	137	964	0	244	0	0	0
RTOR Reduction (vph)	0	0	0	0	9	0	0	41	87	0	0	0
Lane Group Flow (vph)	106	464	0	0	1264	0	492	455	133	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	9.6	58.7			45.1		32.3	32.3	32.3			
Effective Green, g (s)	9.6	58.7			45.1		32.3	32.3	32.3			
Actuated g/C Ratio	0.10	0.59			0.45		0.32	0.32	0.32			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	173	2119			1601		553	529	495			
v/s Ratio Prot	c0.06	0.13			c0.36							
v/s Ratio Perm							c0.29	0.28	0.09			
v/c Ratio	0.61	0.22			0.79		0.89	0.86	0.27			
Uniform Delay, d1	43.4	9.8			23.4		32.2	31.7	25.1			
Progression Factor	1.60	0.08			0.82		1.00	1.00	1.00			
Incremental Delay, d2	6.1	0.2			2.4		16.0	13.4	0.3			
Delay (s)	75.7	1.1			21.6		48.2	45.2	25.4			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		14.9			21.6			42.8			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	112.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	843	0	0	1037	216	817	0	407	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.97		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3517		1715	1630	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3517		1715	1630	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	153	843	0	0	1037	216	817	0	407	0	0	0
RTOR Reduction (vph)	0	0	0	0	17	0	0	42	115	0	0	0
Lane Group Flow (vph)	153	843	0	0	1236	0	433	383	251	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	12.0	61.3			45.3		29.7	29.7	29.7			
Effective Green, g (s)	12.0	61.3			45.3		29.7	29.7	29.7			
Actuated g/C Ratio	0.12	0.61			0.45		0.30	0.30	0.30			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	216	2212			1593		509	484	455			
v/s Ratio Prot	c0.08	0.23			c0.35							
v/s Ratio Perm							c0.25	0.23	0.16			
v/c Ratio	0.71	0.38			0.78		0.85	0.79	0.55			
Uniform Delay, d1	42.3	9.8			23.1		33.1	32.3	29.5			
Progression Factor	1.47	0.13			1.04		1.00	1.00	1.00			
Incremental Delay, d2	9.0	0.4			2.8		12.9	8.6	1.4			
Delay (s)	71.1	1.7			26.9		45.9	40.9	31.0			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		12.3			26.9			39.7			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	27.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	113.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	135	520	150	104	950	49	353	441	69	138	636	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3537		1805	3485	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3537		1805	3485	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	135	520	150	104	950	49	353	441	69	138	636	191
RTOR Reduction (vph)	0	0	79	0	0	34	0	12	0	0	29	0
Lane Group Flow (vph)	135	520	71	104	950	15	353	498	0	138	798	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.0	34.0	47.2	9.3	31.3	31.3	13.2	31.0		11.2	29.0	
Effective Green, g (s)	12.0	34.0	47.2	9.3	31.3	31.3	13.2	31.0		11.2	29.0	
Actuated g/C Ratio	0.12	0.34	0.47	0.09	0.31	0.31	0.13	0.31		0.11	0.29	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	420	1227	762	167	1129	505	462	1096		202	1010	
v/s Ratio Prot	0.04	c0.14	0.01	0.06	c0.26		c0.10	0.14		0.08	c0.23	
v/s Ratio Perm			0.03			0.01						
v/c Ratio	0.32	0.42	0.09	0.62	0.84	0.03	0.76	0.45		0.68	0.79	
Uniform Delay, d1	40.3	25.4	14.6	43.7	32.0	23.8	41.9	27.7		42.7	32.7	
Progression Factor	0.86	0.77	0.36	1.00	1.00	1.00	1.18	0.88		1.00	1.00	
Incremental Delay, d2	0.2	1.1	0.0	5.1	7.6	0.1	6.6	0.4		7.4	4.4	
Delay (s)	35.0	20.6	5.3	48.8	39.7	23.9	56.1	24.7		50.1	37.1	
Level of Service	C	C	A	D	D	C	E	C		D	D	
Approach Delay (s)		20.2			39.8			37.5			39.0	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	260	801	185	80	700	116	497	675	90	199	463	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3546		1805	3451	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3546		1805	3451	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	260	801	185	80	700	116	497	675	90	199	463	193
RTOR Reduction (vph)	0	0	69	0	0	62	0	10	0	0	47	0
Lane Group Flow (vph)	260	801	116	80	700	54	497	755	0	199	609	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.6	38.0	55.0	7.4	32.8	32.8	17.0	26.0		14.1	23.1	
Effective Green, g (s)	12.6	38.0	55.0	7.4	32.8	32.8	17.0	26.0		14.1	23.1	
Actuated g/C Ratio	0.13	0.38	0.55	0.07	0.33	0.33	0.17	0.26		0.14	0.23	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	441	1371	888	133	1184	529	595	921		254	797	
v/s Ratio Prot	0.07	c0.22	0.02	0.04	c0.19		c0.14	c0.21		0.11	0.18	
v/s Ratio Perm			0.05			0.03						
v/c Ratio	0.59	0.58	0.13	0.60	0.59	0.10	0.84	0.82		0.78	0.76	
Uniform Delay, d1	41.3	24.7	10.9	44.9	28.0	23.4	40.1	34.8		41.5	35.9	
Progression Factor	0.90	0.84	0.66	1.00	1.00	1.00	0.96	0.92		1.00	1.00	
Incremental Delay, d2	1.2	1.7	0.0	5.2	2.2	0.4	9.2	5.9		13.5	4.7	
Delay (s)	38.4	22.5	7.2	50.0	30.2	23.7	47.7	37.8		55.0	40.6	
Level of Service	D	C	A	D	C	C	D	D		D	D	
Approach Delay (s)		23.5			31.1			41.7			43.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	177	305	330	235	478	68	193	363	161	27	1061	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	4948		1805	5047	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	4948		1805	5047	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	177	305	330	235	478	68	193	363	161	27	1061	233
RTOR Reduction (vph)	0	0	212	0	0	56	0	69	0	0	33	0
Lane Group Flow (vph)	177	305	118	235	478	12	193	455	0	27	1261	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	12.3	14.1	14.1	15.6	17.4	17.4	13.1	47.4		4.6	38.9	
Effective Green, g (s)	12.3	14.1	14.1	15.6	17.4	17.4	13.1	47.4		4.6	38.9	
Actuated g/C Ratio	0.13	0.14	0.14	0.16	0.18	0.18	0.13	0.49		0.05	0.40	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	227	520	233	288	642	287	242	2400		84	2009	
v/s Ratio Prot	0.10	0.08		c0.13	c0.13		c0.11	0.09		0.01	c0.25	
v/s Ratio Perm			0.07			0.01						
v/c Ratio	0.78	0.59	0.51	0.82	0.74	0.04	0.80	0.19		0.32	0.63	
Uniform Delay, d1	41.4	39.1	38.6	39.7	38.0	33.2	41.0	14.3		45.0	23.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.5	1.7	1.7	16.1	4.7	0.1	16.5	0.2		2.2	1.5	
Delay (s)	56.9	40.8	40.3	55.8	42.7	33.3	57.5	14.4		47.3	25.1	
Level of Service	E	D	D	E	D	C	E	B		D	C	
Approach Delay (s)		44.1			45.8			26.0			25.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	97.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	238	362	242	145	339	44	259	1326	229	53	588	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4989	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4989	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	238	362	242	145	339	44	259	1326	229	53	588	201
RTOR Reduction (vph)	0	0	194	0	0	37	0	21	0	0	57	0
Lane Group Flow (vph)	238	362	48	145	339	7	259	1534	0	53	732	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	16.4	17.7	17.7	11.9	13.2	13.2	17.3	37.9		5.2	25.8	
Effective Green, g (s)	16.4	17.7	17.7	11.9	13.2	13.2	17.3	37.9		5.2	25.8	
Actuated g/C Ratio	0.18	0.20	0.20	0.13	0.15	0.15	0.20	0.43		0.06	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	333	720	322	242	537	240	352	2167		105	1451	
v/s Ratio Prot	c0.13	0.10		0.08	c0.09		c0.14	c0.30		0.03	0.15	
v/s Ratio Perm			0.03			0.00						
v/c Ratio	0.71	0.50	0.15	0.60	0.63	0.03	0.74	0.71		0.50	0.50	
Uniform Delay, d1	34.0	31.6	29.3	36.2	35.5	32.3	33.6	20.9		40.5	26.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.1	0.6	0.2	4.0	2.4	0.0	7.8	2.0		3.8	1.3	
Delay (s)	41.1	32.1	29.5	40.1	37.9	32.3	41.3	22.8		44.3	27.4	
Level of Service	D	C	C	D	D	C	D	C		D	C	
Approach Delay (s)		33.9			38.0			25.5			28.5	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	88.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	10	21	227	20	81	10	524	47	107	818	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1707		1805	1900	1615	1805	3565		1805	3610	1615
Flt Permitted	0.74	1.00		0.74	1.00	1.00	0.32	1.00		0.43	1.00	1.00
Satd. Flow (perm)	1414	1707		1400	1900	1615	602	3565		808	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	10	21	227	20	81	10	524	47	107	818	34
RTOR Reduction (vph)	0	16	0	0	0	63	0	4	0	0	0	10
Lane Group Flow (vph)	14	15	0	227	20	18	10	567	0	107	818	24
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	21.8	21.8		21.8	21.8	21.8	70.2	70.2		70.2	70.2	70.2
Effective Green, g (s)	21.8	21.8		21.8	21.8	21.8	70.2	70.2		70.2	70.2	70.2
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.22	0.70	0.70		0.70	0.70	0.70
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	308	372		305	414	352	422	2502		567	2534	1133
v/s Ratio Prot		0.01			0.01			0.16			c0.23	
v/s Ratio Perm	0.01			c0.16		0.01	0.02			0.13		0.01
v/c Ratio	0.05	0.04		0.74	0.05	0.05	0.02	0.23		0.19	0.32	0.02
Uniform Delay, d1	30.9	30.8		36.5	30.9	30.9	4.5	5.3		5.1	5.7	4.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.19	0.18	0.00
Incremental Delay, d2	0.1	0.0		9.5	0.0	0.1	0.1	0.2		0.6	0.3	0.0
Delay (s)	30.9	30.9		46.0	31.0	31.0	4.6	5.5		1.6	1.3	0.0
Level of Service	C	C		D	C	C	A	A		A	A	A
Approach Delay (s)		30.9			41.3			5.5			1.3	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	39	149	86	27	41	23	827	164	93	567	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.88		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1674		1805	1900	1615	1805	3520		1805	3610	1615
Flt Permitted	0.74	1.00		0.42	1.00	1.00	0.43	1.00		0.27	1.00	1.00
Satd. Flow (perm)	1405	1674		805	1900	1615	824	3520		504	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	160	39	149	86	27	41	23	827	164	93	567	68
RTOR Reduction (vph)	0	124	0	0	0	34	0	10	0	0	0	17
Lane Group Flow (vph)	160	64	0	86	27	7	23	981	0	93	567	51
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	16.9	16.9		16.9	16.9	16.9	75.1	75.1		75.1	75.1	75.1
Effective Green, g (s)	16.9	16.9		16.9	16.9	16.9	75.1	75.1		75.1	75.1	75.1
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.75	0.75		0.75	0.75	0.75
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	237	282		136	321	272	618	2643		378	2711	1212
v/s Ratio Prot		0.04			0.01			c0.28			0.16	
v/s Ratio Perm	c0.11			0.11		0.00	0.03			0.18		0.03
v/c Ratio	0.68	0.23		0.63	0.08	0.03	0.04	0.37		0.25	0.21	0.04
Uniform Delay, d1	39.0	35.9		38.7	35.0	34.7	3.2	4.3		3.8	3.7	3.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.21	0.22	0.00
Incremental Delay, d2	7.4	0.4		9.2	0.1	0.0	0.1	0.4		1.3	0.1	0.1
Delay (s)	46.4	36.3		47.9	35.1	34.7	3.3	4.7		2.1	1.0	0.1
Level of Service	D	D		D	D	C	A	A		A	A	A
Approach Delay (s)		40.9			42.1			4.7			1.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	61	142	116	189	19	43	290	30	15	428	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3559		1805	3549	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3559		1805	3549	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	61	142	116	189	19	43	290	30	15	428	54
RTOR Reduction (vph)	0	0	120	0	0	15	0	6	0	0	8	0
Lane Group Flow (vph)	15	61	22	116	189	4	43	314	0	15	474	0
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	1.2	11.7	11.7	7.5	18.0	18.0	4.4	39.7		1.2	36.5	
Effective Green, g (s)	1.2	11.7	11.7	7.5	18.0	18.0	4.4	39.7		1.2	36.5	
Actuated g/C Ratio	0.02	0.15	0.15	0.10	0.24	0.24	0.06	0.52		0.02	0.48	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	28	292	248	178	449	382	104	1857		28	1702	
v/s Ratio Prot	0.01	0.03		c0.06	c0.10		c0.02	c0.09		0.01	c0.13	
v/s Ratio Perm			0.01			0.00						
v/c Ratio	0.54	0.21	0.09	0.65	0.42	0.01	0.41	0.17		0.54	0.28	
Uniform Delay, d1	37.2	28.2	27.6	33.0	24.6	22.2	34.6	9.5		37.2	11.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.3	0.4	0.2	8.3	0.6	0.0	2.7	0.2		18.3	0.4	
Delay (s)	55.5	28.5	27.8	41.3	25.3	22.3	37.3	9.7		55.5	12.3	
Level of Service	E	C	C	D	C	C	D	A		E	B	
Approach Delay (s)		29.9			30.8			13.0			13.6	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	76.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	168	68	65	178	39	151	423	99	17	197	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3507		1805	3545	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3507		1805	3545	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	168	68	65	178	39	151	423	99	17	197	27
RTOR Reduction (vph)	0	0	57	0	0	31	0	14	0	0	9	0
Lane Group Flow (vph)	31	168	11	65	178	8	151	508	0	17	215	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	2.9	13.8	13.8	6.7	17.6	17.6	11.4	44.3		1.3	34.2	
Effective Green, g (s)	2.9	13.8	13.8	6.7	17.6	17.6	11.4	44.3		1.3	34.2	
Actuated g/C Ratio	0.04	0.17	0.17	0.08	0.21	0.21	0.14	0.54		0.02	0.42	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	63	319	271	147	407	346	250	1892		28	1476	
v/s Ratio Prot	0.02	c0.09		c0.04	c0.09		c0.08	c0.14		0.01	0.06	
v/s Ratio Perm			0.01			0.01						
v/c Ratio	0.49	0.53	0.04	0.44	0.44	0.02	0.60	0.27		0.61	0.15	
Uniform Delay, d1	38.9	31.2	28.6	35.9	28.0	25.5	33.2	10.2		40.1	14.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.9	1.6	0.1	2.1	0.8	0.0	4.1	0.3		32.0	0.2	
Delay (s)	44.8	32.7	28.7	38.0	28.7	25.5	37.3	10.5		72.1	15.1	
Level of Service	D	C	C	D	C	C	D	B		E	B	
Approach Delay (s)		33.1			30.4			16.5			19.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	98	69	1	73	34	37	649	5	30	1506	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1782		1805	1900	1615	1805	5181		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1782		1805	1900	1615	1805	5181		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	44	98	69	1	73	34	37	649	5	30	1506	147
RTOR Reduction (vph)	0	28	0	0	0	29	0	0	0	0	0	54
Lane Group Flow (vph)	44	139	0	1	73	5	37	654	0	30	1506	93
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	4.5	14.6		1.0	11.1	11.1	4.3	42.7		2.8	41.2	41.2
Effective Green, g (s)	4.5	14.6		1.0	11.1	11.1	4.3	42.7		2.8	41.2	41.2
Actuated g/C Ratio	0.06	0.19		0.01	0.14	0.14	0.06	0.55		0.04	0.53	0.53
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	105	337		23	273	232	100	2869		65	1929	863
v/s Ratio Prot	c0.02	c0.08		0.00	0.04		c0.02	0.13		0.02	c0.42	
v/s Ratio Perm						0.00						0.06
v/c Ratio	0.42	0.41		0.04	0.27	0.02	0.37	0.23		0.46	0.78	0.11
Uniform Delay, d1	35.0	27.5		37.6	29.4	28.3	35.1	8.8		36.4	14.3	8.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.7	0.8		0.8	0.5	0.0	2.3	0.2		5.1	3.2	0.3
Delay (s)	37.7	28.3		38.4	29.9	28.4	37.4	9.0		41.5	17.6	9.1
Level of Service	D	C		D	C	C	D	A		D	B	A
Approach Delay (s)		30.3			29.5			10.5			17.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	77.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	128	52	4	128	21	94	1731	2	29	794	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1818		1805	1900	1615	1805	5186		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1818		1805	1900	1615	1805	5186		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	109	128	52	4	128	21	94	1731	2	29	794	78
RTOR Reduction (vph)	0	15	0	0	0	18	0	0	0	0	0	41
Lane Group Flow (vph)	109	165	0	4	128	3	94	1733	0	29	794	37
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	7.6	19.8		1.1	13.3	13.3	7.4	44.3		2.9	39.8	39.8
Effective Green, g (s)	7.6	19.8		1.1	13.3	13.3	7.4	44.3		2.9	39.8	39.8
Actuated g/C Ratio	0.09	0.24		0.01	0.16	0.16	0.09	0.53		0.03	0.47	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	163	428		23	300	255	158	2731		62	1708	764
v/s Ratio Prot	c0.06	c0.09		0.00	0.07		c0.05	c0.33		0.02	0.22	
v/s Ratio Perm						0.00						0.02
v/c Ratio	0.67	0.38		0.17	0.43	0.01	0.59	0.63		0.47	0.46	0.05
Uniform Delay, d1	37.0	27.0		41.1	32.0	29.9	36.9	14.1		39.8	15.0	11.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	9.9	0.6		3.6	1.0	0.0	5.9	1.1		5.5	0.9	0.1
Delay (s)	47.0	27.6		44.6	32.9	29.9	42.8	15.3		45.3	15.9	12.1
Level of Service	D	C		D	C	C	D	B		D	B	B
Approach Delay (s)		34.9			32.8			16.7			16.5	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	84.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	139	482	29	106	786	187	41	186	76	138	258	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3343	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3343	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	139	482	29	106	786	187	41	186	76	138	258	251
RTOR Reduction (vph)	0	6	0	0	0	136	0	0	55	0	161	0
Lane Group Flow (vph)	139	505	0	106	786	51	41	186	21	138	348	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	20.5	36.0		14.5	30.0	30.0	10.5	30.0	30.0	10.5	30.0	
Effective Green, g (s)	20.5	36.0		14.5	30.0	30.0	10.5	30.0	30.0	10.5	30.0	
Actuated g/C Ratio	0.19	0.33		0.13	0.27	0.27	0.10	0.27	0.27	0.10	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	336	1683		237	1414	440	172	984	440	334	911	
v/s Ratio Prot	c0.08	0.10		0.06	c0.15		0.02	0.05		c0.04	c0.10	
v/s Ratio Perm						0.03			0.01			
v/c Ratio	0.41	0.30		0.45	0.56	0.12	0.24	0.19	0.05	0.41	0.38	
Uniform Delay, d1	39.5	27.6		44.1	34.3	30.0	46.0	30.7	29.5	46.8	32.5	
Progression Factor	0.69	0.51		0.53	0.70	1.58	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.4	0.4		5.8	1.5	0.5	3.2	0.4	0.2	3.7	1.2	
Delay (s)	30.5	14.5		29.1	25.5	48.0	49.3	31.1	29.7	50.6	33.7	
Level of Service	C	B		C	C	D	D	C	C	D	C	
Approach Delay (s)		17.9			29.8			33.2			37.3	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	233	676	43	136	832	241	55	340	93	255	283	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3363	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3363	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	233	676	43	136	832	241	55	340	93	255	283	237
RTOR Reduction (vph)	0	6	0	0	0	155	0	0	78	0	149	0
Lane Group Flow (vph)	233	713	0	136	832	86	55	340	15	255	371	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	21.5	48.0		12.9	39.4	39.4	7.3	17.8	17.8	12.3	22.8	
Effective Green, g (s)	21.5	48.0		12.9	39.4	39.4	7.3	17.8	17.8	12.3	22.8	
Actuated g/C Ratio	0.20	0.44		0.12	0.36	0.36	0.07	0.16	0.16	0.11	0.21	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	352	2242		211	1857	578	119	584	261	391	697	
v/s Ratio Prot	c0.13	0.14		c0.08	c0.16		0.03	0.09		c0.07	c0.11	
v/s Ratio Perm						0.05			0.01			
v/c Ratio	0.66	0.32		0.64	0.45	0.15	0.46	0.58	0.06	0.65	0.53	
Uniform Delay, d1	40.9	20.3		46.4	27.0	23.9	49.5	42.7	39.0	46.8	38.8	
Progression Factor	1.22	1.25		0.61	0.72	1.46	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.0	0.3		6.4	0.8	0.5	2.8	1.5	0.1	3.9	0.8	
Delay (s)	54.1	25.7		34.8	20.3	35.5	52.3	44.1	39.1	50.7	39.6	
Level of Service	D	C		C	C	D	D	D	D	D	D	
Approach Delay (s)		32.7			25.0			44.1			43.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	117	620	3	7	850	341	5	7	17	261	1	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	0.99	
Satd. Flow (prot)	3502	5183		1805	5187	1615		1861	1615	1715	1559	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	0.99	
Satd. Flow (perm)	3502	5183		1805	5187	1615		1861	1615	1715	1559	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	117	620	3	7	850	341	5	7	17	261	1	189
RTOR Reduction (vph)	0	0	0	0	0	161	0	0	16	0	152	0
Lane Group Flow (vph)	117	623	0	7	850	180	0	12	1	235	64	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	8.9	65.2		2.3	58.1	58.1		4.1	4.1	21.6	21.6	
Effective Green, g (s)	8.9	65.2		2.3	58.1	58.1		4.1	4.1	21.6	21.6	
Actuated g/C Ratio	0.08	0.59		0.02	0.53	0.53		0.04	0.04	0.20	0.20	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	283	3072		37	2739	853		69	60	336	306	
v/s Ratio Prot	c0.03	0.12		0.00	c0.16			c0.01		c0.14	0.04	
v/s Ratio Perm						0.11			0.00			
v/c Ratio	0.41	0.20		0.19	0.31	0.21		0.17	0.01	0.70	0.21	
Uniform Delay, d1	48.1	10.4		52.9	14.6	13.8		51.3	51.0	41.2	37.0	
Progression Factor	0.86	0.38		0.95	0.81	2.31		1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.1		2.4	0.3	0.5		1.2	0.1	6.2	0.3	
Delay (s)	42.3	4.1		52.5	12.1	32.4		52.5	51.1	47.4	37.4	
Level of Service	D	A		D	B	C		D	D	D	D	
Approach Delay (s)		10.2			18.1			51.7			42.6	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	231	770	0	15	835	312	7	5	10	164	1	257
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5187		1805	5187	1615		1846	1615	1715	1547	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5187		1805	5187	1615		1846	1615	1715	1547	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	231	770	0	15	835	312	7	5	10	164	1	257
RTOR Reduction (vph)	0	0	0	0	0	142	0	0	10	0	216	0
Lane Group Flow (vph)	231	770	0	15	835	170	0	12	0	148	58	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	12.3	68.3		4.6	60.1	60.1		2.9	2.9	17.4	17.4	
Effective Green, g (s)	12.3	68.3		4.6	60.1	60.1		2.9	2.9	17.4	17.4	
Actuated g/C Ratio	0.11	0.62		0.04	0.55	0.55		0.03	0.03	0.16	0.16	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	391	3220		75	2833	882		48	42	271	244	
v/s Ratio Prot	c0.07	0.15		0.01	c0.16			c0.01		c0.09	0.04	
v/s Ratio Perm						0.11			0.00			
v/c Ratio	0.59	0.24		0.20	0.29	0.19		0.25	0.01	0.55	0.24	
Uniform Delay, d1	46.5	9.3		50.9	13.5	12.7		52.5	52.1	42.7	40.5	
Progression Factor	0.70	0.31		1.13	1.07	2.90		1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.3	0.2		1.2	0.2	0.4		2.7	0.1	2.2	0.5	
Delay (s)	34.8	3.0		58.7	14.7	37.2		55.2	52.2	44.9	41.0	
Level of Service	C	A		E	B	D		E	D	D	D	
Approach Delay (s)		10.3			21.3			53.8			42.4	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	122	778	0	0	881	203	315	0	450	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			5041		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			5041		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	122	778	0	0	881	203	315	0	450	0	0	0
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	80	0	0	0
Lane Group Flow (vph)	122	778	0	0	1059	0	157	158	370	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	9.2	68.4			55.7		31.8	31.8	31.8			
Effective Green, g (s)	9.2	68.4			55.7		31.8	31.8	31.8			
Actuated g/C Ratio	0.08	0.62			0.51		0.29	0.29	0.29			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	292	3225			2552		495	495	466			
v/s Ratio Prot	c0.03	0.15			c0.21							
v/s Ratio Perm							0.09	0.09	c0.23			
v/c Ratio	0.42	0.24			0.42		0.32	0.32	0.79			
Uniform Delay, d1	47.9	9.3			17.0		30.6	30.6	36.1			
Progression Factor	1.13	1.12			0.35		1.00	1.00	1.00			
Incremental Delay, d2	1.0	0.2			0.4		0.4	0.4	9.1			
Delay (s)	55.2	10.5			6.3		31.0	31.0	45.2			
Level of Service	E	B			A		C	C	D			
Approach Delay (s)		16.6			6.3			39.3			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	224	725	0	0	969	542	194	0	394	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			4908		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			4908		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	224	725	0	0	969	542	194	0	394	0	0	0
RTOR Reduction (vph)	0	0	0	0	67	0	0	0	173	0	0	0
Lane Group Flow (vph)	224	725	0	0	1444	0	97	97	221	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	12.3	80.0			64.2		20.2	20.2	20.2			
Effective Green, g (s)	12.3	80.0			64.2		20.2	20.2	20.2			
Actuated g/C Ratio	0.11	0.73			0.58		0.18	0.18	0.18			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	391	3772			2864		314	314	296			
v/s Ratio Prot	c0.06	0.14			c0.29							
v/s Ratio Perm							0.06	0.06	c0.14			
v/c Ratio	0.57	0.19			0.50		0.31	0.31	0.75			
Uniform Delay, d1	46.4	4.8			13.5		38.9	38.9	42.5			
Progression Factor	0.98	1.43			0.42		1.00	1.00	1.00			
Incremental Delay, d2	2.0	0.1			0.5		0.6	0.6	9.8			
Delay (s)	47.5	6.9			6.2		39.4	39.4	52.3			
Level of Service	D	A			A		D	D	D			
Approach Delay (s)		16.5			6.2			48.0			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	672	382	44	945	41	231	272	65	59	432	222
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	4905		3502	5155		1805	3506		1805	3426	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	4905		3502	5155		1805	3506		1805	3426	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	157	672	382	44	945	41	231	272	65	59	432	222
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	157	1054	0	44	986	0	231	337	0	59	654	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	9.6	42.4		5.5	38.3		18.6	38.2		6.9	26.5	
Effective Green, g (s)	9.6	42.4		5.5	38.3		18.6	38.2		6.9	26.5	
Actuated g/C Ratio	0.09	0.39		0.05	0.35		0.17	0.35		0.06	0.24	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	306	1891		175	1795		305	1218		113	825	
v/s Ratio Prot	0.04	c0.21		0.01	c0.19		c0.13	0.10		0.03	c0.19	
v/s Ratio Perm												
v/c Ratio	0.51	0.56		0.25	0.55		0.76	0.28		0.52	0.79	
Uniform Delay, d1	48.0	26.5		50.3	28.9		43.5	25.9		50.0	39.2	
Progression Factor	0.94	0.93		1.45	0.67		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	1.1		0.5	0.8		10.3	0.1		4.3	5.3	
Delay (s)	46.4	25.6		73.7	20.1		53.8	26.0		54.3	44.4	
Level of Service	D	C		E	C		D	C		D	D	
Approach Delay (s)		28.3			22.4			37.3			45.2	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	31.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	315	915	205	46	964	44	413	488	94	52	176	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	5045		3502	5153		1805	3523		1805	3300	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	5045		3502	5153		1805	3523		1805	3300	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	315	915	205	46	964	44	413	488	94	52	176	235
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	315	1120	0	46	1008	0	413	582	0	52	411	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.6	38.6		5.8	31.8		28.0	41.2		7.4	20.6	
Effective Green, g (s)	12.6	38.6		5.8	31.8		28.0	41.2		7.4	20.6	
Actuated g/C Ratio	0.11	0.35		0.05	0.29		0.25	0.37		0.07	0.19	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	401	1770		184	1489		459	1319		121	618	
v/s Ratio Prot	c0.09	0.22		0.01	c0.20		c0.23	0.17		0.03	c0.12	
v/s Ratio Perm												
v/c Ratio	0.79	0.63		0.25	0.68		0.90	0.44		0.43	0.67	
Uniform Delay, d1	47.4	29.8		50.0	34.6		39.6	25.8		49.3	41.5	
Progression Factor	0.93	0.92		1.30	0.83		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.6	1.7		0.6	2.0		20.1	0.2		2.4	2.7	
Delay (s)	53.8	29.2		65.3	30.6		59.7	26.0		51.7	44.2	
Level of Service	D	C		E	C		E	C		D	D	
Approach Delay (s)		34.6			32.2			40.0			45.0	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	36.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	469	273	140	682	32	254	466	22	12	1237	254
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	130	469	273	140	682	32	254	466	22	12	1237	254
RTOR Reduction (vph)	0	0	209	0	5	0	0	0	10	0	0	134
Lane Group Flow (vph)	130	469	64	140	709	0	254	466	12	12	1237	120
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	10.5	21.1	21.1	10.7	21.3		19.0	60.7	60.7	1.5	43.2	43.2
Effective Green, g (s)	10.5	21.1	21.1	10.7	21.3		19.0	60.7	60.7	1.5	43.2	43.2
Actuated g/C Ratio	0.10	0.19	0.19	0.10	0.19		0.17	0.55	0.55	0.01	0.39	0.39
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	172	692	309	175	997		311	1992	891	24	1417	634
v/s Ratio Prot	0.07	0.13		c0.08	c0.14		c0.14	0.13		0.01	c0.34	
v/s Ratio Perm			0.04						0.01			0.07
v/c Ratio	0.76	0.68	0.21	0.80	0.71		0.82	0.23	0.01	0.50	0.87	0.19
Uniform Delay, d1	48.5	41.3	37.4	48.6	41.5		43.8	12.7	11.1	53.9	30.9	21.9
Progression Factor	1.11	1.53	5.15	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.6	2.4	0.3	22.4	2.4		15.2	0.3	0.0	15.4	7.7	0.7
Delay (s)	69.3	65.5	192.9	71.0	43.9		59.0	13.0	11.2	69.3	38.6	22.6
Level of Service	E	E	F	E	D		E	B	B	E	D	C
Approach Delay (s)		106.0			48.3			28.7			36.1	
Approach LOS		F			D			C			D	

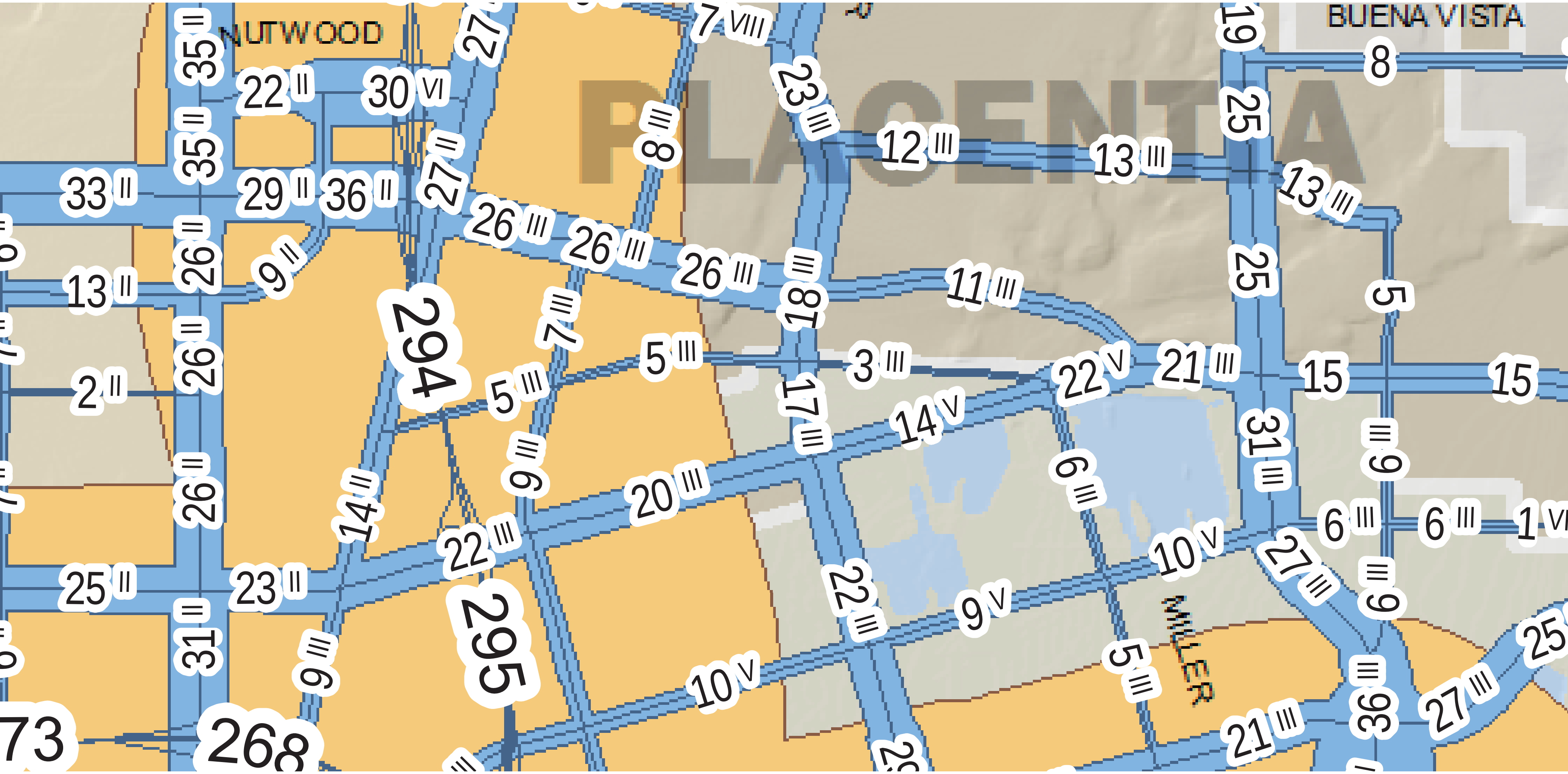
Intersection Summary			
HCM 2000 Control Delay	52.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	272	570	146	57	521	21	345	1302	67	39	605	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5157		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5157		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	272	570	146	57	521	21	345	1302	67	39	605	214
RTOR Reduction (vph)	0	0	109	0	4	0	0	0	35	0	0	150
Lane Group Flow (vph)	272	570	37	57	538	0	345	1302	32	39	605	64
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	17.0	28.2	28.2	7.5	18.7		25.4	52.9	52.9	5.4	32.9	32.9
Effective Green, g (s)	17.0	28.2	28.2	7.5	18.7		25.4	52.9	52.9	5.4	32.9	32.9
Actuated g/C Ratio	0.15	0.26	0.26	0.07	0.17		0.23	0.48	0.48	0.05	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	925	414	123	876		416	1736	776	88	1079	483
v/s Ratio Prot	c0.15	c0.16		0.03	0.10		c0.19	c0.36		0.02	0.17	
v/s Ratio Perm			0.02						0.02			0.04
v/c Ratio	0.98	0.62	0.09	0.46	0.61		0.83	0.75	0.04	0.44	0.56	0.13
Uniform Delay, d1	46.3	36.1	31.1	49.3	42.3		40.2	23.2	15.1	50.8	32.5	28.1
Progression Factor	1.10	1.57	5.60	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	42.7	1.0	0.1	2.7	1.3		12.8	3.0	0.1	3.5	2.1	0.6
Delay (s)	93.8	57.7	174.5	52.1	43.6		53.1	26.2	15.2	54.4	34.6	28.7
Level of Service	F	E	F	D	D		D	C	B	D	C	C
Approach Delay (s)		84.9			44.4			31.2			34.0	
Approach LOS		F			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	46.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX F

2013-2014 OCTA Traffic Flow Map


NUTWOOD
PLACENTIA
BUENA VISTA
MILLER
294
295
268

APPENDIX G

2016 Average Daily Traffic Segment Counts
– Crowther Avenue (Placentia Avenue - Melrose Street)

Wednesday, March 02, 2016 | Location: Placentia | PROJECT: SC1603

ADT1 Crowther west of Melrose. | **Prepared by AimTD tel. 714 753 7888**

AM Period	NB	SB	EB		WB			PM Period	NB	SB	EB		WB		
00:30			3		2			12:00			47		52		
00:15			0		3			12:15			40		58		
00:30			0		2			12:30			42		40		
00:45			2	5	0	7	12	12:45			58	187	33	183	370
01:00			0		1			13:00			51		35		
01:15			4		0			13:15			48		39		
01:30			4		3			13:30			54		53		
01:45			1	9	1	5	14	13:45			48	201	26	153	354
02:00			5		3			14:00			52		36		
02:15			2		1			14:15			40		40		
02:30			1		3			14:30			51		55		
02:45			1	9	0	7	16	14:45			43	186	62	193	379
03:00			0		2			15:00			50		66		
03:15			2		0			15:15			46		45		
03:30			1		2			15:30			46		49		
03:45			2	5	2	6	11	15:45			34	176	63	223	399
04:00			3		4			16:00			45		65		
04:15			4		2			16:15			60		54		
04:30			4		9			16:30			43		69		
04:45			7	18	12	27	45	16:45			47	195	72	260	455
05:00			7		8			17:00			35		66		
05:15			8		5			17:15			53		78		
05:30			14		6			17:30			54		60		
05:45			16	45	12	31	76	17:45			50	192	52	256	448
06:00			20		16			18:00			48		44		
06:15			17		13			18:15			31		23		
06:30			20		22			18:30			33		34		
06:45			17	74	29	80	154	18:45			31	143	34	135	278
07:00			41		42			19:00			39		17		
07:15			31		43			19:15			24		25		
07:30			52		54			19:30			22		17		
07:45			48	172	52	191	363	19:45			26	111	15	74	185
08:00			58		59			20:00			7		13		
08:15			39		58			20:15			8		8		
08:30			35		45			20:30			19		12		
08:45			38	170	43	205	375	20:45			16	50	6	39	89
09:00			34		32			21:00			7		5		
09:15			31		45			21:15			5		4		
09:30			33		29			21:30			9		7		
09:45			31	129	46	152	281	21:45			11	32	5	21	53
10:00			24		37			22:00			2		2		
10:15			26		44			22:15			4		3		
10:30			20		38			22:30			0		0		
10:45			36	106	39	158	264	22:45			4	10	4	9	19
11:00			32		38			23:00			0		0		
11:15			34		29			23:15			4		2		
11:30			45		41			23:30			0		3		
11:45			39	150	44	152	302	23:45			3	7	0	5	12
Total Vol.				892		1021	**1913**					1490		1551	**3041**

Daily Totals

NB	SB	EB	WB	Combined
		2382	2572	**4954**

			AM				PM		
Split %			46.6%	53.4%	**38.6%**		49.0%	51.0%	**61.4%**
Peak Hour	00:30	00:30	07:30	07:30	**07:30**		12:45	16:30	**16:45**
Volume			197	223	**420**		211	285	**465**
P.H.F.			0.85	0.94	**0.90**		0.91	0.91	**0.89**

Wednesday, March 02, 2016 Location: Placentia PROJECT: SC1603

ADT2 Crowther east of Melrose. **Prepared by AimTD tel. 714 753 7888**

AM Period	NB	SB	EB		WB			PM Period	NB	SB	EB		WB		
00:30			3		2			12:00			32		40		
00:15			0		0			12:15			37		43		
00:30			0		5			12:30			34		31		
00:45			2	5	0	7	12	12:45			32	135	31	145	280
01:00			0		2			13:00			34		45		
01:15			2		1			13:15			43		30		
01:30			3		10			13:30			33		32		
01:45			1	6	5	18	24	13:45			45	155	36	143	298
02:00			2		0			14:00			45		25		
02:15			2		1			14:15			34		35		
02:30			0		1			14:30			35		36		
02:45			0	4	2	4	8	14:45			31	145	57	153	298
03:00			0		0			15:00			45		44		
03:15			0		0			15:15			40		52		
03:30			2		0			15:30			25		45		
03:45			3	5	2	2	7	15:45			38	148	50	191	339
04:00			3		2			16:00			38		50		
04:15			3		3			16:15			43		43		
04:30			6		2			16:30			28		44		
04:45			10	22	3	10	32	16:45			41	150	68	205	355
05:00			10		6			17:00			39		56		
05:15			5		4			17:15			28		50		
05:30			12		2			17:30			42		46		
05:45			16	43	10	22	65	17:45			29	138	46	198	336
06:00			51		7			18:00			30		43		
06:15			43		6			18:15			32		25		
06:30			12		16			18:30			26		22		
06:45			13	119	9	38	157	18:45			28	116	20	110	226
07:00			21		26			19:00			32		25		
07:15			33		45			19:15			15		14		
07:30			25		39			19:30			14		18		
07:45			31	110	47	157	267	19:45			16	77	11	68	145
08:00			39		47			20:00			10		8		
08:15			28		60			20:15			9		14		
08:30			28		44			20:30			4		8		
08:45			28	123	35	186	309	20:45			9	32	7	37	69
09:00			26		36			21:00			8		5		
09:15			28		30			21:15			5		3		
09:30			23		30			21:30			7		11		
09:45			24	101	34	130	231	21:45			9	29	2	21	50
10:00			13		31			22:00			7		3		
10:15			18		25			22:15			2		2		
10:30			21		38			22:30			2		0		
10:45			30	82	21	115	197	22:45			4	15	2	7	22
11:00			21		30			23:00			0		3		
11:15			25		35			23:15			2		8		
11:30			31		36			23:30			2		6		
11:45			32	109	37	138	247	23:45			0	4	3	20	24
Total Vol.				729		827	**1556**					1144		1298	**2442**

Daily Totals

NB	SB	EB	WB	Combined
		1873	2125	**3998**

	NB	SB	AM EB	AM WB	AM Combined	PM NB	PM SB	PM EB	PM WB	PM Combined
Split %			46.9%	53.1%	**38.9%**			46.8%	53.2%	**61.1%**
Peak Hour	00:30	00:30	11:45	07:45	**07:45**			13:15	16:45	**16:45**
Volume			135	198	**324**			166	220	**370**
P.H.F.			0.91	0.83	**0.92**			0.92	0.81	**0.85**

APPENDIX H

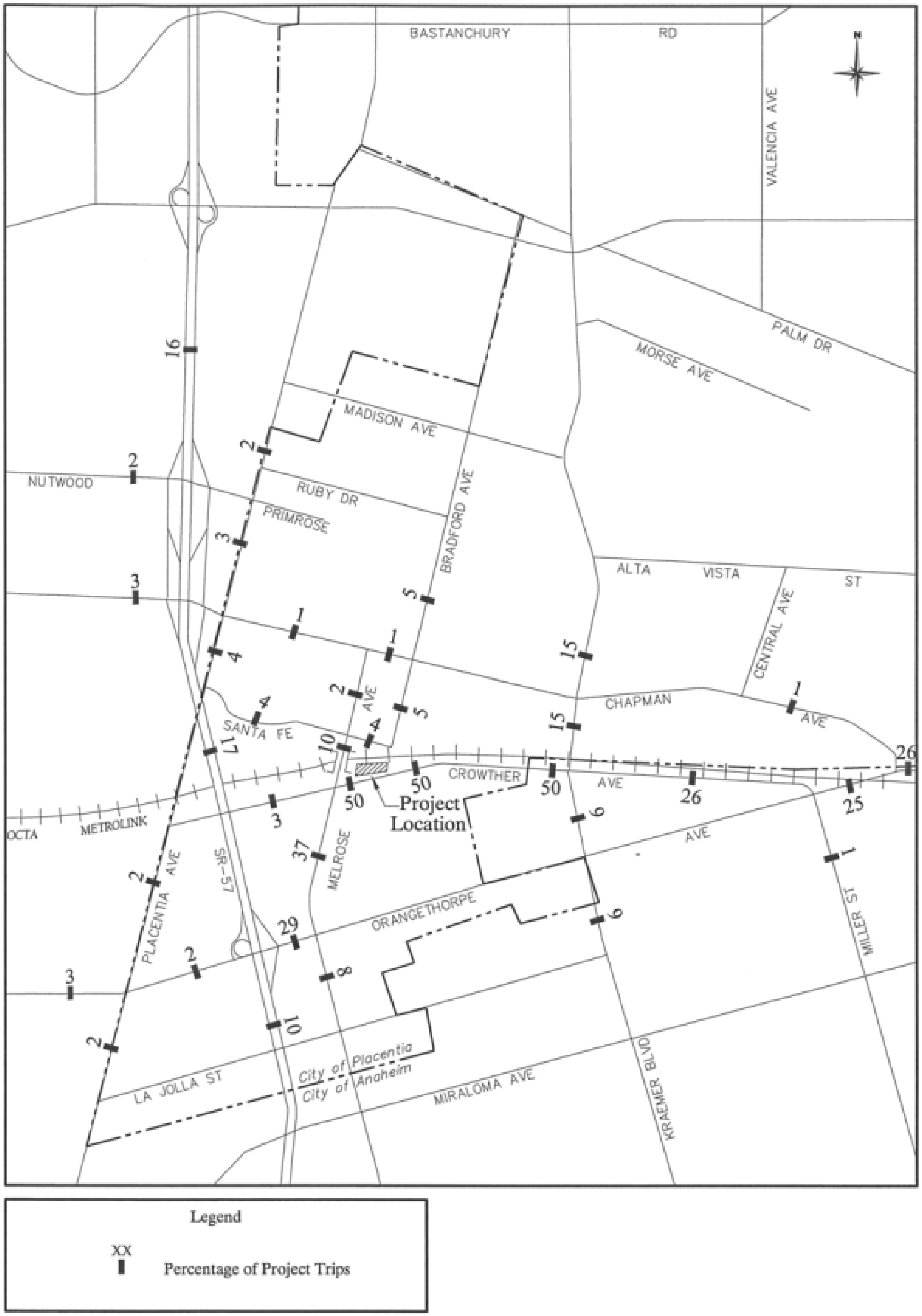
Opening Day 2018 Cumulative Projects

Table 5.1-6

WESTGATE METROLINK STATION TRIP GENERATION

	AM Peak Hour			PM Peak Hour			
	In	**Out**	**Total**	**In**	**Out**	**Total**	**ADT**
PASSENGERS BOARDING							
Persons							
Park	170	0	170	0	10	10	440
Drop-Off/Shuttle	30	0	30	0	5	5	80
Walk	10	0	10	0	0	0	10
Total	210	0	210	0	15	15	530
Vehicles							
Park	170	0	170	0	10	10	440
Drop-Off/Shuttle	30	30	60	1	1	2	150
Total	200	30	230	1	11	12	590
PASSENGERS ALIGHTING							
Persons							
Park	10	0	10	0	170	170	440
Drop-Off/Shuttle	5	0	5	0	30	30	80
Walk	0	0	0	0	10	10	10
Total	15	0	15	0	210	210	530
Vehicles							
Park	10	0	10	0	170	170	440
Drop-Off/Shuttle	1	1	2	30	30	60	150
Total	11	1	12	30	200	230	590
TOTAL VEHICLES	**211**	**31**	**242**	**31**	**211**	**242**	**1,180**

Figure 5.1-6 - Project Trip Distribution



APPENDIX I

LOS Analysis Worksheets – Opening Day 2018 without Project

APPENDIX I-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	0	0	0	----		
NB Thru	0	0	0	----		
NB Right	0	0	0	----		
SB Left	63	0	0	----		
SB Thru	49	1	1700	112/1,700= 0.066		
SB Right	142	1	1700	142/1,700= 0.084	< ==	0.084
EB Left	0	0	0	----		
EB Thru	528	2	3400	528/3,400= 0.155		
EB Right	565	1	1700	565/1,700= 0.332		
WB Left	313	1	1700	313/1,700= 0.184		
WB Thru	1837	2	3400	1,837/3,400= 0.540	< ==	
WB Right	0	0	0	----		0.540
Sum of Critical V/C Ratios						0.624
Adjustment for Lost Time						0.050
Intersection Capacity Utilization (ICU)						**0.674**
Level of Service (LOS) - Refer to table below						**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Opening Year 2018 w/o Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	119	0	0		----		
SB Thru	97	1	1700	216/1,700=	0.127	< ==	
SB Right	209	1	1700	209/1,700=	0.123		0.127
EB Left	0	0	0		----		
EB Thru	909	2	3400	909/3,400=	0.267		
EB Right	595	1	1700	595/1,700=	0.350		
WB Left	167	1	1700	167/1,700=	0.098		
WB Thru	1722	2	3400	1,722/3,400=	0.506	< ==	
WB Right	0	0	0		----		0.506

Sum of Critical V/C Ratios	0.633
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.683**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	984	2	3400	984/3,400=	0.290	< ==	
NB Thru	0	0	0		----		
NB Right	249	1	1700	249/1,700=	0.146		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.290
EB Left	109	1	1700	109/1,700=	0.064	< ==	
EB Thru	483	2	3400	483/3,400=	0.142		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1161	2	3400	1,288/3,400=	0.379	< ==	
WB Right	127	0	0		----		0.443
Sum of Critical V/C Ratios							0.733
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.783**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps
Scenario: Opening Year 2018 w/o Project | Peak Hr: 5:00 - 6:00 PM
Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	834	2	3400	834/3,400=	0.250	< ==	
NB Thru	0	0	0		----		
NB Right	416	1	1700	416/1,700=	0.245		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.250
EB Left	157	1	1700	157/1,700=	0.092	< ==	
EB Thru	849	2	3400	849/3,400=	0.250		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1063	2	3400	1,281/3,400=	0.377	< ==	
WB Right	218	0	0		----		0.469

Sum of Critical V/C Ratios	0.719
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.769**
Level of Service (LOS) - Refer to table below	**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	348	2	3400	348/3,400= 0.100	< ==	
NB Thru	425	2	3400	496/3,400= 0.150		
NB Right	71	0	0	----		
SB Left	141	1	1700	141/1,700= 0.083		
SB Thru	661	2	3400	856/3,400= 0.252	< ==	
SB Right	195	0	0	----		0.352
EB Left	138	2	3400	138/3,400= 0.041	< ==	
EB Thru	533	2	3400	533/3,400= 0.157		
EB Right	161	1	1700	161/1,700= 0.095		
WB Left	107	1	1700	107/1,700= 0.063		
WB Thru	970	2	3400	970/3,400= 0.285	< ==	
WB Right	50	1	1700	50/1,700= 0.029		0.326
Sum of Critical V/C Ratios						0.678
Adjustment for Lost Time						0.050
Intersection Capacity Utilization (ICU)						**0.728**
Level of Service (LOS) - Refer to table below						**C**

* NOTES
- Per-lane Capacity = 1,700 vehicles/hour
- dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	507	2	3400	507/3,400=	0.150		
NB Thru	688	2	3400	780/3,400=	0.230	< ==	
NB Right	92	0	0		----		
SB Left	203	1	1700	203/1,700=	0.119	< ==	
SB Thru	447	2	3400	644/3,400=	0.189		
SB Right	197	0	0		----		0.349
EB Left	266	2	3400	266/3,400=	0.078	< ==	
EB Thru	819	2	3400	819/3,400=	0.241		
EB Right	177	1	1700	177/1,700=	0.104		
WB Left	82	1	1700	82/1,700=	0.048		
WB Thru	716	2	3400	716/3,400=	0.211	< ==	
WB Right	119	1	1700	119/1,700=	0.070		0.289

Sum of Critical V/C Ratios	0.638
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.688**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	197	1	1700	197/1,700=	0.120	< ==	
NB Thru	357	3	5100	522/5,100=	0.100		
NB Right	165	0	0		----		
SB Left	28	1	1700	28/1,700=	0.016		
SB Thru	1087	3	5100	1,357/5,100=	0.266	< ==	
SB Right	270	0	0		----		0.386
EB Left	186	1	1700	186/1,700=	0.109	< ==	
EB Thru	317	2	3400	317/3,400=	0.093		
EB Right	337	1	1700	337/1,700=	0.198		
WB Left	240	1	1700	240/1,700=	0.141		
WB Thru	518	2	3400	518/3,400=	0.152	< ==	
WB Right	70	1	1700	70/1,700=	0.041		0.261

Sum of Critical V/C Ratios	0.647
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.697**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Opening Year 2018 w/o Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	265	1	1700	265/1,700=	0.160		
NB Thru	1350	3	5100	1,584/5,100=	0.310	< ==	
NB Right	234	0	0		----		
SB Left	55	1	1700	55/1,700=	0.032	< ==	
SB Thru	587	3	5100	798/5,100=	0.156		
SB Right	211	0	0		----		0.342
EB Left	275	1	1700	275/1,700=	0.162	< ==	
EB Thru	400	2	3400	400/3,400=	0.118		
EB Right	247	1	1700	247/1,700=	0.145		
WB Left	148	1	1700	148/1,700=	0.087		
WB Thru	351	2	3400	351/3,400=	0.103	< ==	
WB Right	45	1	1700	45/1,700=	0.026		0.265

Sum of Critical V/C Ratios	0.607
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.657**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Opening Year 2018 w/o Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	11	1	1700	11/1,700=	0.010	< ==	
NB Thru	537	2	3400	604/3,400=	0.180		
NB Right	67	0	0		----		
SB Left	117	1	1700	117/1,700=	0.069		
SB Thru	835	2	3400	835/3,400=	0.246	< ==	
SB Right	35	1	1700	35/1,700=	0.021		0.256
EB Left	15	1	1700	15/1,700=	0.009		
EB Thru	11	1	1700	33/1,700=	0.019	< ==	
EB Right	22	0	0		----		
WB Left	167	1	1700	167/1,700=	0.098	< ==	
WB Thru	21	1	1700	21/1,700=	0.012		
WB Right	57	1	1700	57/1,700=	0.034		0.117

Sum of Critical V/C Ratios	0.373
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.423**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Opening Year 2018 w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	24	1	1700	24/1,700=	0.010		
NB Thru	844	2	3400	945/3,400=	0.280	< ==	
NB Right	101	0	0		----		
SB Left	69	1	1700	69/1,700=	0.041	< ==	
SB Thru	581	2	3400	581/3,400=	0.171		
SB Right	70	1	1700	70/1,700=	0.041		0.321
EB Left	164	1	1700	164/1,700=	0.096		
EB Thru	40	1	1700	192/1,700=	0.113	< ==	
EB Right	152	0	0		----		
WB Left	75	1	1700	75/1,700=	0.044	< ==	
WB Thru	28	1	1700	28/1,700=	0.016		
WB Right	36	1	1700	36/1,700=	0.021		0.157

Sum of Critical V/C Ratios	0.478
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.528**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Opening Year 2018 w/o Project | Peak Hr: 7:15 - 8:15 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	58	1	1700	58/1,700=	0.030	< ==	
NB Thru	374	2	3400	415/3,400=	0.120		
NB Right	41	0	0		----		
SB Left	25	1	1700	25/1,700=	0.015		
SB Thru	448	2	3400	507/3,400=	0.149	< ==	
SB Right	59	0	0		----		0.179
EB Left	14	1	1700	14/1,700=	0.008	< ==	
EB Thru	53	1	1700	53/1,700=	0.031		
EB Right	117	1	1700	117/1,700=	0.069		
WB Left	56	1	1700	56/1,700=	0.033		
WB Thru	139	1	1700	139/1,700=	0.082	< ==	
WB Right	58	1	1700	58/1,700=	0.034		0.090

Sum of Critical V/C Ratios	0.269
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.319**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	125	1	1700	125/1,700=	0.070		
NB Thru	443	2	3400	481/3,400=	0.140	< ==	
NB Right	38	0	0		----		
SB Left	56	1	1700	56/1,700=	0.033	< ==	
SB Thru	279	2	3400	305/3,400=	0.090		
SB Right	26	0	0		----		0.173
EB Left	23	1	1700	23/1,700=	0.014	< ==	
EB Thru	106	1	1700	106/1,700=	0.062		
EB Right	67	1	1700	67/1,700=	0.039		
WB Left	49	1	1700	49/1,700=	0.029		
WB Thru	143	1	1700	143/1,700=	0.084	< ==	
WB Right	45	1	1700	45/1,700=	0.026		0.098

Sum of Critical V/C Ratios	0.271
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.321**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	64	1	1700	64/1,700=	0.040	< ==	
NB Thru	662	3	5100	668/5,100=	0.130		
NB Right	6	0	0		----		
SB Left	31	1	1700	31/1,700=	0.018		
SB Thru	1537	2	3400	1,537/3,400=	0.452	< ==	
SB Right	155	1	1700	155/1,700=	0.091		0.492
EB Left	32	1	1700	32/1,700=	0.019	< ==	
EB Thru	78	1	1700	125/1,700=	0.074		
EB Right	47	0	0		----		
WB Left	2	1	1700	2/1,700=	0.001		
WB Thru	112	1	1700	112/1,700=	0.066	< ==	
WB Right	35	1	1700	35/1,700=	0.021		0.085

Sum of Critical V/C Ratios	0.577
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.627**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	73	1	1700	73/1,700=	0.040		
NB Thru	1766	3	5100	1,769/5,100=	0.350	< ==	
NB Right	3	0	0		----		
SB Left	30	1	1700	30/1,700=	0.018	< ==	
SB Thru	810	2	3400	810/3,400=	0.238		
SB Right	67	1	1700	67/1,700=	0.039		0.368
EB Left	109	1	1700	109/1,700=	0.064		
EB Thru	153	1	1700	219/1,700=	0.129	< ==	
EB Right	66	0	0		----		
WB Left	5	1	1700	5/1,700=	0.003	< ==	
WB Thru	109	1	1700	109/1,700=	0.064		
WB Right	22	1	1700	22/1,700=	0.013		0.132

Sum of Critical V/C Ratios	0.500
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.550**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Opening Year 2018 w/o Project | Peak Hr: 7:15 - 8:15 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	42	1	1700	42/1,700=	0.020	< ==	
NB Thru	201	2	3400	201/3,400=	0.060		
NB Right	78	1	1700	78/1,700=	0.046		
SB Left	141	2	3400	141/3,400=	0.041		
SB Thru	238	2	3400	455/3,400=	0.134	< ==	
SB Right	217	0	0		----		0.154
EB Left	153	1	1700	153/1,700=	0.090	< ==	
EB Thru	498	3	5100	528/5,100=	0.104		
EB Right	30	0	0		----		
WB Left	109	1	1700	109/1,700=	0.064		
WB Thru	793	3	5100	793/5,100=	0.155	< ==	
WB Right	191	1	1700	191/1,700=	0.112		0.245

Sum of Critical V/C Ratios	0.399
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.449**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	57	1	1700	57/1,700=	0.030	< ==	
NB Thru	322	2	3400	322/3,400=	0.090		
NB Right	95	1	1700	95/1,700=	0.056		
SB Left	261	2	3400	261/3,400=	0.077		
SB Thru	287	2	3400	520/3,400=	0.153	< ==	
SB Right	233	0	0		----		0.183
EB Left	198	1	1700	198/1,700=	0.116	< ==	
EB Thru	681	3	5100	725/5,100=	0.142		
EB Right	44	0	0		----		
WB Left	139	1	1700	139/1,700=	0.082		
WB Thru	851	3	5100	851/5,100=	0.167	< ==	
WB Right	246	1	1700	246/1,700=	0.145		0.283

Sum of Critical V/C Ratios	0.466
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.516**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Opening Year 2018 w/o Project | Peak Hr: 7:45 - 8:45 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	6	0	0		----		
NB Thru	8	1	1700	8/1,700=	----		
NB Right	18	1	1700	18/1,700=	0.011		
SB Left	307	1	1700	307/1,700=	0.181	< ==	
SB Thru	2	1	1700	195/1,700=	0.115		
SB Right	193	0	0		----		0.181
EB Left	120	2	3400	120/3,400=	0.035	< ==	
EB Thru	639	3	5100	643/5,100=	0.126		
EB Right	4	0	0		----		
WB Left	8	1	1700	8/1,700=	0.005		
WB Thru	858	3	5100	858/5,100=	0.168	< ==	
WB Right	303	1	1700	303/1,700=	0.178		0.203
Sum of Critical V/C Ratios							0.384
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.434**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	8	0	0		----		
NB Thru	6	1	1700	6/1,700=	----		
NB Right	11	1	1700	11/1,700=	0.006		
SB Left	160	1	1700	160/1,700=	0.094		
SB Thru	2	1	1700	265/1,700=	0.156	< ==	
SB Right	263	0	0		----		0.156
EB Left	236	2	3400	236/3,400=	0.069	< ==	
EB Thru	777	3	5100	777/5,100=	0.152		
EB Right	0	0	0		----		
WB Left	16	1	1700	16/1,700=	0.009		
WB Thru	854	3	5100	854/5,100=	0.167	< ==	
WB Right	330	1	1700	330/1,700=	0.194		0.236

Sum of Critical V/C Ratios	0.392
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.442**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	322	2	3400	322/3,400= 0.090		
NB Thru	0	0	0	----		
NB Right	494	1	1700	494/1,700= 0.291	< ==	
SB Left	0	0	0	----		
SB Thru	0	0	0	----		
SB Right	0	0	0	----		0.291
EB Left	125	2	3400	125/3,400= 0.037	< ==	
EB Thru	840	3	5100	840/5,100= 0.165		
EB Right	0	0	0	----		
WB Left	0	0	0	----		
WB Thru	845	3	5100	1,044/5,100= 0.205	< ==	
WB Right	199	0	0	----		0.242
Sum of Critical V/C Ratios						0.533
Adjustment for Lost Time						0.050
Intersection Capacity Utilization (ICU)						**0.583**
Level of Service (LOS) - Refer to table below						**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	198	2	3400	198/3,400=	0.060		
NB Thru	0	0	0		----		
NB Right	357	1	1700	357/1,700=	0.210	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.210
EB Left	229	2	3400	229/3,400=	0.067	< ==	
EB Thru	723	3	5100	723/5,100=	0.142		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1002	3	5100	1,590/5,100=	0.312	< ==	
WB Right	588	0	0		----		0.379

Sum of Critical V/C Ratios	0.589
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.639**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Opening Year 2018 w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	236	1	1700	236/1,700=	0.140	< ==	
NB Thru	299	2	3400	366/3,400=	0.110		
NB Right	67	0	0		----		
SB Left	61	1	1700	61/1,700=	0.036		
SB Thru	423	2	3400	588/3,400=	0.173	< ==	
SB Right	165	0	0		----		0.313
EB Left	241	2	3400	241/3,400=	0.071	< ==	
EB Thru	686	3	5100	1,076/5,100=	0.211		
EB Right	390	0	0		----		
WB Left	45	2	3400	45/3,400=	0.013		
WB Thru	964	3	5100	1,006/5,100=	0.197	< ==	
WB Right	42	0	0		----		0.268

Sum of Critical V/C Ratios	0.581
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.631**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Opening Year 2018 w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	422	1	1700	422/1,700=	0.250	< ==	
NB Thru	479	2	3400	575/3,400=	0.170		
NB Right	96	0	0		----		
SB Left	54	1	1700	54/1,700=	0.032		
SB Thru	191	2	3400	477/3,400=	0.140	< ==	
SB Right	286	0	0		----		0.390
EB Left	259	2	3400	259/3,400=	0.076	< ==	
EB Thru	934	3	5100	1,144/5,100=	0.224		
EB Right	210	0	0		----		
WB Left	47	2	3400	47/3,400=	0.014		
WB Thru	984	3	5100	1,029/5,100=	0.202	< ==	
WB Right	45	0	0		----		0.278

Sum of Critical V/C Ratios	0.668
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.718**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Opening Year 2018 w/o Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	260	1	1700	260/1,700=	0.150	< ==	
NB Thru	502	2	3400	502/3,400=	0.150		
NB Right	23	1	1700	23/1,700=	0.014		
SB Left	13	1	1700	13/1,700=	0.008		
SB Thru	1239	2	3400	1,239/3,400=	0.364	< ==	
SB Right	260	1	1700	260/1,700=	0.153		0.514
EB Left	133	1	1700	133/1,700=	0.078		
EB Thru	479	2	3400	479/3,400=	0.141	< ==	
EB Right	279	1	1700	279/1,700=	0.164		
WB Left	143	1	1700	143/1,700=	0.084	< ==	
WB Thru	696	3	5100	729/5,100=	0.143		
WB Right	33	0	0		----		0.225

Sum of Critical V/C Ratios	0.739
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.789**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Opening Year 2018 w/o Project　　Peak Hr: 5:00 - 6:00 PM

Analyst: GCW　　Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	352	1	1700	352/1,700=	0.210		
NB Thru	1305	2	3400	1,305/3,400=	0.380	< ==	
NB Right	69	1	1700	69/1,700=	0.041		
SB Left	40	1	1700	40/1,700=	0.024	< ==	
SB Thru	630	2	3400	630/3,400=	0.185		
SB Right	219	1	1700	219/1,700=	0.129		0.404
EB Left	278	1	1700	278/1,700=	0.164	< ==	
EB Thru	582	2	3400	582/3,400=	0.171		
EB Right	149	1	1700	149/1,700=	0.088		
WB Left	59	1	1700	59/1,700=	0.035		
WB Thru	532	3	5100	554/5,100=	0.109	< ==	
WB Right	22	0	0		----		0.273

Sum of Critical V/C Ratios	0.677
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.727**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX I-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	528	565	313	1837	0	0	0	0	63	49	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1848	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1848	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	528	565	313	1837	0	0	0	0	63	49	142
RTOR Reduction (vph)	0	0	253	0	0	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	528	312	313	1837	0	0	0	0	0	112	86
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		45.6	45.6	28.0	77.6						13.4	13.4
Effective Green, g (s)		45.6	45.6	28.0	77.6						13.4	13.4
Actuated g/C Ratio		0.46	0.46	0.28	0.78						0.13	0.13
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1646	736	505	2801						247	216
v/s Ratio Prot		0.15		0.17	c0.51							
v/s Ratio Perm			0.19								0.06	0.05
v/c Ratio		0.32	0.42	0.62	0.66						0.45	0.40
Uniform Delay, d1		17.3	18.3	31.4	5.1						39.9	39.6
Progression Factor		0.37	0.32	0.87	0.80						1.00	1.00
Incremental Delay, d2		0.5	1.7	1.2	0.6						1.3	1.2
Delay (s)		6.9	7.6	28.3	4.7						41.2	40.8
Level of Service		A	A	C	A						D	D
Approach Delay (s)		7.2			8.2			0.0			41.0	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	113.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	909	595	167	1722	0	0	0	0	119	97	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1849	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1849	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	909	595	167	1722	0	0	0	0	119	97	209
RTOR Reduction (vph)	0	0	246	0	0	0	0	0	0	0	0	54
Lane Group Flow (vph)	0	909	349	167	1722	0	0	0	0	0	216	155
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		51.0	51.0	19.0	74.0						17.0	17.0
Effective Green, g (s)		51.0	51.0	19.0	74.0						17.0	17.0
Actuated g/C Ratio		0.51	0.51	0.19	0.74						0.17	0.17
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1841	823	342	2671						314	274
v/s Ratio Prot		0.25		0.09	c0.48							
v/s Ratio Perm			0.22								0.12	0.10
v/c Ratio		0.49	0.42	0.49	0.64						0.69	0.57
Uniform Delay, d1		16.0	15.3	36.2	6.5						39.0	38.1
Progression Factor		0.50	0.11	1.00	1.13						1.00	1.00
Incremental Delay, d2		0.9	1.6	0.7	0.7						6.1	2.7
Delay (s)		9.0	3.3	36.7	8.0						45.2	40.8
Level of Service		A	A	D	A						D	D
Approach Delay (s)		6.7			10.6			0.0			43.0	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	116.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	483	0	0	1161	127	984	0	249	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.99		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1805	3610			3557		1715	1638	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1805	3610			3557		1715	1638	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	109	483	0	0	1161	127	984	0	249	0	0	0
RTOR Reduction (vph)	0	0	0	0	8	0	0	40	86	0	0	0
Lane Group Flow (vph)	109	483	0	0	1280	0	502	467	138	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	12.0	58.4			42.4		32.6	32.6	32.6			
Effective Green, g (s)	12.0	58.4			42.4		32.6	32.6	32.6			
Actuated g/C Ratio	0.12	0.58			0.42		0.33	0.33	0.33			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	216	2108			1508		559	533	500			
v/s Ratio Prot	c0.06	0.13			c0.36							
v/s Ratio Perm							c0.29	0.28	0.09			
v/c Ratio	0.50	0.23			0.85		0.90	0.88	0.28			
Uniform Delay, d1	41.2	10.0			25.9		32.1	31.8	25.0			
Progression Factor	1.57	0.09			0.65		1.00	1.00	1.00			
Incremental Delay, d2	1.8	0.2			3.7		17.0	14.9	0.3			
Delay (s)	66.5	1.1			20.6		49.2	46.6	25.3			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		13.2			20.6			43.8			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	113.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	849	0	0	1063	218	834	0	416	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.97		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3518		1715	1630	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3518		1715	1630	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	157	849	0	0	1063	218	834	0	416	0	0	0
RTOR Reduction (vph)	0	0	0	0	16	0	0	42	108	0	0	0
Lane Group Flow (vph)	157	849	0	0	1265	0	442	392	266	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	12.1	60.5			44.4		30.5	30.5	30.5			
Effective Green, g (s)	12.1	60.5			44.4		30.5	30.5	30.5			
Actuated g/C Ratio	0.12	0.60			0.44		0.30	0.30	0.30			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	218	2184			1561		523	497	467			
v/s Ratio Prot	c0.09	0.24			c0.36							
v/s Ratio Perm							c0.26	0.24	0.17			
v/c Ratio	0.72	0.39			0.81		0.85	0.79	0.57			
Uniform Delay, d1	42.3	10.2			24.1		32.5	31.8	29.2			
Progression Factor	1.44	0.13			1.06		1.00	1.00	1.00			
Incremental Delay, d2	9.9	0.5			3.5		11.9	8.1	1.6			
Delay (s)	70.8	1.8			29.1		44.5	40.0	30.8			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		12.5			29.1			38.8			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	116.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	138	533	161	107	970	50	348	425	71	141	661	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3532		1805	3487	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3532		1805	3487	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	138	533	161	107	970	50	348	425	71	141	661	195
RTOR Reduction (vph)	0	0	84	0	0	30	0	13	0	0	28	0
Lane Group Flow (vph)	138	533	77	107	970	20	348	483	0	141	828	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	9.0	38.7	47.7	9.8	39.5	39.5	9.0	26.2		10.8	28.0	
Effective Green, g (s)	9.0	38.7	47.7	9.8	39.5	39.5	9.0	26.2		10.8	28.0	
Actuated g/C Ratio	0.09	0.39	0.48	0.10	0.40	0.40	0.09	0.26		0.11	0.28	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	315	1397	770	176	1425	637	315	925		194	976	
v/s Ratio Prot	c0.04	0.15	0.01	0.06	c0.27		c0.10	0.14		0.08	c0.24	
v/s Ratio Perm			0.04			0.01						
v/c Ratio	0.44	0.38	0.10	0.61	0.68	0.03	1.10	0.52		0.73	0.85	
Uniform Delay, d1	43.1	22.0	14.4	43.3	25.0	18.5	45.5	31.5		43.2	34.0	
Progression Factor	0.94	0.80	0.55	1.00	1.00	1.00	0.98	0.93		1.00	1.00	
Incremental Delay, d2	0.3	0.8	0.0	4.0	2.6	0.1	81.7	0.7		10.9	7.2	
Delay (s)	40.9	18.4	7.9	47.3	27.7	18.6	126.3	29.9		54.1	41.2	
Level of Service	D	B	A	D	C	B	F	C		D	D	
Approach Delay (s)		20.1			29.1			69.7			43.0	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	266	819	177	82	716	119	507	688	92	203	447	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3546		1805	3444	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3546		1805	3444	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	266	819	177	82	716	119	507	688	92	203	447	197
RTOR Reduction (vph)	0	0	65	0	0	63	0	10	0	0	51	0
Lane Group Flow (vph)	266	819	112	82	716	56	507	770	0	203	593	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.6	37.1	54.3	7.4	31.9	31.9	17.2	26.8		14.2	23.8	
Effective Green, g (s)	12.6	37.1	54.3	7.4	31.9	31.9	17.2	26.8		14.2	23.8	
Actuated g/C Ratio	0.13	0.37	0.54	0.07	0.32	0.32	0.17	0.27		0.14	0.24	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	441	1339	876	133	1151	515	602	950		256	819	
v/s Ratio Prot	0.08	c0.23	0.02	0.05	c0.20		c0.14	c0.22		0.11	0.17	
v/s Ratio Perm			0.05			0.03						
v/c Ratio	0.60	0.61	0.13	0.62	0.62	0.11	0.84	0.81		0.79	0.72	
Uniform Delay, d1	41.3	25.6	11.2	44.9	28.9	24.0	40.1	34.2		41.5	35.1	
Progression Factor	0.91	0.85	0.67	1.00	1.00	1.00	0.96	0.92		1.00	1.00	
Incremental Delay, d2	1.4	1.9	0.0	5.9	2.5	0.4	9.7	5.4		14.5	3.4	
Delay (s)	39.0	23.5	7.6	50.8	31.5	24.4	48.2	36.8		55.9	38.5	
Level of Service	D	C	A	D	C	C	D	D		E	D	
Approach Delay (s)		24.6			32.3			41.3			42.7	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	313	337	240	518	70	197	357	165	28	1087	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	4941		1805	5032	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	4941		1805	5032	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	186	313	337	240	518	70	197	357	165	28	1087	270
RTOR Reduction (vph)	0	0	208	0	0	58	0	72	0	0	41	0
Lane Group Flow (vph)	186	313	129	240	518	12	197	450	0	28	1316	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	13.0	14.7	14.7	15.8	17.5	17.5	13.2	47.4		4.7	38.9	
Effective Green, g (s)	13.0	14.7	14.7	15.8	17.5	17.5	13.2	47.4		4.7	38.9	
Actuated g/C Ratio	0.13	0.15	0.15	0.16	0.18	0.18	0.13	0.48		0.05	0.39	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	237	538	240	289	640	286	241	2375		86	1985	
v/s Ratio Prot	0.10	0.09		c0.13	c0.14		c0.11	0.09		0.02	c0.26	
v/s Ratio Perm			0.08			0.01						
v/c Ratio	0.78	0.58	0.54	0.83	0.81	0.04	0.82	0.19		0.33	0.66	
Uniform Delay, d1	41.4	39.1	38.8	40.1	38.9	33.6	41.5	14.6		45.4	24.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.6	1.6	2.3	18.0	7.5	0.1	18.9	0.2		2.2	1.8	
Delay (s)	57.0	40.7	41.1	58.1	46.4	33.7	60.4	14.8		47.6	26.2	
Level of Service	E	D	D	E	D	C	E	B		D	C	
Approach Delay (s)		44.5			48.7			27.3			26.7	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	98.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	275	400	247	148	351	45	265	1350	234	55	587	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4981	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4981	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	275	400	247	148	351	45	265	1350	234	55	587	211
RTOR Reduction (vph)	0	0	193	0	0	38	0	22	0	0	61	0
Lane Group Flow (vph)	275	400	54	148	351	7	265	1562	0	55	737	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	18.1	19.6	19.6	12.0	13.5	13.5	17.5	35.8		6.7	25.0	
Effective Green, g (s)	18.1	19.6	19.6	12.0	13.5	13.5	17.5	35.8		6.7	25.0	
Actuated g/C Ratio	0.20	0.22	0.22	0.13	0.15	0.15	0.19	0.40		0.07	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	362	785	351	240	540	241	350	2015		134	1382	
v/s Ratio Prot	c0.15	0.11		0.08	c0.10		c0.15	c0.31		0.03	0.15	
v/s Ratio Perm			0.03			0.00						
v/c Ratio	0.76	0.51	0.15	0.62	0.65	0.03	0.76	0.78		0.41	0.53	
Uniform Delay, d1	33.9	31.0	28.5	36.9	36.1	32.7	34.3	23.6		39.8	27.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.9	0.5	0.2	4.7	2.8	0.0	9.0	3.0		2.0	1.5	
Delay (s)	42.8	31.5	28.7	41.5	38.9	32.7	43.3	26.6		41.9	29.1	
Level of Service	D	C	C	D	D	C	D	C		D	C	
Approach Delay (s)		34.2			39.1			29.0			29.9	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	11	22	167	21	57	11	537	67	117	835	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1710		1805	1900	1615	1805	3550		1805	3610	1615
Flt Permitted	0.74	1.00		0.74	1.00	1.00	0.32	1.00		0.42	1.00	1.00
Satd. Flow (perm)	1413	1710		1398	1900	1615	605	3550		789	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	11	22	167	21	57	11	537	67	117	835	35
RTOR Reduction (vph)	0	18	0	0	0	47	0	5	0	0	0	9
Lane Group Flow (vph)	15	15	0	167	21	10	11	599	0	117	835	26
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	17.4	17.4		17.4	17.4	17.4	74.6	74.6		74.6	74.6	74.6
Effective Green, g (s)	17.4	17.4		17.4	17.4	17.4	74.6	74.6		74.6	74.6	74.6
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.75	0.75		0.75	0.75	0.75
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	245	297		243	330	281	451	2648		588	2693	1204
v/s Ratio Prot		0.01			0.01			0.17			c0.23	
v/s Ratio Perm	0.01			c0.12		0.01	0.02			0.15		0.02
v/c Ratio	0.06	0.05		0.69	0.06	0.04	0.02	0.23		0.20	0.31	0.02
Uniform Delay, d1	34.5	34.4		38.7	34.5	34.3	3.3	3.9		3.8	4.2	3.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.21	0.19	0.02
Incremental Delay, d2	0.1	0.1		7.8	0.1	0.1	0.1	0.2		0.6	0.2	0.0
Delay (s)	34.6	34.5		46.6	34.6	34.4	3.4	4.1		1.4	1.0	0.1
Level of Service	C	C		D	C	C	A	A		A	A	A
Approach Delay (s)		34.5			42.7			4.1			1.1	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	164	40	152	75	28	36	24	844	101	69	581	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.88		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1674		1805	1900	1615	1805	3552		1805	3610	1615
Flt Permitted	0.74	1.00		0.42	1.00	1.00	0.43	1.00		0.28	1.00	1.00
Satd. Flow (perm)	1404	1674		799	1900	1615	810	3552		532	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	164	40	152	75	28	36	24	844	101	69	581	70
RTOR Reduction (vph)	0	126	0	0	0	30	0	6	0	0	0	18
Lane Group Flow (vph)	164	66	0	75	28	6	24	939	0	69	581	52
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	17.3	17.3		17.3	17.3	17.3	74.7	74.7		74.7	74.7	74.7
Effective Green, g (s)	17.3	17.3		17.3	17.3	17.3	74.7	74.7		74.7	74.7	74.7
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.75	0.75		0.75	0.75	0.75
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	242	289		138	328	279	605	2653		397	2696	1206
v/s Ratio Prot		0.04			0.01			c0.26			0.16	
v/s Ratio Perm	c0.12			0.09		0.00	0.03			0.13		0.03
v/c Ratio	0.68	0.23		0.54	0.09	0.02	0.04	0.35		0.17	0.22	0.04
Uniform Delay, d1	38.7	35.6		37.7	34.7	34.3	3.3	4.4		3.7	3.8	3.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.24	0.24	0.00
Incremental Delay, d2	7.3	0.4		4.3	0.1	0.0	0.1	0.4		0.8	0.2	0.1
Delay (s)	46.1	36.0		42.1	34.8	34.4	3.4	4.7		1.7	1.1	0.1
Level of Service	D	D		D	C	C	A	A		A	A	A
Approach Delay (s)		40.6			38.6			4.7			1.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	14	53	117	56	139	58	58	374	41	25	448	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3557		1805	3547	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3557		1805	3547	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	53	117	56	139	58	58	374	41	25	448	59
RTOR Reduction (vph)	0	0	100	0	0	47	0	6	0	0	7	0
Lane Group Flow (vph)	14	53	17	56	139	11	58	409	0	25	500	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	1.2	10.9	10.9	4.8	14.5	14.5	4.8	39.4		2.6	37.2	
Effective Green, g (s)	1.2	10.9	10.9	4.8	14.5	14.5	4.8	39.4		2.6	37.2	
Actuated g/C Ratio	0.02	0.15	0.15	0.07	0.20	0.20	0.07	0.53		0.04	0.50	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	29	281	238	117	373	317	117	1901		63	1790	
v/s Ratio Prot	0.01	0.03		c0.03	c0.07		c0.03	0.12		0.01	c0.14	
v/s Ratio Perm			0.01			0.01						
v/c Ratio	0.48	0.19	0.07	0.48	0.37	0.04	0.50	0.22		0.40	0.28	
Uniform Delay, d1	35.9	27.5	27.0	33.2	25.7	23.9	33.3	9.0		34.8	10.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.1	0.3	0.1	3.1	0.6	0.0	3.3	0.3		4.1	0.4	
Delay (s)	48.1	27.9	27.2	36.3	26.3	24.0	36.6	9.3		38.9	10.9	
Level of Service	D	C	C	D	C	C	D	A		D	B	
Approach Delay (s)		29.0			28.0			12.6			12.2	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	73.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	39.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	106	67	49	143	45	125	443	38	56	279	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3567		1805	3564	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3567		1805	3564	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	23	106	67	49	143	45	125	443	38	56	279	26
RTOR Reduction (vph)	0	0	57	0	0	37	0	5	0	0	5	0
Lane Group Flow (vph)	23	106	10	49	143	8	125	476	0	56	300	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	2.7	11.1	11.1	4.7	13.1	13.1	8.8	39.6		4.9	35.7	
Effective Green, g (s)	2.7	11.1	11.1	4.7	13.1	13.1	8.8	39.6		4.9	35.7	
Actuated g/C Ratio	0.04	0.15	0.15	0.06	0.17	0.17	0.12	0.52		0.06	0.47	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	63	276	234	111	326	277	208	1851		115	1667	
v/s Ratio Prot	0.01	0.06		c0.03	c0.08		c0.07	c0.13		0.03	0.08	
v/s Ratio Perm			0.01			0.00						
v/c Ratio	0.37	0.38	0.04	0.44	0.44	0.03	0.60	0.26		0.49	0.18	
Uniform Delay, d1	36.0	29.5	28.0	34.5	28.3	26.3	32.1	10.2		34.5	11.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.6	0.9	0.1	2.8	0.9	0.0	4.8	0.3		3.2	0.2	
Delay (s)	39.5	30.4	28.1	37.3	29.3	26.3	36.9	10.5		37.7	12.0	
Level of Service	D	C	C	D	C	C	D	B		D	B	
Approach Delay (s)		30.7			30.4			16.0			16.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	78	47	2	112	35	64	662	6	31	1537	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1793		1805	1900	1615	1805	5180		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1793		1805	1900	1615	1805	5180		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	32	78	47	2	112	35	64	662	6	31	1537	155
RTOR Reduction (vph)	0	25	0	0	0	31	0	0	0	0	0	52
Lane Group Flow (vph)	32	100	0	2	112	4	64	668	0	31	1537	103
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	2.7	11.0		0.9	9.2	9.2	5.0	44.4		2.7	42.1	42.1
Effective Green, g (s)	2.7	11.0		0.9	9.2	9.2	5.0	44.4		2.7	42.1	42.1
Actuated g/C Ratio	0.04	0.15		0.01	0.12	0.12	0.07	0.59		0.04	0.56	0.56
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	64	262		21	233	198	120	3066		64	2026	906
v/s Ratio Prot	c0.02	0.06		0.00	c0.06		c0.04	0.13		0.02	c0.43	
v/s Ratio Perm						0.00						0.06
v/c Ratio	0.50	0.38		0.10	0.48	0.02	0.53	0.22		0.48	0.76	0.11
Uniform Delay, d1	35.5	28.9		36.6	30.7	28.9	33.9	7.2		35.5	12.6	7.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	6.0	0.9		2.0	1.6	0.0	4.5	0.2		5.7	2.7	0.3
Delay (s)	41.5	29.9		38.6	32.2	29.0	38.4	7.3		41.1	15.3	8.0
Level of Service	D	C		D	C	C	D	A		D	B	A
Approach Delay (s)		32.2			31.6			10.0			15.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	153	66	5	109	22	73	1766	3	30	810	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1814		1805	1900	1615	1805	5186		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1814		1805	1900	1615	1805	5186		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	109	153	66	5	109	22	73	1766	3	30	810	67
RTOR Reduction (vph)	0	16	0	0	0	19	0	0	0	0	0	35
Lane Group Flow (vph)	109	203	0	5	109	3	73	1769	0	30	810	32
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	7.6	19.5		1.1	13.0	13.0	6.8	43.4		2.9	39.5	39.5
Effective Green, g (s)	7.6	19.5		1.1	13.0	13.0	6.8	43.4		2.9	39.5	39.5
Actuated g/C Ratio	0.09	0.24		0.01	0.16	0.16	0.08	0.52		0.03	0.48	0.48
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	165	426		23	297	253	148	2714		63	1720	769
v/s Ratio Prot	c0.06	c0.11		0.00	0.06		c0.04	c0.34		0.02	0.22	
v/s Ratio Perm						0.00						0.02
v/c Ratio	0.66	0.48		0.22	0.37	0.01	0.49	0.65		0.48	0.47	0.04
Uniform Delay, d1	36.4	27.3		40.5	31.3	29.5	36.4	14.3		39.3	14.6	11.6
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	9.5	0.8		4.7	0.8	0.0	2.6	1.2		5.6	0.9	0.1
Delay (s)	45.9	28.1		45.2	32.0	29.6	39.0	15.5		44.8	15.6	11.7
Level of Service	D	C		D	C	C	D	B		D	B	B
Approach Delay (s)		34.1			32.1			16.4			16.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	82.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	153	498	30	109	793	191	42	201	78	141	238	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3352	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3352	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	153	498	30	109	793	191	42	201	78	141	238	217
RTOR Reduction (vph)	0	6	0	0	0	139	0	0	57	0	151	0
Lane Group Flow (vph)	153	522	0	109	793	52	42	201	21	141	304	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	20.5	36.0		14.5	30.0	30.0	10.5	30.0	30.0	10.5	30.0	
Effective Green, g (s)	20.5	36.0		14.5	30.0	30.0	10.5	30.0	30.0	10.5	30.0	
Actuated g/C Ratio	0.19	0.33		0.13	0.27	0.27	0.10	0.27	0.27	0.10	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	336	1683		237	1414	440	172	984	440	334	914	
v/s Ratio Prot	c0.08	0.10		0.06	c0.15		0.02	0.06		c0.04	c0.09	
v/s Ratio Perm						0.03			0.01			
v/c Ratio	0.46	0.31		0.46	0.56	0.12	0.24	0.20	0.05	0.42	0.33	
Uniform Delay, d1	39.8	27.7		44.1	34.3	30.1	46.1	30.8	29.5	46.9	32.0	
Progression Factor	0.69	0.51		0.53	0.69	1.56	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.0	0.4		6.1	1.6	0.5	3.3	0.5	0.2	3.9	1.0	
Delay (s)	31.5	14.6		29.3	25.3	47.3	49.4	31.3	29.7	50.8	33.0	
Level of Service	C	B		C	C	D	D	C	C	D	C	
Approach Delay (s)		18.4			29.5			33.3			37.2	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	198	681	44	139	851	246	57	322	95	261	287	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3367	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3367	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	198	681	44	139	851	246	57	322	95	261	287	233
RTOR Reduction (vph)	0	5	0	0	0	158	0	0	80	0	146	0
Lane Group Flow (vph)	198	720	0	139	851	88	57	322	15	261	374	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	21.5	47.6		13.2	39.3	39.3	7.4	17.4	17.4	12.8	22.8	
Effective Green, g (s)	21.5	47.6		13.2	39.3	39.3	7.4	17.4	17.4	12.8	22.8	
Actuated g/C Ratio	0.20	0.43		0.12	0.36	0.36	0.07	0.16	0.16	0.12	0.21	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	352	2224		216	1853	576	121	571	255	407	697	
v/s Ratio Prot	c0.11	0.14		c0.08	c0.16		0.03	0.09		c0.07	c0.11	
v/s Ratio Perm						0.05			0.01			
v/c Ratio	0.56	0.32		0.64	0.46	0.15	0.47	0.56	0.06	0.64	0.54	
Uniform Delay, d1	40.0	20.6		46.2	27.2	24.0	49.4	42.8	39.3	46.4	38.9	
Progression Factor	1.21	1.22		0.61	0.69	1.27	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	0.3		6.2	0.8	0.5	2.9	1.3	0.1	3.4	0.8	
Delay (s)	50.2	25.4		34.2	19.5	31.1	52.3	44.1	39.4	49.8	39.7	
Level of Service	D	C		C	B	C	D	D	D	D	D	
Approach Delay (s)		30.7			23.5			44.1			43.1	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	639	4	8	858	303	6	8	18	307	2	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	0.99	
Satd. Flow (prot)	3502	5182		1805	5187	1615		1860	1615	1715	1571	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	0.99	
Satd. Flow (perm)	3502	5182		1805	5187	1615		1860	1615	1715	1571	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	639	4	8	858	303	6	8	18	307	2	193
RTOR Reduction (vph)	0	0	0	0	0	147	0	0	17	0	153	0
Lane Group Flow (vph)	120	643	0	8	858	156	0	14	1	264	85	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	9.0	63.7		2.3	56.5	56.5		4.2	4.2	23.0	23.0	
Effective Green, g (s)	9.0	63.7		2.3	56.5	56.5		4.2	4.2	23.0	23.0	
Actuated g/C Ratio	0.08	0.58		0.02	0.51	0.51		0.04	0.04	0.21	0.21	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	286	3000		37	2664	829		71	61	358	328	
v/s Ratio Prot	c0.03	0.12		0.00	c0.17			c0.01		c0.15	0.05	
v/s Ratio Perm						0.10			0.00			
v/c Ratio	0.42	0.21		0.22	0.32	0.19		0.20	0.01	0.74	0.26	
Uniform Delay, d1	48.0	11.1		53.0	15.6	14.4		51.3	50.9	40.7	36.4	
Progression Factor	0.87	0.41		1.00	1.01	3.71		1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.2		2.8	0.3	0.5		1.4	0.1	7.7	0.4	
Delay (s)	42.7	4.8		55.9	16.1	53.9		52.6	51.0	48.4	36.8	
Level of Service	D	A		E	B	D		D	D	D	D	
Approach Delay (s)		10.7			26.2			51.7			42.9	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	236	777	0	16	854	330	8	6	11	160	2	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5187		1805	5187	1615		1847	1615	1715	1547	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5187		1805	5187	1615		1847	1615	1715	1547	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	236	777	0	16	854	330	8	6	11	160	2	263
RTOR Reduction (vph)	0	0	0	0	0	153	0	0	11	0	222	0
Lane Group Flow (vph)	236	777	0	16	854	177	0	14	0	144	59	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	12.2	67.2		4.6	59.1	59.1		4.2	4.2	17.2	17.2	
Effective Green, g (s)	12.2	67.2		4.6	59.1	59.1		4.2	4.2	17.2	17.2	
Actuated g/C Ratio	0.11	0.61		0.04	0.54	0.54		0.04	0.04	0.16	0.16	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	388	3168		75	2786	867		70	61	268	241	
v/s Ratio Prot	c0.07	0.15		0.01	c0.16			c0.01		c0.08	0.04	
v/s Ratio Perm						0.11			0.00			
v/c Ratio	0.61	0.25		0.21	0.31	0.20		0.20	0.01	0.54	0.25	
Uniform Delay, d1	46.6	9.8		51.0	14.1	13.2		51.3	50.9	42.7	40.7	
Progression Factor	0.61	0.35		1.24	1.36	4.38		1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.6	0.2		1.3	0.3	0.5		1.4	0.0	2.1	0.5	
Delay (s)	31.2	3.6		64.2	19.5	58.4		52.7	50.9	44.8	41.2	
Level of Service	C	A		E	B	E		D	D	D	D	
Approach Delay (s)		10.0			30.8			51.9			42.4	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	840	0	0	845	199	322	0	494	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			5039		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			5039		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	125	840	0	0	845	199	322	0	494	0	0	0
RTOR Reduction (vph)	0	0	0	0	27	0	0	0	59	0	0	0
Lane Group Flow (vph)	125	840	0	0	1017	0	161	161	435	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	9.3	63.6			50.8		36.6	36.6	36.6			
Effective Green, g (s)	9.3	63.6			50.8		36.6	36.6	36.6			
Actuated g/C Ratio	0.08	0.58			0.46		0.33	0.33	0.33			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	296	2999			2327		570	570	537			
v/s Ratio Prot	c0.04	0.16			c0.20							
v/s Ratio Perm							0.09	0.09	c0.27			
v/c Ratio	0.42	0.28			0.44		0.28	0.28	0.81			
Uniform Delay, d1	47.8	11.7			20.0		27.0	27.0	33.5			
Progression Factor	1.22	1.03			0.54		1.00	1.00	1.00			
Incremental Delay, d2	0.9	0.2			0.5		0.3	0.3	9.0			
Delay (s)	59.3	12.3			11.3		27.3	27.3	42.6			
Level of Service	E	B			B		C	C	D			
Approach Delay (s)		18.4			11.3			36.5			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	229	723	0	0	1002	588	198	0	357	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.94		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			4899		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			4899		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	229	723	0	0	1002	588	198	0	357	0	0	0
RTOR Reduction (vph)	0	0	0	0	69	0	0	0	183	0	0	0
Lane Group Flow (vph)	229	723	0	0	1521	0	99	99	174	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	12.3	82.2			66.4		18.0	18.0	18.0			
Effective Green, g (s)	12.3	82.2			66.4		18.0	18.0	18.0			
Actuated g/C Ratio	0.11	0.75			0.60		0.16	0.16	0.16			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	391	3876			2957		280	280	264			
v/s Ratio Prot	c0.07	0.14			c0.31							
v/s Ratio Perm							0.06	0.06	c0.11			
v/c Ratio	0.59	0.19			0.51		0.35	0.35	0.66			
Uniform Delay, d1	46.4	4.1			12.5		40.8	40.8	43.1			
Progression Factor	0.92	1.59			0.78		1.00	1.00	1.00			
Incremental Delay, d2	2.2	0.1			0.4		0.8	0.8	5.8			
Delay (s)	45.0	6.6			10.2		41.6	41.6	48.9			
Level of Service	D	A			B		D	D	D			
Approach Delay (s)		15.8			10.2			46.3			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	241	686	390	45	964	42	236	299	67	61	423	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	4905		3502	5155		1805	3511		1805	3458	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	4905		3502	5155		1805	3511		1805	3458	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	241	686	390	45	964	42	236	299	67	61	423	165
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	241	1076	0	45	1006	0	236	366	0	61	588	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.6	43.8		5.7	36.9		18.9	35.7		7.8	24.6	
Effective Green, g (s)	12.6	43.8		5.7	36.9		18.9	35.7		7.8	24.6	
Actuated g/C Ratio	0.11	0.40		0.05	0.34		0.17	0.32		0.07	0.22	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	401	1953		181	1729		310	1139		127	773	
v/s Ratio Prot	c0.07	0.22		0.01	c0.20		c0.13	0.10		0.03	c0.17	
v/s Ratio Perm												
v/c Ratio	0.60	0.55		0.25	0.58		0.76	0.32		0.48	0.76	
Uniform Delay, d1	46.3	25.5		50.1	30.2		43.4	28.0		49.2	39.9	
Progression Factor	1.07	1.10		1.36	1.18		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	1.0		0.5	0.9		10.5	0.2		2.8	4.4	
Delay (s)	52.1	29.1		68.7	36.6		53.9	28.2		52.0	44.4	
Level of Service	D	C		E	D		D	C		D	D	
Approach Delay (s)		33.3			38.0			38.3			45.1	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	37.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	259	934	210	47	984	45	422	479	96	54	191	286
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	5044		3502	5153		1805	3520		1805	3285	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	5044		3502	5153		1805	3520		1805	3285	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	259	934	210	47	984	45	422	479	96	54	191	286
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	259	1144	0	47	1029	0	422	575	0	54	477	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.6	36.5		5.8	29.7		28.3	43.1		7.6	22.4	
Effective Green, g (s)	12.6	36.5		5.8	29.7		28.3	43.1		7.6	22.4	
Actuated g/C Ratio	0.11	0.33		0.05	0.27		0.26	0.39		0.07	0.20	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	401	1673		184	1391		464	1379		124	668	
v/s Ratio Prot	0.07	c0.23		0.01	c0.20		c0.23	0.16		0.03	c0.15	
v/s Ratio Perm												
v/c Ratio	0.65	0.68		0.26	0.74		0.91	0.42		0.44	0.90dr	
Uniform Delay, d1	46.6	31.8		50.0	36.6		39.6	24.3		49.1	40.8	
Progression Factor	1.02	1.04		1.47	0.95		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.5	2.3		0.6	2.8		21.4	0.2		2.4	3.6	
Delay (s)	50.9	35.3		74.3	37.4		61.1	24.5		51.6	44.4	
Level of Service	D	D		E	D		E	C		D	D	
Approach Delay (s)		38.2			39.0			40.0			45.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	133	479	279	143	696	33	260	502	23	13	1239	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	133	479	279	143	696	33	260	502	23	13	1239	260
RTOR Reduction (vph)	0	0	192	0	5	0	0	0	11	0	0	141
Lane Group Flow (vph)	133	479	87	143	724	0	260	502	12	13	1239	119
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	10.6	21.8	21.8	10.7	21.9		19.3	58.6	58.6	2.9	42.2	42.2
Effective Green, g (s)	10.6	21.8	21.8	10.7	21.9		19.3	58.6	58.6	2.9	42.2	42.2
Actuated g/C Ratio	0.10	0.20	0.20	0.10	0.20		0.18	0.53	0.53	0.03	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	173	715	320	175	1025		316	1923	860	47	1384	619
v/s Ratio Prot	0.07	0.13		c0.08	c0.14		c0.14	0.14		0.01	c0.34	
v/s Ratio Perm			0.05						0.01			0.07
v/c Ratio	0.77	0.67	0.27	0.82	0.71		0.82	0.26	0.01	0.28	0.90	0.19
Uniform Delay, d1	48.5	40.8	37.4	48.7	41.1		43.7	13.9	12.1	52.5	31.8	22.6
Progression Factor	1.33	1.01	2.03	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	2.2	0.4	24.6	2.2		15.7	0.3	0.0	3.2	9.3	0.7
Delay (s)	81.6	43.5	76.4	73.3	43.3		59.4	14.3	12.1	55.7	41.1	23.2
Level of Service	F	D	E	E	D		E	B	B	E	D	C
Approach Delay (s)		59.5			48.2			29.2			38.2	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	43.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	278	582	149	59	532	22	352	1305	69	40	630	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5156		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5156		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	278	582	149	59	532	22	352	1305	69	40	630	219
RTOR Reduction (vph)	0	0	111	0	4	0	0	0	36	0	0	155
Lane Group Flow (vph)	278	582	38	59	550	0	352	1305	33	40	630	64
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	17.0	28.4	28.4	7.6	19.0		25.8	52.5	52.5	5.5	32.2	32.2
Effective Green, g (s)	17.0	28.4	28.4	7.6	19.0		25.8	52.5	52.5	5.5	32.2	32.2
Actuated g/C Ratio	0.15	0.26	0.26	0.07	0.17		0.23	0.48	0.48	0.05	0.29	0.29
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	932	416	124	890		423	1722	770	90	1056	472
v/s Ratio Prot	c0.15	c0.16		0.03	0.11		c0.20	c0.36		0.02	0.17	
v/s Ratio Perm			0.02						0.02			0.04
v/c Ratio	1.00	0.62	0.09	0.48	0.62		0.83	0.76	0.04	0.44	0.60	0.14
Uniform Delay, d1	46.5	36.1	31.0	49.3	42.1		40.0	23.5	15.3	50.8	33.3	28.7
Progression Factor	1.32	1.76	6.22	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	47.9	1.0	0.1	2.9	1.3		13.1	3.2	0.1	3.5	2.5	0.6
Delay (s)	109.3	64.4	193.0	52.1	43.4		53.1	26.7	15.4	54.2	35.8	29.3
Level of Service	F	E	F	D	D		D	C	B	D	D	C
Approach Delay (s)		95.8			44.3			31.7			35.0	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	49.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX J

LOS Analysis Worksheets – Opening Day 2018 with Project

APPENDIX J-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Opening Year 2018 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	0	0	0	----		
NB Thru	0	0	0	----		
NB Right	0	0	0	----		
SB Left	59	0	0	----		
SB Thru	49	1	1700	108/1,700= 0.064		
SB Right	142	1	1700	142/1,700= 0.084	< ==	0.084
EB Left	0	0	0	----		
EB Thru	528	2	3400	528/3,400= 0.155		
EB Right	565	1	1700	565/1,700= 0.332		
WB Left	313	1	1700	313/1,700= 0.184		
WB Thru	1837	2	3400	1,837/3,400= 0.540	< ==	
WB Right	0	0	0	----		0.540

Sum of Critical V/C Ratios	0.624
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.674**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	0	0	0	----		
NB Thru	0	0	0	----		
NB Right	0	0	0	----		
SB Left	132	0	0	----		
SB Thru	97	1	1700	229/1,700= 0.135	< ==	
SB Right	209	1	1700	209/1,700= 0.123		0.135
EB Left	0	0	0	----		
EB Thru	909	2	3400	909/3,400= 0.267		
EB Right	595	1	1700	595/1,700= 0.350		
WB Left	167	1	1700	167/1,700= 0.098		
WB Thru	1722	2	3400	1,722/3,400= 0.506	< ==	
WB Right	0	0	0	----		0.506

Sum of Critical V/C Ratios	0.641
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.691**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Opening Year 2018 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	984	2	3400	984/3,400=	0.290	< ==	
NB Thru	0	0	0		----		
NB Right	249	1	1700	249/1,700=	0.146		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.290
EB Left	109	1	1700	109/1,700=	0.064	< ==	
EB Thru	479	2	3400	479/3,400=	0.141		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1161	2	3400	1,301/3,400=	0.383	< ==	
WB Right	140	0	0		----		0.447
Sum of Critical V/C Ratios							0.737
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.787**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Opening Year 2018 w/ Project　　Peak Hr: 5:00 - 6:00 PM

Analyst: GCW　　Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	834	2	3400	834/3,400=	0.250	< ==	
NB Thru	0	0	0		----		
NB Right	416	1	1700	416/1,700=	0.245		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.250
EB Left	157	1	1700	157/1,700=	0.092	< ==	
EB Thru	862	2	3400	862/3,400=	0.254		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1063	2	3400	1,284/3,400=	0.378	< ==	
WB Right	221	0	0		----		0.470

Sum of Critical V/C Ratios	0.720
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.770**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	361	2	3400	361/3,400= 0.110	< ==	
NB Thru	451	2	3400	522/3,400= 0.150		
NB Right	71	0	0	----		
SB Left	141	1	1700	141/1,700= 0.083		
SB Thru	654	2	3400	849/3,400= 0.250	< ==	
SB Right	195	0	0	----		0.360
EB Left	138	2	3400	138/3,400= 0.041	< ==	
EB Thru	533	2	3400	533/3,400= 0.157		
EB Right	157	1	1700	157/1,700= 0.092		
WB Left	107	1	1700	107/1,700= 0.063		
WB Thru	970	2	3400	970/3,400= 0.285	< ==	
WB Right	50	1	1700	50/1,700= 0.029		0.326
Sum of Critical V/C Ratios						0.686
Adjustment for Lost Time						0.050
Intersection Capacity Utilization (ICU)						**0.736**
Level of Service (LOS) - Refer to table below						**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection:	Chapman at Placentia		
Scenario:	Opening Year 2018 w/ Project	Peak Hr:	5:00 - 6:00 PM
Analyst:	GCW	Agency:	Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	510	2	3400	510/3,400=	0.150		
NB Thru	694	2	3400	786/3,400=	0.230	< ==	
NB Right	92	0	0		----		
SB Left	203	1	1700	203/1,700=	0.119	< ==	
SB Thru	473	2	3400	670/3,400=	0.197		
SB Right	197	0	0		----		0.349
EB Left	266	2	3400	266/3,400=	0.078	< ==	
EB Thru	819	2	3400	819/3,400=	0.241		
EB Right	190	1	1700	190/1,700=	0.112		
WB Left	82	1	1700	82/1,700=	0.048		
WB Thru	716	2	3400	716/3,400=	0.211	< ==	
WB Right	119	1	1700	119/1,700=	0.070		0.289

Sum of Critical V/C Ratios	0.638
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.688**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Opening Year 2018 w/ Project

Peak Hr: 7:30 - 8:30 AM

Analyst: GCW

Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	197	1	1700	197/1,700=	0.120	< ==	
NB Thru	370	3	5100	535/5,100=	0.100		
NB Right	165	0	0		----		
SB Left	28	1	1700	28/1,700=	0.016		
SB Thru	1083	3	5100	1,353/5,100=	0.265	< ==	
SB Right	270	0	0		----		0.385
EB Left	186	1	1700	186/1,700=	0.109	< ==	
EB Thru	317	2	3400	317/3,400=	0.093		
EB Right	337	1	1700	337/1,700=	0.198		
WB Left	240	1	1700	240/1,700=	0.141		
WB Thru	518	2	3400	518/3,400=	0.152	< ==	
WB Right	70	1	1700	70/1,700=	0.041		0.261

Sum of Critical V/C Ratios	0.646
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.696**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	265	1	1700	265/1,700=	0.160		
NB Thru	1353	3	5100	1,587/5,100=	0.310	< ==	
NB Right	234	0	0		----		
SB Left	55	1	1700	55/1,700=	0.032	< ==	
SB Thru	600	3	5100	811/5,100=	0.159		
SB Right	211	0	0		----		0.342
EB Left	275	1	1700	275/1,700=	0.162	< ==	
EB Thru	400	2	3400	400/3,400=	0.118		
EB Right	247	1	1700	247/1,700=	0.145		
WB Left	148	1	1700	148/1,700=	0.087		
WB Thru	351	2	3400	351/3,400=	0.103	< ==	
WB Right	45	1	1700	45/1,700=	0.026		0.265

Sum of Critical V/C Ratios	0.607
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.657**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	11	1	1700	11/1,700=	0.010	< ==	
NB Thru	537	2	3400	588/3,400=	0.170		
NB Right	51	0	0		----		
SB Left	110	1	1700	110/1,700=	0.065		
SB Thru	835	2	3400	835/3,400=	0.246	< ==	
SB Right	35	1	1700	35/1,700=	0.021		0.256
EB Left	15	1	1700	15/1,700=	0.009		
EB Thru	11	1	1700	33/1,700=	0.019	< ==	
EB Right	22	0	0		----		
WB Left	232	1	1700	232/1,700=	0.136	< ==	
WB Thru	21	1	1700	21/1,700=	0.012		
WB Right	83	1	1700	83/1,700=	0.049		0.155

Sum of Critical V/C Ratios	0.411
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.461**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Opening Year 2018 w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	24	1	1700	24/1,700=	0.010		
NB Thru	844	2	3400	1,011/3,400=	0.300	< ==	
NB Right	167	0	0		----		
SB Left	95	1	1700	95/1,700=	0.056	< ==	
SB Thru	581	2	3400	581/3,400=	0.171		
SB Right	70	1	1700	70/1,700=	0.041		0.356
EB Left	164	1	1700	164/1,700=	0.096		
EB Thru	40	1	1700	192/1,700=	0.113	< ==	
EB Right	152	0	0		----		
WB Left	90	1	1700	90/1,700=	0.053	< ==	
WB Thru	28	1	1700	28/1,700=	0.016		
WB Right	42	1	1700	42/1,700=	0.025		0.166

Sum of Critical V/C Ratios	0.522
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.572**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	45	1	1700	45/1,700=	0.030	< ==	
NB Thru	374	2	3400	405/3,400=	0.120		
NB Right	31	0	0		----		
SB Left	23	1	1700	23/1,700=	0.014		
SB Thru	448	2	3400	505/3,400=	0.149	< ==	
SB Right	57	0	0		----		0.179
EB Left	18	1	1700	18/1,700=	0.011	< ==	
EB Thru	63	1	1700	63/1,700=	0.037		
EB Right	145	1	1700	145/1,700=	0.085		
WB Left	118	1	1700	118/1,700=	0.069		
WB Thru	192	1	1700	192/1,700=	0.113	< ==	
WB Right	67	1	1700	67/1,700=	0.039		0.124

Sum of Critical V/C Ratios	0.303
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.353**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	154	1	1700	154/1,700=	0.090		
NB Thru	443	2	3400	543/3,400=	0.160	< ==	
NB Right	100	0	0		----		
SB Left	65	1	1700	65/1,700=	0.038	< ==	
SB Thru	279	2	3400	309/3,400=	0.091		
SB Right	30	0	0		----		0.198
EB Left	33	1	1700	33/1,700=	0.019		
EB Thru	171	1	1700	171/1,700=	0.101	< ==	
EB Right	70	1	1700	70/1,700=	0.041		
WB Left	66	1	1700	66/1,700=	0.039	< ==	
WB Thru	181	1	1700	181/1,700=	0.106		
WB Right	47	1	1700	47/1,700=	0.028		0.140

Sum of Critical V/C Ratios	0.338
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.388**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	57	1	1700	57/1,700=	0.030	< ==	
NB Thru	662	3	5100	668/5,100=	0.130		
NB Right	6	0	0		----		
SB Left	31	1	1700	31/1,700=	0.018		
SB Thru	1537	2	3400	1,537/3,400=	0.452	< ==	
SB Right	151	1	1700	151/1,700=	0.089		0.482
EB Left	45	1	1700	45/1,700=	0.026		
EB Thru	104	1	1700	177/1,700=	0.104	< ==	
EB Right	73	0	0		----		
WB Left	2	1	1700	2/1,700=	0.001	< ==	
WB Thru	103	1	1700	103/1,700=	0.061		
WB Right	35	1	1700	35/1,700=	0.021		0.105

Sum of Critical V/C Ratios	0.587
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.637**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Opening Year 2018 w/ Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	99	1	1700	99/1,700=	0.060		
NB Thru	1766	3	5100	1,769/5,100=	0.350	< ==	
NB Right	3	0	0		----		
SB Left	30	1	1700	30/1,700=	0.018	< ==	
SB Thru	810	2	3400	810/3,400=	0.238		
SB Right	80	1	1700	80/1,700=	0.047		0.368
EB Left	112	1	1700	112/1,700=	0.066	< ==	
EB Thru	159	1	1700	231/1,700=	0.136		
EB Right	72	0	0		----		
WB Left	5	1	1700	5/1,700=	0.003		
WB Thru	135	1	1700	135/1,700=	0.079	< ==	
WB Right	22	1	1700	22/1,700=	0.013		0.145

Sum of Critical V/C Ratios	0.513
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.563**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	42	1	1700	42/1,700=	0.020	< ==	
NB Thru	194	2	3400	194/3,400=	0.060		
NB Right	78	1	1700	78/1,700=	0.046		
SB Left	141	2	3400	141/3,400=	0.041		
SB Thru	264	2	3400	520/3,400=	0.153	< ==	
SB Right	256	0	0		----		0.173
EB Left	142	1	1700	142/1,700=	0.084	< ==	
EB Thru	496	3	5100	526/5,100=	0.103		
EB Right	30	0	0		----		
WB Left	109	1	1700	109/1,700=	0.064		
WB Thru	803	3	5100	803/5,100=	0.157	< ==	
WB Right	191	1	1700	191/1,700=	0.112		0.241

Sum of Critical V/C Ratios	0.414
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.464**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	57	1	1700	57/1,700=	0.030	< ==	
NB Thru	348	2	3400	348/3,400=	0.100		
NB Right	95	1	1700	95/1,700=	0.056		
SB Left	261	2	3400	261/3,400=	0.077		
SB Thru	293	2	3400	535/3,400=	0.157	< ==	
SB Right	242	0	0		----		0.187
EB Left	237	1	1700	237/1,700=	0.139	< ==	
EB Thru	691	3	5100	735/5,100=	0.144		
EB Right	44	0	0		----		
WB Left	139	1	1700	139/1,700=	0.082		
WB Thru	853	3	5100	853/5,100=	0.167	< ==	
WB Right	246	1	1700	246/1,700=	0.145		0.306

Sum of Critical V/C Ratios	0.493
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.543**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	6	0	0		----		
NB Thru	8	1	1700	8/1,700=	----		
NB Right	18	1	1700	18/1,700=	0.011		
SB Left	303	1	1700	303/1,700=	0.178	< ==	
SB Thru	2	1	1700	195/1,700=	0.115		
SB Right	193	0	0		----		0.178
EB Left	120	2	3400	120/3,400=	0.035		
EB Thru	637	3	5100	641/5,100=	0.126		
EB Right	4	0	0		----		
WB Left	8	1	1700	8/1,700=	0.005		
WB Thru	868	3	5100	868/5,100=	0.170		
WB Right	350	1	1700	350/1,700=	0.206	< ==	0.241

Sum of Critical V/C Ratios	0.419
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.469**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	8	0	0		----		
NB Thru	6	1	1700	6/1,700=	----		
NB Right	11	1	1700	11/1,700=	0.006		
SB Left	173	1	1700	173/1,700=	0.102		
SB Thru	2	1	1700	265/1,700=	0.156	< ==	
SB Right	263	0	0		----		0.156
EB Left	236	2	3400	236/3,400=	0.069	< ==	
EB Thru	787	3	5100	787/5,100=	0.154		
EB Right	0	0	0		----		
WB Left	16	1	1700	16/1,700=	0.009		
WB Thru	856	3	5100	856/5,100=	0.168	< ==	
WB Right	341	1	1700	341/1,700=	0.201		0.237

Sum of Critical V/C Ratios	0.393
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.443**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection:	Orangethorpe Ave at SR-57 NB Ramps		
Scenario:	Opening Year 2018 w/ Project	Peak Hr:	7:45 - 8:45 AM
Analyst:	GCW	Agency:	Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	322	2	3400	322/3,400=	0.090		
NB Thru	0	0	0		----		
NB Right	482	1	1700	482/1,700=	0.284	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.284
EB Left	125	2	3400	125/3,400=	0.037	< ==	
EB Thru	834	3	5100	834/5,100=	0.164		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	902	3	5100	1,114/5,100=	0.218	< ==	
WB Right	212	0	0		----		0.255
Sum of Critical V/C Ratios							0.539
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.589**
Level of Service (LOS) - Refer to table below							**A**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps
Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM
Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	198	2	3400	198/3,400=	0.060		
NB Thru	0	0	0		----		
NB Right	404	1	1700	404/1,700=	0.238	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.238
EB Left	229	2	3400	229/3,400=	0.067	< ==	
EB Thru	746	3	5100	746/5,100=	0.146		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1015	3	5100	1,604/5,100=	0.315	< ==	
WB Right	589	0	0		----		0.382

Sum of Critical V/C Ratios	0.620
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.670**
Level of Service (LOS) - Refer to table below	**B**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Opening Year 2018 w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	236	1	1700	236/1,700=	0.140	< ==	
NB Thru	294	2	3400	361/3,400=	0.110		
NB Right	67	0	0		----		
SB Left	61	1	1700	61/1,700=	0.036		
SB Thru	443	2	3400	678/3,400=	0.199	< ==	
SB Right	235	0	0		----		0.339
EB Left	223	2	3400	223/3,400=	0.066	< ==	
EB Thru	686	3	5100	1,076/5,100=	0.211		
EB Right	390	0	0		----		
WB Left	45	2	3400	45/3,400=	0.013		
WB Thru	964	3	5100	1,006/5,100=	0.197	< ==	
WB Right	42	0	0		----		0.263
Sum of Critical V/C Ratios							0.602
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.652**
Level of Service (LOS) - Refer to table below							**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	422	1	1700	422/1,700=	0.250	< ==	
NB Thru	500	2	3400	596/3,400=	0.180		
NB Right	96	0	0		----		
SB Left	54	1	1700	54/1,700=	0.032		
SB Thru	196	2	3400	498/3,400=	0.146	< ==	
SB Right	302	0	0		----		0.396
EB Left	329	2	3400	329/3,400=	0.097	< ==	
EB Thru	934	3	5100	1,144/5,100=	0.224		
EB Right	210	0	0		----		
WB Left	47	2	3400	47/3,400=	0.014		
WB Thru	984	3	5100	1,029/5,100=	0.202	< ==	
WB Right	45	0	0		----		0.299

Sum of Critical V/C Ratios	0.695
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.745**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Opening Year 2018 w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	260	1	1700	260/1,700=	0.150	< ==	
NB Thru	495	2	3400	495/3,400=	0.150		
NB Right	23	1	1700	23/1,700=	0.014		
SB Left	13	1	1700	13/1,700=	0.008		
SB Thru	1265	2	3400	1,265/3,400=	0.372	< ==	
SB Right	260	1	1700	260/1,700=	0.153		0.522
EB Left	133	1	1700	133/1,700=	0.078		
EB Thru	479	2	3400	479/3,400=	0.141	< ==	
EB Right	279	1	1700	279/1,700=	0.164		
WB Left	143	1	1700	143/1,700=	0.084	< ==	
WB Thru	696	3	5100	729/5,100=	0.143		
WB Right	33	0	0		----		0.225

Sum of Critical V/C Ratios	0.747
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.797**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Opening Year 2018 w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	352	1	1700	352/1,700=	0.210		
NB Thru	1331	2	3400	1,331/3,400=	0.390	< ==	
NB Right	69	1	1700	69/1,700=	0.041		
SB Left	40	1	1700	40/1,700=	0.024	< ==	
SB Thru	636	2	3400	636/3,400=	0.187		
SB Right	219	1	1700	219/1,700=	0.129		0.414
EB Left	278	1	1700	278/1,700=	0.164	< ==	
EB Thru	582	2	3400	582/3,400=	0.171		
EB Right	149	1	1700	149/1,700=	0.088		
WB Left	59	1	1700	59/1,700=	0.035		
WB Thru	532	3	5100	554/5,100=	0.109	< ==	
WB Right	22	0	0		----		0.273

Sum of Critical V/C Ratios	0.687
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.737**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX J-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	528	565	313	1837	0	0	0	0	59	49	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1849	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1849	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	528	565	313	1837	0	0	0	0	59	49	142
RTOR Reduction (vph)	0	0	253	0	0	0	0	0	0	0	0	56
Lane Group Flow (vph)	0	528	312	313	1837	0	0	0	0	0	108	86
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		45.6	45.6	28.0	77.6						13.4	13.4
Effective Green, g (s)		45.6	45.6	28.0	77.6						13.4	13.4
Actuated g/C Ratio		0.46	0.46	0.28	0.78						0.13	0.13
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1646	736	505	2801						247	216
v/s Ratio Prot		0.15		0.17	c0.51							
v/s Ratio Perm			0.19								0.06	0.05
v/c Ratio		0.32	0.42	0.62	0.66						0.44	0.40
Uniform Delay, d1		17.3	18.3	31.4	5.1						39.8	39.6
Progression Factor		0.37	0.32	0.86	0.81						1.00	1.00
Incremental Delay, d2		0.5	1.7	1.1	0.6						1.2	1.2
Delay (s)		6.9	7.6	28.2	4.7						41.1	40.8
Level of Service		A	A	C	A						D	D
Approach Delay (s)		7.2			8.1			0.0			40.9	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	114.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	909	595	167	1722	0	0	0	0	132	97	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1847	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1847	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	909	595	167	1722	0	0	0	0	132	97	209
RTOR Reduction (vph)	0	0	255	0	0	0	0	0	0	0	0	53
Lane Group Flow (vph)	0	909	340	167	1722	0	0	0	0	0	229	156
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		50.3	50.3	19.0	73.3						17.7	17.7
Effective Green, g (s)		50.3	50.3	19.0	73.3						17.7	17.7
Actuated g/C Ratio		0.50	0.50	0.19	0.73						0.18	0.18
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1815	812	342	2646						326	285
v/s Ratio Prot		0.25		0.09	c0.48							
v/s Ratio Perm			0.21								0.12	0.10
v/c Ratio		0.50	0.42	0.49	0.65						0.70	0.55
Uniform Delay, d1		16.5	15.6	36.2	6.8						38.7	37.5
Progression Factor		0.51	0.13	1.00	1.11						1.00	1.00
Incremental Delay, d2		1.0	1.5	0.6	0.7						6.7	2.1
Delay (s)		9.4	3.5	36.8	8.3						45.4	39.6
Level of Service		A	A	D	A						D	D
Approach Delay (s)		7.1			10.8			0.0			42.6	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	479	0	0	1161	140	984	0	249	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1805	3610			3552		1715	1638	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	1805	3610			3552		1715	1638	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	109	479	0	0	1161	140	984	0	249	0	0	0
RTOR Reduction (vph)	0	0	0	0	9	0	0	40	86	0	0	0
Lane Group Flow (vph)	109	479	0	0	1292	0	502	467	138	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	12.0	58.4			42.4		32.6	32.6	32.6			
Effective Green, g (s)	12.0	58.4			42.4		32.6	32.6	32.6			
Actuated g/C Ratio	0.12	0.58			0.42		0.33	0.33	0.33			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	216	2108			1506		559	533	500			
v/s Ratio Prot	c0.06	0.13			c0.36							
v/s Ratio Perm							c0.29	0.28	0.09			
v/c Ratio	0.50	0.23			0.86		0.90	0.88	0.28			
Uniform Delay, d1	41.2	10.0			26.1		32.1	31.8	25.0			
Progression Factor	1.58	0.09			0.67		1.00	1.00	1.00			
Incremental Delay, d2	1.8	0.2			3.8		17.0	14.9	0.3			
Delay (s)	66.8	1.1			21.3		49.2	46.6	25.3			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		13.3			21.3			43.8			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	114.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	862	0	0	1063	221	834	0	416	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.97		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3517		1715	1630	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3517		1715	1630	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	157	862	0	0	1063	221	834	0	416	0	0	0
RTOR Reduction (vph)	0	0	0	0	17	0	0	42	106	0	0	0
Lane Group Flow (vph)	157	862	0	0	1267	0	442	392	268	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	12.1	60.5			44.4		30.5	30.5	30.5			
Effective Green, g (s)	12.1	60.5			44.4		30.5	30.5	30.5			
Actuated g/C Ratio	0.12	0.60			0.44		0.30	0.30	0.30			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	218	2184			1561		523	497	467			
v/s Ratio Prot	c0.09	0.24			c0.36							
v/s Ratio Perm							c0.26	0.24	0.17			
v/c Ratio	0.72	0.39			0.81		0.85	0.79	0.57			
Uniform Delay, d1	42.3	10.2			24.2		32.5	31.8	29.3			
Progression Factor	1.45	0.13			1.06		1.00	1.00	1.00			
Incremental Delay, d2	9.8	0.5			3.5		11.9	8.1	1.7			
Delay (s)	71.3	1.8			29.1		44.5	40.0	31.0			
Level of Service	E	A			C		D	D	C			
Approach Delay (s)		12.5			29.1			38.9			0.0	
Approach LOS		B			C			D			A	

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	138	533	157	107	970	50	361	451	71	141	654	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3536		1805	3486	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3536		1805	3486	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	138	533	157	107	970	50	361	451	71	141	654	195
RTOR Reduction (vph)	0	0	82	0	0	30	0	13	0	0	28	0
Lane Group Flow (vph)	138	533	75	107	970	20	361	509	0	141	821	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	9.0	38.8	47.8	9.8	39.6	39.6	9.0	26.1		10.8	27.9	
Effective Green, g (s)	9.0	38.8	47.8	9.8	39.6	39.6	9.0	26.1		10.8	27.9	
Actuated g/C Ratio	0.09	0.39	0.48	0.10	0.40	0.40	0.09	0.26		0.11	0.28	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	315	1400	771	176	1429	639	315	922		194	972	
v/s Ratio Prot	c0.04	0.15	0.01	0.06	c0.27		c0.10	0.14		0.08	c0.24	
v/s Ratio Perm			0.04			0.01						
v/c Ratio	0.44	0.38	0.10	0.61	0.68	0.03	1.15	0.55		0.73	0.84	
Uniform Delay, d1	43.1	22.0	14.3	43.3	24.9	18.5	45.5	31.9		43.2	34.0	
Progression Factor	0.94	0.80	0.53	1.00	1.00	1.00	1.01	0.90		1.00	1.00	
Incremental Delay, d2	0.3	0.8	0.0	4.0	2.6	0.1	96.2	0.9		10.9	7.1	
Delay (s)	40.9	18.3	7.6	47.3	27.6	18.6	142.0	29.5		54.1	41.1	
Level of Service	D	B	A	D	C	B	F	C		D	D	
Approach Delay (s)		20.1			29.0			75.5			42.9	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	41.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	266	819	190	82	716	119	510	694	92	203	473	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3547		1805	3451	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3547		1805	3451	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	266	819	190	82	716	119	510	694	92	203	473	197
RTOR Reduction (vph)	0	0	69	0	0	63	0	10	0	0	46	0
Lane Group Flow (vph)	266	819	121	82	716	56	510	776	0	203	624	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.6	37.0	54.3	7.4	31.8	31.8	17.3	26.9		14.2	23.8	
Effective Green, g (s)	12.6	37.0	54.3	7.4	31.8	31.8	17.3	26.9		14.2	23.8	
Actuated g/C Ratio	0.13	0.37	0.54	0.07	0.32	0.32	0.17	0.27		0.14	0.24	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	441	1335	876	133	1147	513	605	954		256	821	
v/s Ratio Prot	0.08	c0.23	0.02	0.05	c0.20		c0.15	c0.22		0.11	0.18	
v/s Ratio Perm			0.05			0.03						
v/c Ratio	0.60	0.61	0.14	0.62	0.62	0.11	0.84	0.81		0.79	0.76	
Uniform Delay, d1	41.3	25.7	11.3	44.9	29.0	24.1	40.0	34.2		41.5	35.4	
Progression Factor	0.91	0.84	0.66	1.00	1.00	1.00	1.06	0.90		1.00	1.00	
Incremental Delay, d2	1.4	1.9	0.0	5.9	2.6	0.4	9.7	5.5		14.5	4.3	
Delay (s)	38.9	23.5	7.5	50.8	31.6	24.5	52.1	36.1		55.9	39.8	
Level of Service	D	C	A	D	C	C	D	D		E	D	
Approach Delay (s)		24.3			32.4			42.4			43.5	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	186	317	337	240	518	70	197	370	165	28	1083	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	4947		1805	5032	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	4947		1805	5032	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	186	317	337	240	518	70	197	370	165	28	1083	270
RTOR Reduction (vph)	0	0	208	0	0	58	0	70	0	0	41	0
Lane Group Flow (vph)	186	317	129	240	518	12	197	465	0	28	1312	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	13.0	14.7	14.7	15.8	17.5	17.5	13.2	47.4		4.7	38.9	
Effective Green, g (s)	13.0	14.7	14.7	15.8	17.5	17.5	13.2	47.4		4.7	38.9	
Actuated g/C Ratio	0.13	0.15	0.15	0.16	0.18	0.18	0.13	0.48		0.05	0.39	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	237	538	240	289	640	286	241	2378		86	1985	
v/s Ratio Prot	0.10	0.09		c0.13	c0.14		c0.11	0.09		0.02	c0.26	
v/s Ratio Perm			0.08			0.01						
v/c Ratio	0.78	0.59	0.54	0.83	0.81	0.04	0.82	0.20		0.33	0.66	
Uniform Delay, d1	41.4	39.1	38.8	40.1	38.9	33.6	41.5	14.7		45.4	24.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.6	1.7	2.3	18.0	7.5	0.1	18.9	0.2		2.2	1.7	
Delay (s)	57.0	40.8	41.1	58.1	46.4	33.7	60.4	14.9		47.6	26.2	
Level of Service	E	D	D	E	D	C	E	B		D	C	
Approach Delay (s)		44.5			48.7			27.1			26.6	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	98.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	275	400	247	148	351	45	265	1353	234	55	600	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4985	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5072		1805	4985	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	275	400	247	148	351	45	265	1353	234	55	600	211
RTOR Reduction (vph)	0	0	193	0	0	38	0	22	0	0	59	0
Lane Group Flow (vph)	275	400	54	148	351	7	265	1565	0	55	752	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	18.1	19.6	19.6	12.0	13.5	13.5	17.5	35.8		6.7	25.0	
Effective Green, g (s)	18.1	19.6	19.6	12.0	13.5	13.5	17.5	35.8		6.7	25.0	
Actuated g/C Ratio	0.20	0.22	0.22	0.13	0.15	0.15	0.19	0.40		0.07	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	362	785	351	240	540	241	350	2015		134	1383	
v/s Ratio Prot	c0.15	0.11		0.08	c0.10		c0.15	c0.31		0.03	0.15	
v/s Ratio Perm			0.03			0.00						
v/c Ratio	0.76	0.51	0.15	0.62	0.65	0.03	0.76	0.78		0.41	0.54	
Uniform Delay, d1	33.9	31.0	28.5	36.9	36.1	32.7	34.3	23.7		39.8	27.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.9	0.5	0.2	4.7	2.8	0.0	9.0	3.0		2.0	1.5	
Delay (s)	42.8	31.5	28.7	41.5	38.9	32.7	43.3	26.7		41.9	29.2	
Level of Service	D	C	C	D	D	C	D	C		D	C	
Approach Delay (s)		34.2			39.1			29.1			30.0	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	11	22	232	21	83	11	537	44	110	835	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1710		1805	1900	1615	1805	3569		1805	3610	1615
Flt Permitted	0.74	1.00		0.74	1.00	1.00	0.31	1.00		0.42	1.00	1.00
Satd. Flow (perm)	1413	1710		1398	1900	1615	588	3569		797	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	11	22	232	21	83	11	537	44	110	835	35
RTOR Reduction (vph)	0	17	0	0	0	64	0	4	0	0	0	11
Lane Group Flow (vph)	15	16	0	232	21	19	11	577	0	110	835	24
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	22.4	22.4		22.4	22.4	22.4	69.6	69.6		69.6	69.6	69.6
Effective Green, g (s)	22.4	22.4		22.4	22.4	22.4	69.6	69.6		69.6	69.6	69.6
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.22	0.70	0.70		0.70	0.70	0.70
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	316	383		313	425	361	409	2484		554	2512	1124
v/s Ratio Prot		0.01			0.01			0.16			c0.23	
v/s Ratio Perm	0.01			c0.17		0.01	0.02			0.14		0.02
v/c Ratio	0.05	0.04		0.74	0.05	0.05	0.03	0.23		0.20	0.33	0.02
Uniform Delay, d1	30.4	30.4		36.1	30.4	30.5	4.7	5.5		5.4	6.0	4.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.29	0.26	0.08
Incremental Delay, d2	0.1	0.0		9.1	0.0	0.1	0.1	0.2		0.6	0.3	0.0
Delay (s)	30.5	30.4		45.2	30.5	30.5	4.8	5.7		2.2	1.8	0.4
Level of Service	C	C		D	C	C	A	A		A	A	A
Approach Delay (s)		30.5			40.7			5.7			1.8	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	164	40	152	90	28	42	24	844	167	95	581	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.88		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1674		1805	1900	1615	1805	3521		1805	3610	1615
Flt Permitted	0.74	1.00		0.42	1.00	1.00	0.43	1.00		0.26	1.00	1.00
Satd. Flow (perm)	1404	1674		793	1900	1615	810	3521		492	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	164	40	152	90	28	42	24	844	167	95	581	70
RTOR Reduction (vph)	0	126	0	0	0	35	0	12	0	0	0	18
Lane Group Flow (vph)	164	66	0	90	28	7	24	999	0	95	581	52
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	17.1	17.1		17.1	17.1	17.1	74.9	74.9		74.9	74.9	74.9
Effective Green, g (s)	17.1	17.1		17.1	17.1	17.1	74.9	74.9		74.9	74.9	74.9
Actuated g/C Ratio	0.17	0.17		0.17	0.17	0.17	0.75	0.75		0.75	0.75	0.75
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	240	286		135	324	276	606	2637		368	2703	1209
v/s Ratio Prot		0.04			0.01			c0.28			0.16	
v/s Ratio Perm	c0.12			0.11		0.00	0.03			0.19		0.03
v/c Ratio	0.68	0.23		0.67	0.09	0.03	0.04	0.38		0.26	0.21	0.04
Uniform Delay, d1	38.9	35.8		38.8	34.9	34.5	3.2	4.4		3.9	3.8	3.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.17	0.19	0.00
Incremental Delay, d2	7.8	0.4		11.8	0.1	0.0	0.1	0.4		1.4	0.2	0.1
Delay (s)	46.7	36.2		50.6	35.0	34.6	3.4	4.8		2.1	0.9	0.1
Level of Service	D	D		D	C	C	A	A		A	A	A
Approach Delay (s)		41.0			43.6			4.8			1.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	63	145	118	192	67	45	374	31	23	448	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3569		1805	3549	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3569		1805	3549	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	63	145	118	192	67	45	374	31	23	448	57
RTOR Reduction (vph)	0	0	122	0	0	50	0	5	0	0	8	0
Lane Group Flow (vph)	18	63	23	118	192	17	45	400	0	23	497	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	1.2	11.7	11.7	8.1	18.6	18.6	4.4	36.6		2.6	34.8	
Effective Green, g (s)	1.2	11.7	11.7	8.1	18.6	18.6	4.4	36.6		2.6	34.8	
Actuated g/C Ratio	0.02	0.16	0.16	0.11	0.25	0.25	0.06	0.49		0.03	0.46	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	28	296	251	194	471	400	105	1741		62	1646	
v/s Ratio Prot	0.01	0.03		c0.07	c0.10		c0.02	0.11		0.01	c0.14	
v/s Ratio Perm			0.01			0.01						
v/c Ratio	0.64	0.21	0.09	0.61	0.41	0.04	0.43	0.23		0.37	0.30	
Uniform Delay, d1	36.7	27.6	27.1	31.9	23.6	21.4	34.1	11.1		35.4	12.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	40.9	0.4	0.2	5.3	0.6	0.0	2.8	0.3		3.7	0.5	
Delay (s)	77.6	28.0	27.2	37.2	24.2	21.5	36.9	11.4		39.1	13.0	
Level of Service	E	C	C	D	C	C	D	B		D	B	
Approach Delay (s)		31.5			27.8			13.9			14.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	171	70	66	181	47	154	443	100	65	279	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3510		1805	3557	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3510		1805	3557	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	33	171	70	66	181	47	154	443	100	65	279	30
RTOR Reduction (vph)	0	0	58	0	0	37	0	16	0	0	7	0
Lane Group Flow (vph)	33	171	12	66	181	10	154	527	0	65	302	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	3.0	14.1	14.1	6.7	17.8	17.8	11.7	37.6		6.7	32.6	
Effective Green, g (s)	3.0	14.1	14.1	6.7	17.8	17.8	11.7	37.6		6.7	32.6	
Actuated g/C Ratio	0.04	0.17	0.17	0.08	0.22	0.22	0.14	0.46		0.08	0.40	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	66	330	280	149	417	354	260	1627		149	1429	
v/s Ratio Prot	0.02	c0.09		c0.04	c0.10		c0.09	c0.15		0.04	0.08	
v/s Ratio Perm			0.01			0.01						
v/c Ratio	0.50	0.52	0.04	0.44	0.43	0.03	0.59	0.32		0.44	0.21	
Uniform Delay, d1	38.3	30.4	27.9	35.4	27.3	24.9	32.5	13.7		35.4	15.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	1.4	0.1	2.1	0.7	0.0	3.6	0.5		2.0	0.3	
Delay (s)	44.2	31.8	28.0	37.5	28.0	24.9	36.1	14.3		37.4	16.2	
Level of Service	D	C	C	D	C	C	D	B		D	B	
Approach Delay (s)		32.3			29.7			19.1			19.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	81.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	104	73	2	103	35	57	662	6	31	1537	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1782		1805	1900	1615	1805	5180		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1782		1805	1900	1615	1805	5180		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	104	73	2	103	35	57	662	6	31	1537	151
RTOR Reduction (vph)	0	27	0	0	0	30	0	0	0	0	0	55
Lane Group Flow (vph)	45	150	0	2	103	5	57	668	0	31	1537	96
Turn Type	Prot			Prot		Perm	Prot			Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	4.5	15.5		1.0	12.0	12.0	4.9	43.2		2.8	41.1	41.1
Effective Green, g (s)	4.5	15.5		1.0	12.0	12.0	4.9	43.2		2.8	41.1	41.1
Actuated g/C Ratio	0.06	0.20		0.01	0.15	0.15	0.06	0.55		0.04	0.52	0.52
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	103	352		23	290	247	113	2851		64	1890	846
v/s Ratio Prot	c0.02	c0.08		0.00	0.05		c0.03	0.13		0.02	c0.43	
v/s Ratio Perm						0.00						0.06
v/c Ratio	0.44	0.43		0.09	0.36	0.02	0.50	0.23		0.48	0.81	0.11
Uniform Delay, d1	35.8	27.6		38.3	29.8	28.3	35.6	9.1		37.1	15.5	9.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.9	0.8		1.6	0.8	0.0	3.5	0.2		5.7	4.0	0.3
Delay (s)	38.7	28.4		39.9	30.5	28.3	39.1	9.3		42.8	19.5	9.7
Level of Service	D	C		D	C	C	D	A		D	B	A
Approach Delay (s)		30.5			30.1			11.6			19.0	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	112	159	72	5	135	22	99	1766	3	30	810	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.95		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1811		1805	1900	1615	1805	5186		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1811		1805	1900	1615	1805	5186		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	112	159	72	5	135	22	99	1766	3	30	810	80
RTOR Reduction (vph)	0	17	0	0	0	18	0	0	0	0	0	43
Lane Group Flow (vph)	112	214	0	5	135	4	99	1769	0	30	810	37
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	7.6	20.5		1.1	14.0	14.0	7.4	43.6		2.9	39.1	39.1
Effective Green, g (s)	7.6	20.5		1.1	14.0	14.0	7.4	43.6		2.9	39.1	39.1
Actuated g/C Ratio	0.09	0.24		0.01	0.17	0.17	0.09	0.52		0.03	0.46	0.46
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	163	441		23	316	268	158	2688		62	1678	750
v/s Ratio Prot	c0.06	c0.12		0.00	0.07		c0.05	c0.34		0.02	0.22	
v/s Ratio Perm						0.00						0.02
v/c Ratio	0.69	0.49		0.22	0.43	0.01	0.63	0.66		0.48	0.48	0.05
Uniform Delay, d1	37.1	27.3		41.1	31.5	29.3	37.0	14.8		39.9	15.5	12.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	11.4	0.8		4.7	0.9	0.0	7.5	1.3		5.8	1.0	0.1
Delay (s)	48.5	28.1		45.8	32.4	29.3	44.6	16.1		45.7	16.5	12.4
Level of Service	D	C		D	C	C	D	B		D	B	B
Approach Delay (s)		34.8			32.4			17.6			17.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	84.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	496	30	109	803	191	42	194	78	141	264	256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3343	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5143		1805	5187	1615	1805	3610	1615	3502	3343	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	142	496	30	109	803	191	42	194	78	141	264	256
RTOR Reduction (vph)	0	6	0	0	0	134	0	0	57	0	161	0
Lane Group Flow (vph)	142	520	0	109	803	57	42	194	21	141	359	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	17.5	36.0		14.5	33.0	33.0	10.5	30.0	30.0	10.5	30.0	
Effective Green, g (s)	17.5	36.0		14.5	33.0	33.0	10.5	30.0	30.0	10.5	30.0	
Actuated g/C Ratio	0.16	0.33		0.13	0.30	0.30	0.10	0.27	0.27	0.10	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	287	1683		237	1556	484	172	984	440	334	911	
v/s Ratio Prot	c0.08	0.10		0.06	c0.15		0.02	0.05		c0.04	c0.11	
v/s Ratio Perm						0.04			0.01			
v/c Ratio	0.49	0.31		0.46	0.52	0.12	0.24	0.20	0.05	0.42	0.39	
Uniform Delay, d1	42.2	27.7		44.1	31.9	27.9	46.1	30.7	29.5	46.9	32.6	
Progression Factor	0.71	0.51		0.52	0.72	1.63	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.4	0.4		6.1	1.2	0.5	3.3	0.4	0.2	3.9	1.3	
Delay (s)	35.5	14.6		28.9	24.2	46.0	49.4	31.2	29.7	50.8	33.9	
Level of Service	D	B		C	C	D	D	C	C	D	C	
Approach Delay (s)		19.1			28.4			33.3			37.5	
Approach LOS		B			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	237	691	44	139	853	246	57	348	95	261	293	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3365	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5140		1805	5187	1615	1805	3610	1615	3502	3365	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	237	691	44	139	853	246	57	348	95	261	293	242
RTOR Reduction (vph)	0	6	0	0	0	168	0	0	79	0	146	0
Lane Group Flow (vph)	237	729	0	139	853	78	57	348	16	261	389	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	25.5	47.6		13.0	35.1	35.1	7.4	18.0	18.0	12.4	23.0	
Effective Green, g (s)	25.5	47.6		13.0	35.1	35.1	7.4	18.0	18.0	12.4	23.0	
Actuated g/C Ratio	0.23	0.43		0.12	0.32	0.32	0.07	0.16	0.16	0.11	0.21	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	418	2224		213	1655	515	121	590	264	394	703	
v/s Ratio Prot	c0.13	0.14		c0.08	c0.16		0.03	0.10		c0.07	c0.12	
v/s Ratio Perm						0.05			0.01			
v/c Ratio	0.57	0.33		0.65	0.52	0.15	0.47	0.59	0.06	0.66	0.55	
Uniform Delay, d1	37.4	20.6		46.3	30.5	26.8	49.4	42.6	38.8	46.8	38.9	
Progression Factor	1.24	1.25		0.59	0.69	1.26	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.5	0.3		6.8	1.1	0.6	2.9	1.5	0.1	4.2	0.9	
Delay (s)	47.7	26.2		34.1	22.3	34.3	52.3	44.1	38.9	50.9	39.8	
Level of Service	D	C		C	C	C	D	D	D	D	D	
Approach Delay (s)		31.4			26.0			44.1			43.5	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	637	4	8	868	350	6	8	18	303	2	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	0.99	
Satd. Flow (prot)	3502	5182		1805	5187	1615		1860	1615	1715	1571	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.98	1.00	0.95	0.99	
Satd. Flow (perm)	3502	5182		1805	5187	1615		1860	1615	1715	1571	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	637	4	8	868	350	6	8	18	303	2	193
RTOR Reduction (vph)	0	0	0	0	0	170	0	0	17	0	153	0
Lane Group Flow (vph)	120	641	0	8	868	180	0	14	1	261	84	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	9.0	63.9		2.3	56.7	56.7		4.2	4.2	22.8	22.8	
Effective Green, g (s)	9.0	63.9		2.3	56.7	56.7		4.2	4.2	22.8	22.8	
Actuated g/C Ratio	0.08	0.58		0.02	0.52	0.52		0.04	0.04	0.21	0.21	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	286	3010		37	2673	832		71	61	355	325	
v/s Ratio Prot	c0.03	0.12		0.00	c0.17			c0.01		c0.15	0.05	
v/s Ratio Perm						0.11			0.00			
v/c Ratio	0.42	0.21		0.22	0.32	0.22		0.20	0.01	0.74	0.26	
Uniform Delay, d1	48.0	11.0		53.0	15.5	14.5		51.3	50.9	40.8	36.5	
Progression Factor	0.87	0.41		0.94	0.81	2.64		1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.2		2.7	0.3	0.6		1.4	0.1	7.7	0.4	
Delay (s)	42.6	4.7		52.4	12.8	39.0		52.6	51.0	48.5	36.9	
Level of Service	D	A		D	B	D		D	D	D	D	
Approach Delay (s)		10.7			20.6			51.7			43.0	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	236	787	0	16	856	341	8	6	11	173	2	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5187		1805	5187	1615		1847	1615	1715	1548	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5187		1805	5187	1615		1847	1615	1715	1548	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	236	787	0	16	856	341	8	6	11	173	2	263
RTOR Reduction (vph)	0	0	0	0	0	159	0	0	11	0	221	0
Lane Group Flow (vph)	236	787	0	16	856	182	0	14	0	156	61	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	12.2	66.7		4.6	58.6	58.6		4.2	4.2	17.7	17.7	
Effective Green, g (s)	12.2	66.7		4.6	58.6	58.6		4.2	4.2	17.7	17.7	
Actuated g/C Ratio	0.11	0.61		0.04	0.53	0.53		0.04	0.04	0.16	0.16	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	388	3145		75	2763	860		70	61	275	249	
v/s Ratio Prot	c0.07	0.15		0.01	c0.17			c0.01		c0.09	0.04	
v/s Ratio Perm						0.11			0.00			
v/c Ratio	0.61	0.25		0.21	0.31	0.21		0.20	0.01	0.57	0.25	
Uniform Delay, d1	46.6	10.0		51.0	14.4	13.5		51.3	50.9	42.6	40.3	
Progression Factor	0.63	0.34		1.21	1.32	4.56		1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.5	0.2		1.3	0.3	0.5		1.4	0.0	2.7	0.5	
Delay (s)	31.9	3.6		62.8	19.2	62.1		52.7	50.9	45.3	40.8	
Level of Service	C	A		E	B	E		D	D	D	D	
Approach Delay (s)		10.1			31.9			51.9			42.4	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	834	0	0	902	212	322	0	482	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.97		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			5039		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			5039		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	125	834	0	0	902	212	322	0	482	0	0	0
RTOR Reduction (vph)	0	0	0	0	27	0	0	0	64	0	0	0
Lane Group Flow (vph)	125	834	0	0	1087	0	161	161	418	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	9.3	64.9			52.1		35.3	35.3	35.3			
Effective Green, g (s)	9.3	64.9			52.1		35.3	35.3	35.3			
Actuated g/C Ratio	0.08	0.59			0.47		0.32	0.32	0.32			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	296	3060			2386		550	550	518			
v/s Ratio Prot	c0.04	0.16			c0.22							
v/s Ratio Perm							0.09	0.09	c0.26			
v/c Ratio	0.42	0.27			0.46		0.29	0.29	0.81			
Uniform Delay, d1	47.8	11.0			19.4		28.0	28.0	34.2			
Progression Factor	1.20	1.05			0.38		1.00	1.00	1.00			
Incremental Delay, d2	0.9	0.2			0.5		0.3	0.3	9.0			
Delay (s)	58.1	11.7			7.8		28.3	28.3	43.2			
Level of Service	E	B			A		C	C	D			
Approach Delay (s)		17.8			7.8			37.2			0.0	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	229	746	0	0	1015	589	198	0	404	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.94		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	3502	5187			4901		1715	1715	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	3502	5187			4901		1715	1715	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	229	746	0	0	1015	589	198	0	404	0	0	0
RTOR Reduction (vph)	0	0	0	0	72	0	0	0	163	0	0	0
Lane Group Flow (vph)	229	746	0	0	1532	0	99	99	241	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	12.4	78.7			62.8		21.5	21.5	21.5			
Effective Green, g (s)	12.4	78.7			62.8		21.5	21.5	21.5			
Actuated g/C Ratio	0.11	0.72			0.57		0.20	0.20	0.20			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	394	3711			2798		335	335	315			
v/s Ratio Prot	c0.07	0.14			c0.31							
v/s Ratio Perm							0.06	0.06	c0.15			
v/c Ratio	0.58	0.20			0.55		0.30	0.30	0.77			
Uniform Delay, d1	46.3	5.2			14.7		37.8	37.8	41.9			
Progression Factor	0.96	1.39			0.81		1.00	1.00	1.00			
Incremental Delay, d2	2.1	0.1			0.5		0.5	0.5	10.6			
Delay (s)	46.8	7.4			12.4		38.3	38.3	52.5			
Level of Service	D	A			B		D	D	D			
Approach Delay (s)		16.6			12.4			47.8			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	223	686	390	45	964	42	236	294	67	61	443	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	4905		3502	5155		1805	3510		1805	3422	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	4905		3502	5155		1805	3510		1805	3422	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	223	686	390	45	964	42	236	294	67	61	443	235
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	223	1076	0	45	1006	0	236	361	0	61	678	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	11.6	41.6		5.5	35.5		18.6	39.0		6.9	27.3	
Effective Green, g (s)	11.6	41.6		5.5	35.5		18.6	39.0		6.9	27.3	
Actuated g/C Ratio	0.11	0.38		0.05	0.32		0.17	0.35		0.06	0.25	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	369	1855		175	1664		305	1244		113	849	
v/s Ratio Prot	c0.06	0.22		0.01	c0.20		c0.13	0.10		0.03	c0.20	
v/s Ratio Perm												
v/c Ratio	0.60	0.58		0.26	0.60		0.77	0.29		0.54	0.80	
Uniform Delay, d1	47.0	27.2		50.3	31.3		43.7	25.5		50.0	38.8	
Progression Factor	0.93	0.93		1.47	0.66		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	1.2		0.5	1.1		11.6	0.1		4.9	5.3	
Delay (s)	46.3	26.7		74.4	21.8		55.3	25.7		54.9	44.1	
Level of Service	D	C		E	C		E	C		D	D	
Approach Delay (s)		30.0			24.1			37.4			45.0	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	32.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	329	934	210	47	984	45	422	500	96	54	196	302
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	5044		3502	5153		1805	3523		1805	3282	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	5044		3502	5153		1805	3523		1805	3282	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	329	934	210	47	984	45	422	500	96	54	196	302
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	329	1144	0	47	1029	0	422	596	0	54	498	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.6	36.3		5.8	29.5		28.0	43.3		7.6	22.9	
Effective Green, g (s)	12.6	36.3		5.8	29.5		28.0	43.3		7.6	22.9	
Actuated g/C Ratio	0.11	0.33		0.05	0.27		0.25	0.39		0.07	0.21	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	401	1664		184	1381		459	1386		124	683	
v/s Ratio Prot	c0.09	0.23		0.01	c0.20		c0.23	0.17		0.03	c0.15	
v/s Ratio Perm												
v/c Ratio	0.82	0.69		0.26	0.75		0.92	0.43		0.44	0.92dr	
Uniform Delay, d1	47.6	31.9		50.0	36.8		39.9	24.3		49.1	40.7	
Progression Factor	1.03	1.04		1.47	0.94		1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.4	2.3		0.6	2.9		23.3	0.2		2.4	3.9	
Delay (s)	61.3	35.6		74.3	37.6		63.2	24.6		51.6	44.6	
Level of Service	E	D		E	D		E	C		D	D	
Approach Delay (s)		41.3			39.2			40.6			45.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	41.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	133	479	279	143	696	33	260	495	23	13	1265	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5152		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	133	479	279	143	696	33	260	495	23	13	1265	260
RTOR Reduction (vph)	0	0	192	0	5	0	0	0	11	0	0	138
Lane Group Flow (vph)	133	479	87	143	724	0	260	495	12	13	1265	122
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	10.6	21.8	21.8	10.7	21.9		19.3	58.6	58.6	2.9	42.2	42.2
Effective Green, g (s)	10.6	21.8	21.8	10.7	21.9		19.3	58.6	58.6	2.9	42.2	42.2
Actuated g/C Ratio	0.10	0.20	0.20	0.10	0.20		0.18	0.53	0.53	0.03	0.38	0.38
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	173	715	320	175	1025		316	1923	860	47	1384	619
v/s Ratio Prot	0.07	0.13		c0.08	c0.14		c0.14	0.14		0.01	c0.35	
v/s Ratio Perm			0.05						0.01			0.08
v/c Ratio	0.77	0.67	0.27	0.82	0.71		0.82	0.26	0.01	0.28	0.91	0.20
Uniform Delay, d1	48.5	40.8	37.4	48.7	41.1		43.7	13.9	12.1	52.5	32.2	22.6
Progression Factor	1.12	1.55	4.24	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.6	2.1	0.4	24.6	2.2		15.7	0.3	0.0	3.2	10.8	0.7
Delay (s)	70.7	65.4	158.9	73.3	43.3		59.4	14.2	12.1	55.7	43.0	23.3
Level of Service	E	E	F	E	D		E	B	B	E	D	C
Approach Delay (s)		95.4			48.2			29.3			39.8	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	51.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	278	582	149	59	532	22	352	1331	69	40	636	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5156		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5156		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	278	582	149	59	532	22	352	1331	69	40	636	219
RTOR Reduction (vph)	0	0	111	0	4	0	0	0	36	0	0	155
Lane Group Flow (vph)	278	582	38	59	550	0	352	1331	33	40	636	64
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	17.0	28.4	28.4	7.6	19.0		25.8	52.5	52.5	5.5	32.2	32.2
Effective Green, g (s)	17.0	28.4	28.4	7.6	19.0		25.8	52.5	52.5	5.5	32.2	32.2
Actuated g/C Ratio	0.15	0.26	0.26	0.07	0.17		0.23	0.48	0.48	0.05	0.29	0.29
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	932	416	124	890		423	1722	770	90	1056	472
v/s Ratio Prot	c0.15	c0.16		0.03	0.11		c0.20	c0.37		0.02	0.18	
v/s Ratio Perm			0.02						0.02			0.04
v/c Ratio	1.00	0.62	0.09	0.48	0.62		0.83	0.77	0.04	0.44	0.60	0.14
Uniform Delay, d1	46.5	36.1	31.0	49.3	42.1		40.0	23.8	15.3	50.8	33.4	28.7
Progression Factor	1.33	1.77	6.27	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	47.8	1.0	0.1	2.9	1.3		13.1	3.4	0.1	3.5	2.5	0.6
Delay (s)	109.7	64.8	194.3	52.1	43.4		53.1	27.3	15.4	54.2	35.9	29.3
Level of Service	F	E	F	D	D		D	C	B	D	D	C
Approach Delay (s)		96.3			44.3			32.0			35.1	
Approach LOS		F			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	49.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX K

LOS Analysis Worksheets – Future Buildout 2035 without Project

APPENDIX K-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Future Year w/o Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	114	0	0		----		
SB Thru	53	1	1700	167/1,700=	0.098		
SB Right	410	1	1700	410/1,700=	0.241	< ==	0.241
EB Left	0	0	0		----		
EB Thru	1009	2	3400	1,009/3,400=	0.297		
EB Right	603	1	1700	603/1,700=	0.355		
WB Left	391	1	1700	391/1,700=	0.230		
WB Thru	2037	2	3400	2,037/3,400=	0.599	< ==	
WB Right	0	0	0		----		0.599
Sum of Critical V/C Ratios							0.840
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.890**
Level of Service (LOS) - Refer to table below							**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	0	0	0	----		
NB Thru	0	0	0	----		
NB Right	0	0	0	----		
SB Left	136	0	0	----		
SB Thru	105	1	1700	241/1,700= 0.142		
SB Right	390	1	1700	390/1,700= 0.229	< ==	0.229
EB Left	0	0	0	----		
EB Thru	1760	2	3400	1,760/3,400= 0.518	< ==	
EB Right	739	1	1700	739/1,700= 0.435		
WB Left	470	1	1700	470/1,700= 0.276	< ==	
WB Thru	2089	2	3400	2,089/3,400= 0.614		
WB Right	0	0	0	----		0.794

Sum of Critical V/C Ratios	1.023
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.073**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Future Year w/o Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	1060	0	0		----		
NB Thru	48	2	3400	1,108/3,400=	0.326		
NB Right	570	1	1700	570/1,700=	0.335	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.335
EB Left	286	1	1700	286/1,700=	0.168	< ==	
EB Thru	855	2	3400	855/3,400=	0.251		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1534	2	3400	1,768/3,400=	0.520	< ==	
WB Right	234	0	0		----		0.688
Sum of Critical V/C Ratios							1.023
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**1.073**
Level of Service (LOS) - Refer to table below							**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	919	0	0		----		
NB Thru	28	2	3400	947/3,400=	0.279	< ==	
NB Right	435	1	1700	435/1,700=	0.256		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.279
EB Left	476	1	1700	476/1,700=	0.280	< ==	
EB Thru	1660	2	3400	1,660/3,400=	0.488		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	2005	2	3400	2,396/3,400=	0.705	< ==	
WB Right	391	0	0		----		0.985

Sum of Critical V/C Ratios	1.264
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.314**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Future Year w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	386	2	3400	386/3,400=	0.110	< ==	
NB Thru	457	2	3400	564/3,400=	0.170		
NB Right	107	0	0		----		
SB Left	229	1	1700	229/1,700=	0.135		
SB Thru	707	2	3400	941/3,400=	0.277	< ==	
SB Right	234	0	0		----		0.387
EB Left	265	2	3400	265/3,400=	0.078	< ==	
EB Thru	617	2	3400	617/3,400=	0.181		
EB Right	209	1	1700	209/1,700=	0.123		
WB Left	144	1	1700	144/1,700=	0.085		
WB Thru	1098	2	3400	1,098/3,400=	0.323	< ==	
WB Right	145	1	1700	145/1,700=	0.085		0.401

Sum of Critical V/C Ratios	0.788
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.838**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	543	2	3400	543/3,400=	0.160		
NB Thru	749	2	3400	925/3,400=	0.270	< ==	
NB Right	176	0	0		----		
SB Left	290	1	1700	290/1,700=	0.171	< ==	
SB Thru	670	2	3400	923/3,400=	0.271		
SB Right	253	0	0		----		0.441
EB Left	335	2	3400	335/3,400=	0.099		
EB Thru	959	2	3400	959/3,400=	0.282	< ==	
EB Right	293	1	1700	293/1,700=	0.172		
WB Left	178	1	1700	178/1,700=	0.105	< ==	
WB Thru	909	2	3400	909/3,400=	0.267		
WB Right	200	1	1700	200/1,700=	0.118		0.387

Sum of Critical V/C Ratios	0.828
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.878**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Future Year w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	212	1	1700	212/1,700=	0.120	< ==	
NB Thru	546	3	5100	723/5,100=	0.140		
NB Right	177	0	0		----		
SB Left	120	1	1700	120/1,700=	0.071		
SB Thru	1540	3	5100	1,798/5,100=	0.353	< ==	
SB Right	258	0	0		----		0.473
EB Left	188	1	1700	188/1,700=	0.111	< ==	
EB Thru	310	2	3400	310/3,400=	0.091		
EB Right	365	1	1700	365/1,700=	0.215		
WB Left	259	1	1700	259/1,700=	0.152		
WB Thru	490	2	3400	490/3,400=	0.144	< ==	
WB Right	115	1	1700	115/1,700=	0.068		0.255

Sum of Critical V/C Ratios	0.728
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.778**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman
Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM
Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	380	1	1700	380/1,700=	0.220		
NB Thru	1488	3	5100	1,740/5,100=	0.340	< ==	
NB Right	252	0	0		----		
SB Left	148	1	1700	148/1,700=	0.087	< ==	
SB Thru	780	3	5100	1,030/5,100=	0.202		
SB Right	250	0	0		----		0.427
EB Left	270	1	1700	270/1,700=	0.159	< ==	
EB Thru	431	2	3400	431/3,400=	0.127		
EB Right	266	1	1700	266/1,700=	0.156		
WB Left	160	1	1700	160/1,700=	0.094		
WB Thru	451	2	3400	451/3,400=	0.133	< ==	
WB Right	176	1	1700	176/1,700=	0.104		0.292

Sum of Critical V/C Ratios	0.719
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.769**
Level of Service (LOS) - Refer to table below	**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Future Year w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	90	1	1700	90/1,700=	0.050		
NB Thru	576	2	3400	850/3,400=	0.250	< ==	
NB Right	274	0	0		----		
SB Left	163	1	1700	163/1,700=	0.096	< ==	
SB Thru	900	2	3400	900/3,400=	0.265		
SB Right	37	1	1700	37/1,700=	0.022		0.346
EB Left	25	1	1700	25/1,700=	0.015		
EB Thru	20	1	1700	45/1,700=	0.026	< ==	
EB Right	25	0	0		----		
WB Left	350	1	1700	350/1,700=	0.206	< ==	
WB Thru	60	1	1700	60/1,700=	0.035		
WB Right	171	1	1700	171/1,700=	0.101		0.232
Sum of Critical V/C Ratios							0.578
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.628**
Level of Service (LOS) - Refer to table below							**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	50	1	1700	50/1,700=	0.030		
NB Thru	893	2	3400	1,285/3,400=	0.380	< ==	
NB Right	392	0	0		----		
SB Left	246	1	1700	246/1,700=	0.145	< ==	
SB Thru	840	2	3400	840/3,400=	0.247		
SB Right	75	1	1700	75/1,700=	0.044		0.525
EB Left	176	1	1700	176/1,700=	0.104		
EB Thru	80	1	1700	244/1,700=	0.144	< ==	
EB Right	164	0	0		----		
WB Left	340	1	1700	340/1,700=	0.200	< ==	
WB Thru	80	1	1700	80/1,700=	0.047		
WB Right	244	1	1700	244/1,700=	0.144		0.344

Sum of Critical V/C Ratios	0.869
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.919**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Future Year w/o Project | Peak Hr: 7:15 - 8:15 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	90	1	1700	90/1,700=	0.050	< ==	
NB Thru	386	2	3400	512/3,400=	0.150		
NB Right	126	0	0		----		
SB Left	45	1	1700	45/1,700=	0.026		
SB Thru	471	2	3400	629/3,400=	0.185	< ==	
SB Right	158	0	0		----		0.235
EB Left	67	1	1700	67/1,700=	0.039	< ==	
EB Thru	264	1	1700	264/1,700=	0.155		
EB Right	218	1	1700	218/1,700=	0.128		
WB Left	71	1	1700	71/1,700=	0.042		
WB Thru	481	1	1700	481/1,700=	0.283	< ==	
WB Right	30	1	1700	30/1,700=	0.018		0.322
Sum of Critical V/C Ratios							0.557
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.607**
Level of Service (LOS) - Refer to table below							**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Future Year w/o Project   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	281	1	1700	281/1,700=	0.170	< ==	
NB Thru	725	2	3400	795/3,400=	0.230		
NB Right	70	0	0		----		
SB Left	40	1	1700	40/1,700=	0.024		
SB Thru	377	2	3400	538/3,400=	0.158	< ==	
SB Right	161	0	0		----		0.328
EB Left	193	1	1700	193/1,700=	0.114		
EB Thru	555	1	1700	555/1,700=	0.326	< ==	
EB Right	162	1	1700	162/1,700=	0.095		
WB Left	134	1	1700	134/1,700=	0.079	< ==	
WB Thru	459	1	1700	459/1,700=	0.270		
WB Right	80	1	1700	80/1,700=	0.047		0.405

Sum of Critical V/C Ratios	0.733
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.783**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Future Year w/o Project
Peak Hr: 7:15 - 8:15 AM

Analyst: GCW
Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	67	1	1700	67/1,700=	0.040	< ==	
NB Thru	713	3	5100	723/5,100=	0.140		
NB Right	10	0	0		----		
SB Left	351	1	1700	351/1,700=	0.206		
SB Thru	1657	2	3400	1,657/3,400=	0.487	< ==	
SB Right	285	1	1700	285/1,700=	0.168		0.527
EB Left	47	1	1700	47/1,700=	0.028	< ==	
EB Thru	209	1	1700	262/1,700=	0.154		
EB Right	53	0	0		----		
WB Left	5	1	1700	5/1,700=	0.003		
WB Thru	246	1	1700	246/1,700=	0.145	< ==	
WB Right	128	1	1700	128/1,700=	0.075		0.173

Sum of Critical V/C Ratios	0.700
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.750**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	101	1	1700	101/1,700=	0.060		
NB Thru	1904	3	5100	1,914/5,100=	0.380	< ==	
NB Right	10	0	0		----		
SB Left	126	1	1700	126/1,700=	0.074	< ==	
SB Thru	897	2	3400	897/3,400=	0.264		
SB Right	129	1	1700	129/1,700=	0.076		0.454
EB Left	243	1	1700	243/1,700=	0.143	< ==	
EB Thru	360	1	1700	429/1,700=	0.252		
EB Right	69	0	0		----		
WB Left	5	1	1700	5/1,700=	0.003		
WB Thru	289	1	1700	289/1,700=	0.170	< ==	
WB Right	265	1	1700	265/1,700=	0.156		0.313

Sum of Critical V/C Ratios	0.767
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.817**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Future Year w/o Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	104	1	1700	104/1,700=	0.060	< ==	
NB Thru	539	2	3400	539/3,400=	0.160		
NB Right	264	1	1700	264/1,700=	0.155		
SB Left	230	2	3400	230/3,400=	0.068		
SB Thru	356	2	3400	662/3,400=	0.195	< ==	
SB Right	306	0	0		----		0.255
EB Left	199	1	1700	199/1,700=	0.117	< ==	
EB Thru	815	3	5100	892/5,100=	0.175		
EB Right	77	0	0		----		
WB Left	142	1	1700	142/1,700=	0.084		
WB Thru	844	3	5100	844/5,100=	0.165	< ==	
WB Right	223	1	1700	223/1,700=	0.131		0.282
Sum of Critical V/C Ratios							0.537
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.587**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	94	1	1700	94/1,700=	0.060	< ==	
NB Thru	594	2	3400	594/3,400=	0.170		
NB Right	280	1	1700	280/1,700=	0.165		
SB Left	354	2	3400	354/3,400=	0.104		
SB Thru	739	2	3400	1,067/3,400=	0.314	< ==	
SB Right	328	0	0		----		0.374
EB Left	433	1	1700	433/1,700=	0.255		
EB Thru	1021	3	5100	1,143/5,100=	0.224	< ==	
EB Right	122	0	0		----		
WB Left	516	1	1700	516/1,700=	0.304	< ==	
WB Thru	1305	3	5100	1,305/5,100=	0.256		
WB Right	387	1	1700	387/1,700=	0.228		0.528

Sum of Critical V/C Ratios	0.902
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.952**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Future Year w/o Project — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	10	0	0		----		
NB Thru	8	1	1700	8/1,700=	----		
NB Right	30	1	1700	30/1,700=	0.018		
SB Left	360	1	1700	360/1,700=	0.212	< ==	
SB Thru	30	1	1700	277/1,700=	0.163		
SB Right	247	0	0		----		0.212
EB Left	174	2	3400	174/3,400=	0.051		
EB Thru	1194	3	5100	1,214/5,100=	0.238		
EB Right	20	0	0		----		
WB Left	40	1	1700	40/1,700=	0.024		
WB Thru	1021	3	5100	1,021/5,100=	0.200		
WB Right	472	1	1700	472/1,700=	0.278	< ==	0.329

Sum of Critical V/C Ratios	0.541
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.591**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	8	0	0		----		
NB Thru	6	1	1700	6/1,700=	----		
NB Right	10	1	1700	10/1,700=	0.006		
SB Left	161	1	1700	161/1,700=	0.095		
SB Thru	5	1	1700	368/1,700=	0.216	< ==	
SB Right	363	0	0		----		0.216
EB Left	314	2	3400	314/3,400=	0.092	< ==	
EB Thru	1300	3	5100	1,310/5,100=	0.257		
EB Right	10	0	0		----		
WB Left	50	1	1700	50/1,700=	0.029		
WB Thru	2035	3	5100	2,035/5,100=	0.399	< ==	
WB Right	331	1	1700	331/1,700=	0.195		0.491

Sum of Critical V/C Ratios	0.707
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.757**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/o Project | Peak Hr: 7:45 - 8:45 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	347	0	0		----		
NB Thru	40	2	3400	387/3,400=	0.114		
NB Right	508	1	1700	508/1,700=	0.299	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.299
EB Left	200	2	3400	200/3,400=	0.059	< ==	
EB Thru	1384	3	5100	1,384/5,100=	0.271		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1292	3	5100	1,517/5,100=	0.297	< ==	
WB Right	225	0	0		----		0.356
Sum of Critical V/C Ratios							0.655
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.705**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	533	0	0		----		
NB Thru	25	2	3400	558/3,400=	0.164		
NB Right	690	1	1700	690/1,700=	0.406	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.406
EB Left	246	2	3400	246/3,400=	0.072	< ==	
EB Thru	1279	3	5100	1,279/5,100=	0.251		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1883	3	5100	2,690/5,100=	0.527	< ==	
WB Right	807	0	0		----		0.599

Sum of Critical V/C Ratios	1.005
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.055**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Future Year w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	254	1	1700	254/1,700=	0.150	< ==	
NB Thru	305	2	3400	381/3,400=	0.110		
NB Right	76	0	0		----		
SB Left	65	1	1700	65/1,700=	0.038		
SB Thru	453	2	3400	634/3,400=	0.186	< ==	
SB Right	181	0	0		----		0.336
EB Left	282	2	3400	282/3,400=	0.083		
EB Thru	998	3	5100	1,470/5,100=	0.288	< ==	
EB Right	472	0	0		----		
WB Left	96	2	3400	96/3,400=	0.028	< ==	
WB Thru	1090	3	5100	1,135/5,100=	0.223		
WB Right	45	0	0		----		0.316

Sum of Critical V/C Ratios	0.652
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.702**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Future Year w/o Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	713	1	1700	713/1,700=	0.420	< ==	
NB Thru	570	2	3400	727/3,400=	0.210		
NB Right	157	0	0		----		
SB Left	131	1	1700	131/1,700=	0.077		
SB Thru	281	2	3400	703/3,400=	0.207	< ==	
SB Right	422	0	0		----		0.627
EB Left	301	2	3400	301/3,400=	0.089	< ==	
EB Thru	1215	3	5100	1,467/5,100=	0.288		
EB Right	252	0	0		----		
WB Left	140	2	3400	140/3,400=	0.041		
WB Thru	1355	3	5100	1,489/5,100=	0.292	< ==	
WB Right	134	0	0		----		0.381

Sum of Critical V/C Ratios	1.008
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.058**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Future Year w/o Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	279	1	1700	279/1,700=	0.160	< ==	
NB Thru	565	2	3400	565/3,400=	0.170		
NB Right	80	1	1700	80/1,700=	0.047		
SB Left	55	1	1700	55/1,700=	0.032		
SB Thru	1357	2	3400	1,357/3,400=	0.399	< ==	
SB Right	341	1	1700	341/1,700=	0.201		0.559
EB Left	249	1	1700	249/1,700=	0.146		
EB Thru	568	2	3400	568/3,400=	0.167	< ==	
EB Right	514	1	1700	514/1,700=	0.302		
WB Left	260	1	1700	260/1,700=	0.153	< ==	
WB Thru	758	3	5100	793/5,100=	0.155		
WB Right	35	0	0		----		0.320

Sum of Critical V/C Ratios	0.879
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.929**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Future Year w/o Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	469	1	1700	469/1,700=	0.280	< ==	
NB Thru	1398	2	3400	1,398/3,400=	0.410		
NB Right	231	1	1700	231/1,700=	0.136		
SB Left	40	1	1700	40/1,700=	0.024		
SB Thru	659	2	3400	659/3,400=	0.194	< ==	
SB Right	388	1	1700	388/1,700=	0.228		0.474
EB Left	543	1	1700	543/1,700=	0.319	< ==	
EB Thru	764	2	3400	764/3,400=	0.225		
EB Right	244	1	1700	244/1,700=	0.144		
WB Left	121	1	1700	121/1,700=	0.071		
WB Thru	772	3	5100	797/5,100=	0.156	< ==	
WB Right	25	0	0		----		0.475

Sum of Critical V/C Ratios	0.949
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.999**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX K-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1009	603	391	2037	0	0	0	0	114	53	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1837	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1837	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1009	603	391	2037	0	0	0	0	114	53	410
RTOR Reduction (vph)	0	0	331	0	0	0	0	0	0	0	0	48
Lane Group Flow (vph)	0	1009	272	391	2037	0	0	0	0	0	167	362
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		37.4	37.4	24.0	65.4						25.6	25.6
Effective Green, g (s)		37.4	37.4	24.0	65.4						25.6	25.6
Actuated g/C Ratio		0.37	0.37	0.24	0.65						0.26	0.26
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1350	604	433	2360						470	413
v/s Ratio Prot		0.28		0.22	c0.56							
v/s Ratio Perm			0.17								0.09	c0.22
v/c Ratio		0.75	0.45	0.90	0.86						0.36	0.88
Uniform Delay, d1		27.2	23.6	36.9	13.7						30.4	35.7
Progression Factor		0.67	0.51	0.91	0.82						1.00	1.00
Incremental Delay, d2		3.7	2.4	2.8	0.4						0.5	18.3
Delay (s)		22.0	14.3	36.2	11.7						30.9	54.0
Level of Service		C	B	D	B						C	D
Approach Delay (s)		19.1			15.7			0.0			47.3	
Approach LOS		B			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	151.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1760	739	470	2089	0	0	0	0	136	105	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1848	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1848	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1760	739	470	2089	0	0	0	0	136	105	390
RTOR Reduction (vph)	0	0	171	0	0	0	0	0	0	0	0	52
Lane Group Flow (vph)	0	1760	568	470	2089	0	0	0	0	0	241	338
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		44.5	44.5	22.0	70.5						20.5	20.5
Effective Green, g (s)		44.5	44.5	22.0	70.5						20.5	20.5
Actuated g/C Ratio		0.44	0.44	0.22	0.70						0.20	0.20
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1606	718	397	2545						378	331
v/s Ratio Prot		c0.49		c0.26	0.58							
v/s Ratio Perm			0.35								0.13	c0.21
v/c Ratio		1.10	0.79	1.18	0.82						0.64	1.02
Uniform Delay, d1		27.8	23.8	39.0	10.3						36.4	39.8
Progression Factor		0.77	0.57	0.82	0.55						1.00	1.00
Incremental Delay, d2		53.4	8.6	85.3	0.3						3.5	55.2
Delay (s)		74.9	22.2	117.4	6.0						39.9	95.0
Level of Service		E	C	F	A						D	F
Approach Delay (s)		59.3			26.4			0.0			73.9	
Approach LOS		E			C			A			E	

Intersection Summary			
HCM 2000 Control Delay	46.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	174.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	286	855	0	0	1534	234	1060	48	570	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3538		1715	1637	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3538		1715	1637	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	286	855	0	0	1534	234	1060	48	570	0	0	0
RTOR Reduction (vph)	0	0	0	0	12	0	0	4	124	0	0	0
Lane Group Flow (vph)	286	855	0	0	1756	0	583	578	389	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	13.0	61.5			44.5		29.5	29.5	29.5			
Effective Green, g (s)	13.0	61.5			44.5		29.5	29.5	29.5			
Actuated g/C Ratio	0.13	0.62			0.44		0.29	0.29	0.29			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	234	2220			1574		505	482	452			
v/s Ratio Prot	c0.16	0.24			c0.50							
v/s Ratio Perm							0.34	0.35	0.25			
v/c Ratio	1.22	0.39			1.12		1.15	1.20	0.86			
Uniform Delay, d1	43.5	9.7			27.8		35.2	35.2	33.3			
Progression Factor	1.38	0.11			0.65		1.00	1.00	1.00			
Incremental Delay, d2	124.2	0.4			56.4		90.1	108.1	15.3			
Delay (s)	184.4	1.4			74.5		125.3	143.3	48.6			
Level of Service	F	A			E		F	F	D			
Approach Delay (s)		47.3			74.5			108.1			0.0	
Approach LOS		D			E			F			A	

Intersection Summary			
HCM 2000 Control Delay	80.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	151.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	476	1660	0	0	2005	391	919	28	435	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3522		1715	1636	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3522		1715	1636	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	476	1660	0	0	2005	391	919	28	435	0	0	0
RTOR Reduction (vph)	0	0	0	0	16	0	0	3	47	0	0	0
Lane Group Flow (vph)	476	1660	0	0	2380	0	496	492	344	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	19.0	69.5			46.5		21.5	21.5	21.5			
Effective Green, g (s)	19.0	69.5			46.5		21.5	21.5	21.5			
Actuated g/C Ratio	0.19	0.70			0.46		0.22	0.22	0.22			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	342	2508			1637		368	351	329			
v/s Ratio Prot	c0.26	0.46			c0.68							
v/s Ratio Perm							0.29	0.30	0.22			
v/c Ratio	1.39	0.66			1.45		1.35	1.40	1.05			
Uniform Delay, d1	40.5	8.6			26.8		39.2	39.2	39.2			
Progression Factor	1.37	0.23			0.93		1.00	1.00	1.00			
Incremental Delay, d2	182.4	0.5			206.9		173.6	197.0	61.9			
Delay (s)	238.0	2.5			231.9		212.9	236.3	101.2			
Level of Service	F	A			F		F	F	F			
Approach Delay (s)		54.9			231.9			189.6			0.0	
Approach LOS		D			F			F			A	

Intersection Summary			
HCM 2000 Control Delay	158.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	174.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	617	209	144	1098	145	386	457	107	229	707	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3507		1805	3475	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3507		1805	3475	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	265	617	209	144	1098	145	386	457	107	229	707	234
RTOR Reduction (vph)	0	0	73	0	0	63	0	20	0	0	32	0
Lane Group Flow (vph)	265	617	136	144	1098	82	386	544	0	229	909	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.1	33.2	45.9	11.5	32.6	32.6	12.7	27.0		13.8	28.1	
Effective Green, g (s)	12.1	33.2	45.9	11.5	32.6	32.6	12.7	27.0		13.8	28.1	
Actuated g/C Ratio	0.12	0.33	0.46	0.12	0.33	0.33	0.13	0.27		0.14	0.28	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	423	1198	741	207	1176	526	444	946		249	976	
v/s Ratio Prot	c0.08	0.17	0.02	0.08	c0.30		0.11	0.15		c0.13	c0.26	
v/s Ratio Perm			0.06			0.05						
v/c Ratio	0.63	0.52	0.18	0.70	0.93	0.16	0.87	0.57		0.92	0.93	
Uniform Delay, d1	41.8	26.9	16.0	42.6	32.7	23.9	42.8	31.5		42.6	35.0	
Progression Factor	0.86	0.79	0.55	1.00	1.00	1.00	1.22	0.84		1.00	1.00	
Incremental Delay, d2	1.7	1.3	0.0	7.9	14.5	0.6	15.5	1.0		35.2	15.1	
Delay (s)	37.7	22.6	8.8	50.5	47.2	24.6	67.8	27.4		77.7	50.1	
Level of Service	D	C	A	D	D	C	E	C		E	D	
Approach Delay (s)		23.6			45.1			43.8			55.5	
Approach LOS		C			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	42.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	335	959	293	178	909	200	543	749	176	290	670	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3507		1805	3462	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3507		1805	3462	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	335	959	293	178	909	200	543	749	176	290	670	253
RTOR Reduction (vph)	0	0	42	0	0	66	0	20	0	0	39	0
Lane Group Flow (vph)	335	959	251	178	909	134	543	905	0	290	884	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.0	30.0	46.0	11.5	29.5	29.5	16.0	27.1		16.9	28.0	
Effective Green, g (s)	12.0	30.0	46.0	11.5	29.5	29.5	16.0	27.1		16.9	28.0	
Actuated g/C Ratio	0.12	0.30	0.46	0.12	0.29	0.29	0.16	0.27		0.17	0.28	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	420	1083	742	207	1064	476	560	950		305	969	
v/s Ratio Prot	0.10	c0.27	0.05	0.10	c0.25		0.16	c0.26		c0.16	0.26	
v/s Ratio Perm			0.10			0.08						
v/c Ratio	0.80	0.89	0.34	0.86	0.85	0.28	0.97	0.95		0.95	0.91	
Uniform Delay, d1	42.8	33.4	17.3	43.5	33.2	27.1	41.8	35.8		41.1	34.8	
Progression Factor	0.78	0.74	0.55	1.00	1.00	1.00	1.13	0.85		1.00	1.00	
Incremental Delay, d2	6.3	7.3	0.1	27.2	8.8	1.5	28.0	17.4		38.1	12.8	
Delay (s)	39.7	31.9	9.5	70.7	42.0	28.6	75.2	47.8		79.3	47.6	
Level of Service	D	C	A	E	D	C	E	D		E	D	
Approach Delay (s)		29.4			43.9			57.9			55.2	
Approach LOS		C			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	45.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	188	310	365	259	490	115	212	546	177	120	1540	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	4997		1805	5075	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	4997		1805	5075	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	188	310	365	259	490	115	212	546	177	120	1540	258
RTOR Reduction (vph)	0	0	185	0	0	97	0	51	0	0	21	0
Lane Group Flow (vph)	188	310	180	259	490	18	212	672	0	120	1777	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	13.5	14.9	14.9	16.0	17.4	17.4	13.0	50.3		11.7	49.0	
Effective Green, g (s)	13.5	14.9	14.9	16.0	17.4	17.4	13.0	50.3		11.7	49.0	
Actuated g/C Ratio	0.12	0.14	0.14	0.15	0.16	0.16	0.12	0.46		0.11	0.45	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	223	493	220	265	576	258	215	2308		193	2283	
v/s Ratio Prot	0.10	0.09		c0.14	c0.14		c0.12	0.13		0.07	c0.35	
v/s Ratio Perm			0.11			0.01						
v/c Ratio	0.84	0.63	0.82	0.98	0.85	0.07	0.99	0.29		0.62	0.78	
Uniform Delay, d1	46.7	44.4	45.7	46.3	44.5	38.9	47.9	18.2		46.5	25.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.1	2.5	20.6	48.5	11.5	0.1	56.9	0.3		6.1	2.7	
Delay (s)	70.7	46.9	66.3	94.7	56.0	39.0	104.8	18.5		52.6	28.1	
Level of Service	E	D	E	F	E	D	F	B		D	C	
Approach Delay (s)		60.3			65.4			38.1			29.6	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	108.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	270	431	266	160	451	176	380	1488	252	148	780	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5074		1805	4998	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5074		1805	4998	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	270	431	266	160	451	176	380	1488	252	148	780	250
RTOR Reduction (vph)	0	0	210	0	0	148	0	23	0	0	57	0
Lane Group Flow (vph)	270	431	56	160	451	28	380	1717	0	148	973	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	18.1	20.3	20.3	13.1	15.3	15.3	22.2	36.2		10.5	24.5	
Effective Green, g (s)	18.1	20.3	20.3	13.1	15.3	15.3	22.2	36.2		10.5	24.5	
Actuated g/C Ratio	0.19	0.21	0.21	0.14	0.16	0.16	0.23	0.38		0.11	0.25	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	339	762	341	246	574	257	416	1911		197	1274	
v/s Ratio Prot	c0.15	0.12		0.09	c0.12		c0.21	c0.34		0.08	0.19	
v/s Ratio Perm			0.03			0.02						
v/c Ratio	0.80	0.57	0.16	0.65	0.79	0.11	0.91	0.90		0.75	0.76	
Uniform Delay, d1	37.2	34.0	31.0	39.3	38.8	34.6	36.0	28.2		41.5	33.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.2	1.0	0.2	6.0	7.0	0.2	24.1	7.2		14.9	4.4	
Delay (s)	49.5	34.9	31.2	45.4	45.8	34.8	60.2	35.4		56.4	37.5	
Level of Service	D	C	C	D	D	C	E	D		E	D	
Approach Delay (s)		38.0			43.2			39.9			39.9	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	40.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	20	25	350	60	171	90	576	274	163	900	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1742		1805	1900	1615	1805	3435		1805	3610	1615
Flt Permitted	0.72	1.00		0.73	1.00	1.00	0.27	1.00		0.29	1.00	1.00
Satd. Flow (perm)	1364	1742		1383	1900	1615	509	3435		545	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	20	25	350	60	171	90	576	274	163	900	37
RTOR Reduction (vph)	0	18	0	0	0	120	0	49	0	0	0	14
Lane Group Flow (vph)	25	27	0	350	60	51	90	801	0	163	900	23
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	29.9	29.9		29.9	29.9	29.9	62.1	62.1		62.1	62.1	62.1
Effective Green, g (s)	29.9	29.9		29.9	29.9	29.9	62.1	62.1		62.1	62.1	62.1
Actuated g/C Ratio	0.30	0.30		0.30	0.30	0.30	0.62	0.62		0.62	0.62	0.62
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	407	520		413	568	482	316	2133		338	2241	1002
v/s Ratio Prot		0.02			0.03			0.23			0.25	
v/s Ratio Perm	0.02			c0.25		0.03	0.18			c0.30		0.01
v/c Ratio	0.06	0.05		0.85	0.11	0.11	0.28	0.38		0.48	0.40	0.02
Uniform Delay, d1	25.0	25.0		32.9	25.4	25.4	8.7	9.4		10.3	9.6	7.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.37	0.28	0.00
Incremental Delay, d2	0.1	0.0		14.8	0.1	0.1	2.3	0.5		3.4	0.4	0.0
Delay (s)	25.1	25.0		47.7	25.5	25.5	11.0	9.9		7.1	3.0	0.0
Level of Service	C	C		D	C	C	B	A		A	A	A
Approach Delay (s)		25.0			38.9			10.0			3.5	
Approach LOS		C			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	80	164	340	80	244	50	893	392	246	840	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1708		1805	1900	1615	1805	3445		1805	3610	1615
Flt Permitted	0.70	1.00		0.45	1.00	1.00	0.30	1.00		0.16	1.00	1.00
Satd. Flow (perm)	1339	1708		853	1900	1615	561	3445		296	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	176	80	164	340	80	244	50	893	392	246	840	75
RTOR Reduction (vph)	0	73	0	0	0	126	0	50	0	0	0	27
Lane Group Flow (vph)	176	171	0	340	80	118	50	1235	0	246	840	48
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	28.0	28.0		28.0	28.0	28.0	64.0	64.0		64.0	64.0	64.0
Effective Green, g (s)	28.0	28.0		28.0	28.0	28.0	64.0	64.0		64.0	64.0	64.0
Actuated g/C Ratio	0.28	0.28		0.28	0.28	0.28	0.64	0.64		0.64	0.64	0.64
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	374	478		238	532	452	359	2204		189	2310	1033
v/s Ratio Prot		0.10			0.04			0.36			0.23	
v/s Ratio Perm	0.13			c0.40		0.07	0.09			c0.83		0.03
v/c Ratio	0.47	0.36		1.43	0.15	0.26	0.14	0.56		1.30	0.36	0.05
Uniform Delay, d1	29.9	28.8		36.0	27.1	28.0	7.1	10.1		18.0	8.4	6.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.66	0.31	0.00
Incremental Delay, d2	0.9	0.5		215.4	0.1	0.3	0.8	1.0		158.7	0.3	0.1
Delay (s)	30.8	29.3		251.4	27.2	28.3	7.9	11.1		170.6	2.9	0.1
Level of Service	C	C		F	C	C	A	B		F	A	A
Approach Delay (s)		29.9			142.4			11.0			38.3	
Approach LOS		C			F			B			D	

Intersection Summary			
HCM 2000 Control Delay	46.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	67	264	218	71	481	30	90	386	126	45	471	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3477		1805	3474	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3477		1805	3474	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	67	264	218	71	481	30	90	386	126	45	471	158
RTOR Reduction (vph)	0	0	152	0	0	21	0	27	0	0	29	0
Lane Group Flow (vph)	67	264	66	71	481	9	90	485	0	45	600	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	6.7	25.6	25.6	6.8	25.7	25.7	7.2	31.4		4.7	28.9	
Effective Green, g (s)	6.7	25.6	25.6	6.8	25.7	25.7	7.2	31.4		4.7	28.9	
Actuated g/C Ratio	0.08	0.30	0.30	0.08	0.30	0.30	0.09	0.37		0.06	0.34	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	575	489	145	577	491	153	1292		100	1188	
v/s Ratio Prot	0.04	0.14		c0.04	c0.25		c0.05	0.14		0.02	c0.17	
v/s Ratio Perm			0.04			0.01						
v/c Ratio	0.47	0.46	0.14	0.49	0.83	0.02	0.59	0.38		0.45	0.51	
Uniform Delay, d1	37.2	23.8	21.4	37.2	27.4	20.6	37.2	19.4		38.6	22.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	0.6	0.1	2.6	10.0	0.0	5.7	0.8		3.2	1.5	
Delay (s)	39.6	24.4	21.5	39.8	37.4	20.6	42.9	20.2		41.8	23.6	
Level of Service	D	C	C	D	D	C	D	C		D	C	
Approach Delay (s)		25.1			36.9			23.6			24.9	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	84.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	193	555	162	134	459	80	281	725	70	40	377	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3562		1805	3448	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3562		1805	3448	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	193	555	162	134	459	80	281	725	70	40	377	161
RTOR Reduction (vph)	0	0	113	0	0	56	0	6	0	0	46	0
Lane Group Flow (vph)	193	555	49	134	459	24	281	789	0	40	492	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	11.0	30.2	30.2	10.4	29.6	29.6	16.0	38.4		5.2	27.6	
Effective Green, g (s)	11.0	30.2	30.2	10.4	29.6	29.6	16.0	38.4		5.2	27.6	
Actuated g/C Ratio	0.11	0.30	0.30	0.10	0.30	0.30	0.16	0.38		0.05	0.28	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	198	572	486	187	561	477	288	1365		93	949	
v/s Ratio Prot	c0.11	c0.29		0.07	0.24		c0.16	c0.22		0.02	0.14	
v/s Ratio Perm			0.03			0.01						
v/c Ratio	0.97	0.97	0.10	0.72	0.82	0.05	0.98	0.58		0.43	0.52	
Uniform Delay, d1	44.5	34.6	25.2	43.5	32.8	25.2	41.9	24.5		46.1	30.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	56.2	30.1	0.1	12.3	9.0	0.0	45.9	1.8		3.2	2.0	
Delay (s)	100.7	64.6	25.3	55.8	41.8	25.3	87.8	26.3		49.2	32.7	
Level of Service	F	E	C	E	D	C	F	C		D	C	
Approach Delay (s)		65.3			42.7			42.3			33.8	
Approach LOS		E			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	47	209	53	5	246	128	67	713	10	351	1657	285
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1842		1805	1900	1615	1805	5176		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1842		1805	1900	1615	1805	5176		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	47	209	53	5	246	128	67	713	10	351	1657	285
RTOR Reduction (vph)	0	9	0	0	0	101	0	1	0	0	0	108
Lane Group Flow (vph)	47	253	0	5	246	27	67	722	0	351	1657	177
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	4.7	21.2		1.1	17.6	17.6	6.8	25.9		19.8	38.9	38.9
Effective Green, g (s)	4.7	21.2		1.1	17.6	17.6	6.8	25.9		19.8	38.9	38.9
Actuated g/C Ratio	0.06	0.25		0.01	0.21	0.21	0.08	0.31		0.24	0.46	0.46
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	100	464		23	398	338	146	1595		425	1671	747
v/s Ratio Prot	c0.03	c0.14		0.00	0.13		0.04	0.14		c0.19	c0.46	
v/s Ratio Perm						0.02						0.11
v/c Ratio	0.47	0.55		0.22	0.62	0.08	0.46	0.45		0.83	0.99	0.24
Uniform Delay, d1	38.4	27.2		41.0	30.1	26.7	36.8	23.4		30.5	22.4	13.6
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.5	1.3		4.7	2.9	0.1	2.3	0.9		12.4	20.1	0.7
Delay (s)	41.9	28.5		45.7	33.0	26.8	39.1	24.3		42.8	42.5	14.3
Level of Service	D	C		D	C	C	D	C		D	D	B
Approach Delay (s)		30.6			31.1			25.5			39.1	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	243	360	69	5	289	265	101	1904	10	126	897	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1854		1805	1900	1615	1805	5183		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1854		1805	1900	1615	1805	5183		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	243	360	69	5	289	265	101	1904	10	126	897	129
RTOR Reduction (vph)	0	6	0	0	0	178	0	1	0	0	0	80
Lane Group Flow (vph)	243	423	0	5	289	87	101	1913	0	126	897	49
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	13.1	34.4		1.2	22.5	22.5	8.0	35.1		10.0	37.1	37.1
Effective Green, g (s)	13.1	34.4		1.2	22.5	22.5	8.0	35.1		10.0	37.1	37.1
Actuated g/C Ratio	0.14	0.36		0.01	0.23	0.23	0.08	0.36		0.10	0.38	0.38
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	244	659		22	442	375	149	1881		186	1385	619
v/s Ratio Prot	c0.13	c0.23		0.00	0.15		0.06	c0.37		c0.07	0.25	
v/s Ratio Perm						0.05						0.03
v/c Ratio	1.00	0.64		0.23	0.65	0.23	0.68	1.02		0.68	0.65	0.08
Uniform Delay, d1	41.8	26.0		47.3	33.6	30.1	43.1	30.8		41.8	24.4	18.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	56.1	2.1		5.2	3.5	0.3	11.6	25.2		9.4	2.4	0.3
Delay (s)	97.9	28.1		52.5	37.0	30.4	54.7	56.0		51.2	26.8	19.2
Level of Service	F	C		D	D	C	D	E		D	C	B
Approach Delay (s)		53.4			34.0			55.9			28.6	
Approach LOS		D			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	45.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	199	815	77	142	844	223	104	539	264	230	356	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5120		1805	5187	1615	1805	3610	1615	3502	3360	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5120		1805	5187	1615	1805	3610	1615	3502	3360	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	199	815	77	142	844	223	104	539	264	230	356	306
RTOR Reduction (vph)	0	10	0	0	0	160	0	0	192	0	141	0
Lane Group Flow (vph)	199	882	0	142	844	63	104	539	72	230	521	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	17.5	33.0		15.5	31.0	31.0	12.5	30.0	30.0	12.5	30.0	
Effective Green, g (s)	17.5	33.0		15.5	31.0	31.0	12.5	30.0	30.0	12.5	30.0	
Actuated g/C Ratio	0.16	0.30		0.14	0.28	0.28	0.11	0.27	0.27	0.11	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	287	1536		254	1461	455	205	984	440	397	916	
v/s Ratio Prot	c0.11	0.17		0.08	c0.16		0.06	0.15		c0.07	c0.16	
v/s Ratio Perm						0.04			0.04			
v/c Ratio	0.69	0.57		0.56	0.58	0.14	0.51	0.55	0.16	0.58	0.57	
Uniform Delay, d1	43.7	32.6		44.1	33.9	29.5	45.9	34.2	30.4	46.3	34.4	
Progression Factor	0.81	0.74		0.52	0.64	1.29	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	12.6	1.5		8.0	1.5	0.6	8.7	2.2	0.8	6.1	2.6	
Delay (s)	48.2	25.6		30.9	23.3	38.5	54.6	36.4	31.2	52.3	37.0	
Level of Service	D	C		C	C	D	D	D	C	D	D	
Approach Delay (s)		29.7			27.0			37.0			40.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	33.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	433	1021	122	516	1305	387	94	594	280	354	739	328
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5104		1805	5187	1615	1805	3610	1615	3502	3444	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5104		1805	5187	1615	1805	3610	1615	3502	3444	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	433	1021	122	516	1305	387	94	594	280	354	739	328
RTOR Reduction (vph)	0	14	0	0	0	177	0	0	204	0	44	0
Lane Group Flow (vph)	433	1129	0	516	1305	210	94	594	76	354	1023	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	23.5	27.1		23.5	27.1	27.1	8.2	29.9	29.9	10.5	32.2	
Effective Green, g (s)	23.5	27.1		23.5	27.1	27.1	8.2	29.9	29.9	10.5	32.2	
Actuated g/C Ratio	0.21	0.25		0.21	0.25	0.25	0.07	0.27	0.27	0.10	0.29	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	385	1257		385	1277	397	134	981	438	334	1008	
v/s Ratio Prot	c0.24	c0.22		c0.29	0.25		0.05	0.16		c0.10	c0.30	
v/s Ratio Perm						0.13			0.05			
v/c Ratio	1.12	0.90		1.34	1.02	0.53	0.70	0.61	0.17	1.06	1.02	
Uniform Delay, d1	43.2	40.1		43.2	41.5	35.9	49.7	34.9	30.6	49.8	38.9	
Progression Factor	1.14	1.15		0.63	0.61	0.65	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	83.4	10.0		165.2	26.9	3.5	15.3	1.1	0.2	65.9	32.1	
Delay (s)	132.9	56.1		192.3	52.2	26.9	65.0	36.0	30.8	115.7	71.0	
Level of Service	F	E		F	D	C	E	D	C	F	E	
Approach Delay (s)		77.2			80.5			37.3			82.2	
Approach LOS		E			F			D			F	

Intersection Summary			
HCM 2000 Control Delay	73.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	103.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	174	1194	20	40	1021	472	10	8	30	360	30	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	0.99	
Satd. Flow (prot)	3502	5174		1805	5187	1615		1849	1615	1715	1582	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	0.99	
Satd. Flow (perm)	3502	5174		1805	5187	1615		1849	1615	1715	1582	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	174	1194	20	40	1021	472	10	8	30	360	30	247
RTOR Reduction (vph)	0	1	0	0	0	250	0	0	29	0	134	0
Lane Group Flow (vph)	174	1213	0	40	1021	222	0	18	1	324	179	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	10.0	55.4		6.9	51.8	51.8		4.4	4.4	26.5	26.5	
Effective Green, g (s)	10.0	55.4		6.9	51.8	51.8		4.4	4.4	26.5	26.5	
Actuated g/C Ratio	0.09	0.50		0.06	0.47	0.47		0.04	0.04	0.24	0.24	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	318	2605		113	2442	760		73	64	413	381	
v/s Ratio Prot	c0.05	c0.23		0.02	c0.20			c0.01		c0.19	0.11	
v/s Ratio Perm						0.14			0.00			
v/c Ratio	0.55	0.47		0.35	0.42	0.29		0.25	0.02	0.78	0.47	
Uniform Delay, d1	47.8	17.7		49.4	19.2	17.9		51.2	50.7	39.1	35.7	
Progression Factor	0.91	0.51		0.97	0.83	3.96		1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.7	0.5		1.5	0.4	0.8		1.8	0.1	9.4	0.9	
Delay (s)	45.0	9.6		49.3	16.3	71.5		53.0	50.8	48.5	36.7	
Level of Service	D	A		D	B	E		D	D	D	D	
Approach Delay (s)		14.0			34.1			51.6			42.7	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	314	1300	10	50	2035	331	8	6	10	161	5	363
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5181		1805	5187	1615		1847	1615	1715	1546	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5181		1805	5187	1615		1847	1615	1715	1546	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	314	1300	10	50	2035	331	8	6	10	161	5	363
RTOR Reduction (vph)	0	0	0	0	0	110	0	0	10	0	306	0
Lane Group Flow (vph)	314	1310	0	50	2035	221	0	14	0	145	78	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	13.3	62.6		9.2	58.0	58.0		4.2	4.2	17.2	17.2	
Effective Green, g (s)	13.3	62.6		9.2	58.0	58.0		4.2	4.2	17.2	17.2	
Actuated g/C Ratio	0.12	0.57		0.08	0.53	0.53		0.04	0.04	0.16	0.16	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	423	2948		150	2734	851		70	61	268	241	
v/s Ratio Prot	c0.09	0.25		0.03	c0.39			c0.01		c0.08	0.05	
v/s Ratio Perm						0.14			0.00			
v/c Ratio	0.74	0.44		0.33	0.74	0.26		0.20	0.01	0.54	0.32	
Uniform Delay, d1	46.7	13.7		47.5	20.2	14.2		51.3	50.9	42.8	41.2	
Progression Factor	1.35	0.24		0.97	0.79	1.16		1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.6	0.3		0.1	0.2	0.1		1.4	0.0	2.2	0.8	
Delay (s)	66.8	3.5		46.1	16.1	16.6		52.7	50.9	45.0	42.0	
Level of Service	E	A		D	B	B		D	D	D	D	
Approach Delay (s)		15.7			16.8			52.0			42.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	1384	0	0	1292	225	347	40	508	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.98		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	3502	5187			5072		1715	1736	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	3502	5187			5072		1715	1736	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	200	1384	0	0	1292	225	347	40	508	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	0	38	0	0	0
Lane Group Flow (vph)	200	1384	0	0	1498	0	191	196	470	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	10.9	62.0			47.6		38.2	38.2	38.2			
Effective Green, g (s)	10.9	62.0			47.6		38.2	38.2	38.2			
Actuated g/C Ratio	0.10	0.56			0.43		0.35	0.35	0.35			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	347	2923			2194		595	602	560			
v/s Ratio Prot	c0.06	0.27			c0.30							
v/s Ratio Perm							0.11	0.11	c0.29			
v/c Ratio	0.58	0.47			0.68		0.32	0.33	0.84			
Uniform Delay, d1	47.3	14.3			25.1		26.4	26.4	33.1			
Progression Factor	1.12	1.54			0.41		1.00	1.00	1.00			
Incremental Delay, d2	2.1	0.5			1.3		0.3	0.3	10.7			
Delay (s)	55.1	22.5			11.5		26.7	26.7	43.7			
Level of Service	E	C			B		C	C	D			
Approach Delay (s)		26.6			11.5			36.4			0.0	
Approach LOS		C			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	246	1279	0	0	1883	807	533	25	690	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	3502	5187			4954		1715	1726	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	3502	5187			4954		1715	1726	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	246	1279	0	0	1883	807	533	25	690	0	0	0
RTOR Reduction (vph)	0	0	0	0	70	0	0	0	37	0	0	0
Lane Group Flow (vph)	246	1279	0	0	2620	0	277	281	653	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	11.1	60.7			46.1		39.5	39.5	39.5			
Effective Green, g (s)	11.1	60.7			46.1		39.5	39.5	39.5			
Actuated g/C Ratio	0.10	0.55			0.42		0.36	0.36	0.36			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	353	2862			2076		615	619	579			
v/s Ratio Prot	c0.07	0.25			c0.53							
v/s Ratio Perm							0.16	0.16	c0.40			
v/c Ratio	0.70	0.45			1.26		0.45	0.45	1.13			
Uniform Delay, d1	47.8	14.7			31.9		27.0	27.0	35.2			
Progression Factor	0.97	2.00			0.90		1.00	1.00	1.00			
Incremental Delay, d2	5.5	0.5			118.4		0.5	0.5	77.7			
Delay (s)	51.9	29.8			147.0		27.5	27.5	112.9			
Level of Service	D	C			F		C	C	F			
Approach Delay (s)		33.4			147.0			74.7			0.0	
Approach LOS		C			F			E			A	

Intersection Summary			
HCM 2000 Control Delay	98.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	282	998	472	96	1090	45	254	305	76	65	453	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	4937		3502	5156		1805	3502		1805	3455	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	4937		3502	5156		1805	3502		1805	3455	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	282	998	472	96	1090	45	254	305	76	65	453	181
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	282	1470	0	96	1135	0	254	381	0	65	634	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.0	40.8		8.4	37.2		18.1	35.8		8.0	25.7	
Effective Green, g (s)	12.0	40.8		8.4	37.2		18.1	35.8		8.0	25.7	
Actuated g/C Ratio	0.11	0.37		0.08	0.34		0.16	0.33		0.07	0.23	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	382	1831		267	1743		297	1139		131	807	
v/s Ratio Prot	0.08	c0.30		0.03	c0.22		c0.14	0.11		0.04	c0.18	
v/s Ratio Perm												
v/c Ratio	0.74	0.80		0.36	0.65		0.86	0.33		0.50	0.79	
Uniform Delay, d1	47.5	31.0		48.2	30.9		44.7	28.1		49.1	39.6	
Progression Factor	0.93	0.84		1.46	0.72		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.3	3.3		0.4	1.0		20.7	0.2		2.9	5.1	
Delay (s)	50.3	29.5		70.7	23.3		65.3	28.3		52.0	44.6	
Level of Service	D	C		E	C		E	C		D	D	
Approach Delay (s)		32.8			27.0			43.1			45.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	301	1215	252	140	1355	134	713	570	157	131	281	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	5053		3502	5117		1805	3493		1805	3285	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	5053		3502	5117		1805	3493		1805	3285	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	301	1215	252	140	1355	134	713	570	157	131	281	422
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	301	1467	0	140	1489	0	713	727	0	131	703	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.0	28.0		9.6	25.6		28.0	42.9		12.5	27.4	
Effective Green, g (s)	12.0	28.0		9.6	25.6		28.0	42.9		12.5	27.4	
Actuated g/C Ratio	0.11	0.25		0.09	0.23		0.25	0.39		0.11	0.25	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	382	1286		305	1190		459	1362		205	818	
v/s Ratio Prot	0.09	c0.29		0.04	c0.29		c0.40	0.21		0.07	c0.21	
v/s Ratio Perm												
v/c Ratio	0.79	1.14		0.46	1.25		1.55	0.53		0.64	1.05dr	
Uniform Delay, d1	47.8	41.0		47.7	42.2		41.0	25.8		46.6	39.5	
Progression Factor	0.87	0.83		1.45	1.23		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.6	70.7		0.3	114.8		259.6	0.4		6.4	9.0	
Delay (s)	49.3	104.8		69.5	166.7		300.6	26.3		53.0	48.4	
Level of Service	D	F		E	F		F	C		D	D	
Approach Delay (s)		95.3			158.3			162.1			49.1	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	123.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	114.4%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	249	568	514	260	758	35	279	565	80	55	1357	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5153		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5153		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	249	568	514	260	758	35	279	565	80	55	1357	341
RTOR Reduction (vph)	0	0	158	0	5	0	0	0	46	0	0	172
Lane Group Flow (vph)	249	568	356	260	788	0	279	565	34	55	1357	169
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	14.0	25.7	25.7	14.0	25.7		15.3	46.9	46.9	7.4	39.0	39.0
Effective Green, g (s)	14.0	25.7	25.7	14.0	25.7		15.3	46.9	46.9	7.4	39.0	39.0
Actuated g/C Ratio	0.13	0.23	0.23	0.13	0.23		0.14	0.43	0.43	0.07	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	229	843	377	229	1203		251	1539	688	121	1279	572
v/s Ratio Prot	0.14	0.16		c0.14	0.15		c0.15	0.16		0.03	c0.38	
v/s Ratio Perm			c0.22						0.02			0.10
v/c Ratio	1.09	0.67	0.94	1.14	0.66		1.11	0.37	0.05	0.45	1.06	0.30
Uniform Delay, d1	48.0	38.3	41.5	48.0	38.1		47.3	21.5	18.5	49.4	35.5	25.6
Progression Factor	1.06	1.55	1.94	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	77.7	1.7	27.3	100.8	1.3		90.0	0.7	0.1	2.7	43.1	1.3
Delay (s)	128.7	60.9	107.6	148.8	39.4		137.4	22.1	18.6	52.1	78.6	26.9
Level of Service	F	E	F	F	D		F	C	B	D	E	C
Approach Delay (s)		91.6			66.4			56.6			67.7	
Approach LOS		F			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	71.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	96.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	543	764	244	121	772	25	469	1398	231	40	659	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5163		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5163		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	543	764	244	121	772	25	469	1398	231	40	659	388
RTOR Reduction (vph)	0	0	170	0	3	0	0	0	101	0	0	260
Lane Group Flow (vph)	543	764	74	121	794	0	469	1398	130	40	659	128
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	22.0	33.3	33.3	11.8	23.1		21.9	43.4	43.4	5.5	27.0	27.0
Effective Green, g (s)	22.0	33.3	33.3	11.8	23.1		21.9	43.4	43.4	5.5	27.0	27.0
Actuated g/C Ratio	0.20	0.30	0.30	0.11	0.21		0.20	0.39	0.39	0.05	0.25	0.25
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	361	1092	488	193	1084		359	1424	637	90	886	396
v/s Ratio Prot	c0.30	c0.21		0.07	0.15		c0.26	c0.39		0.02	0.18	
v/s Ratio Perm			0.05						0.08			0.08
v/c Ratio	1.50	0.70	0.15	0.63	0.73		1.31	0.98	0.20	0.44	0.74	0.32
Uniform Delay, d1	44.0	33.9	28.0	47.0	40.6		44.0	32.9	21.9	50.8	38.3	34.0
Progression Factor	1.25	1.80	7.30	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	230.4	0.5	0.0	6.2	2.6		156.7	19.9	0.7	3.5	5.6	2.1
Delay (s)	285.4	61.7	204.7	53.2	43.2		200.7	52.8	22.7	54.2	43.9	36.2
Level of Service	F	E	F	D	D		F	D	C	D	D	D
Approach Delay (s)		162.5			44.5			82.5			41.5	
Approach LOS		F			D			F			D	

Intersection Summary			
HCM 2000 Control Delay	90.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX L

LOS Analysis Worksheets – Future Buildout 2035 with Project

APPENDIX L-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Future Year w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	107	0	0		----		
SB Thru	53	1	1700	160/1,700=	0.094		
SB Right	410	1	1700	410/1,700=	0.241	< ==	0.241
EB Left	0	0	0		----		
EB Thru	1009	2	3400	1,009/3,400=	0.297		
EB Right	603	1	1700	603/1,700=	0.355		
WB Left	391	1	1700	391/1,700=	0.230		
WB Thru	2037	2	3400	2,037/3,400=	0.599	< ==	
WB Right	0	0	0		----		0.599

Sum of Critical V/C Ratios	0.840
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.890**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 SB Ramps

Scenario: Future Year w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	0	0	0		----		
NB Thru	0	0	0		----		
NB Right	0	0	0		----		
SB Left	148	0	0		----		
SB Thru	105	1	1700	253/1,700=	0.149		
SB Right	390	1	1700	390/1,700=	0.229	< ==	0.229
EB Left	0	0	0		----		
EB Thru	1760	2	3400	1,760/3,400=	0.518	< ==	
EB Right	739	1	1700	739/1,700=	0.435		
WB Left	470	1	1700	470/1,700=	0.276	< ==	
WB Thru	2089	2	3400	2,089/3,400=	0.614		
WB Right	0	0	0		----		0.794

Sum of Critical V/C Ratios	1.023
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.073**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Future Year w/ Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	1060	0	0		----		
NB Thru	48	2	3400	1,108/3,400=	0.326		
NB Right	570	1	1700	570/1,700=	0.335	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.335
EB Left	286	1	1700	286/1,700=	0.168	< ==	
EB Thru	848	2	3400	848/3,400=	0.249		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1534	2	3400	1,780/3,400=	0.524	< ==	
WB Right	246	0	0		----		0.692

Sum of Critical V/C Ratios	1.027
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.077**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at SR-57 NB Ramps

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	919	0	0		----		
NB Thru	28	2	3400	947/3,400=	0.279	< ==	
NB Right	435	1	1700	435/1,700=	0.256		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.279
EB Left	476	1	1700	476/1,700=	0.280	< ==	
EB Thru	1672	2	3400	1,672/3,400=	0.492		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	2005	2	3400	2,396/3,400=	0.705	< ==	
WB Right	391	0	0		----		0.985

Sum of Critical V/C Ratios	1.264
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.314**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Future Year w/ Project　　Peak Hr: 7:30 - 8:30 AM

Analyst: GCW　　Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	398	2	3400	398/3,400=	0.120	< ==	
NB Thru	481	2	3400	588/3,400=	0.170		
NB Right	107	0	0		----		
SB Left	229	1	1700	229/1,700=	0.135		
SB Thru	692	2	3400	926/3,400=	0.272	< ==	
SB Right	234	0	0		----		0.392
EB Left	265	2	3400	265/3,400=	0.078	< ==	
EB Thru	617	2	3400	617/3,400=	0.181		
EB Right	202	1	1700	202/1,700=	0.119		
WB Left	144	1	1700	144/1,700=	0.085		
WB Thru	1098	2	3400	1,098/3,400=	0.323	< ==	
WB Right	145	1	1700	145/1,700=	0.085		0.401

Sum of Critical V/C Ratios	0.793
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.843**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Chapman at Placentia

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	543	2	3400	543/3,400=	0.160		
NB Thru	749	2	3400	925/3,400=	0.270	< ==	
NB Right	176	0	0		----		
SB Left	290	1	1700	290/1,700=	0.171	< ==	
SB Thru	694	2	3400	947/3,400=	0.279		
SB Right	253	0	0		----		0.441
EB Left	335	2	3400	335/3,400=	0.099		
EB Thru	959	2	3400	959/3,400=	0.282	< ==	
EB Right	305	1	1700	305/1,700=	0.179		
WB Left	178	1	1700	178/1,700=	0.105	< ==	
WB Thru	909	2	3400	909/3,400=	0.267		
WB Right	200	1	1700	200/1,700=	0.118		0.387

Sum of Critical V/C Ratios	0.828
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.878**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman

Scenario: Future Year w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	212	1	1700	212/1,700=	0.120	< ==	
NB Thru	558	3	5100	735/5,100=	0.140		
NB Right	177	0	0		----		
SB Left	120	1	1700	120/1,700=	0.071		
SB Thru	1533	3	5100	1,791/5,100=	0.351	< ==	
SB Right	258	0	0		----		0.471
EB Left	188	1	1700	188/1,700=	0.111	< ==	
EB Thru	310	2	3400	310/3,400=	0.091		
EB Right	365	1	1700	365/1,700=	0.215		
WB Left	259	1	1700	259/1,700=	0.152		
WB Thru	490	2	3400	490/3,400=	0.144	< ==	
WB Right	115	1	1700	115/1,700=	0.068		0.255
Sum of Critical V/C Ratios							0.726
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.776**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Chapman
Scenario: Future Year w/ Project
Peak Hr: 5:00 - 6:00 PM
Analyst: GCW
Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	380	1	1700	380/1,700=	0.220		
NB Thru	1488	3	5100	1,740/5,100=	0.340	< ==	
NB Right	252	0	0		----		
SB Left	148	1	1700	148/1,700=	0.087	< ==	
SB Thru	792	3	5100	1,042/5,100=	0.204		
SB Right	250	0	0		----		0.427
EB Left	270	1	1700	270/1,700=	0.159	< ==	
EB Thru	431	2	3400	431/3,400=	0.127		
EB Right	266	1	1700	266/1,700=	0.156		
WB Left	160	1	1700	160/1,700=	0.094		
WB Thru	451	2	3400	451/3,400=	0.133	< ==	
WB Right	176	1	1700	176/1,700=	0.104		0.292

Sum of Critical V/C Ratios	0.719
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.769**
Level of Service (LOS) - Refer to table below	**C**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Future Year w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	90	1	1700	90/1,700=	0.050		
NB Thru	576	2	3400	813/3,400=	0.240	< ==	
NB Right	237	0	0		----		
SB Left	148	1	1700	148/1,700=	0.087	< ==	
SB Thru	900	2	3400	900/3,400=	0.265		
SB Right	37	1	1700	37/1,700=	0.022		0.327
EB Left	25	1	1700	25/1,700=	0.015		
EB Thru	20	1	1700	45/1,700=	0.026	< ==	
EB Right	25	0	0		----		
WB Left	411	1	1700	411/1,700=	0.242	< ==	
WB Thru	60	1	1700	60/1,700=	0.035		
WB Right	195	1	1700	195/1,700=	0.115		0.268

Sum of Critical V/C Ratios	0.595
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.645**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	50	1	1700	50/1,700=	0.030		
NB Thru	893	2	3400	1,348/3,400=	0.400	< ==	
NB Right	455	0	0		----		
SB Left	270	1	1700	270/1,700=	0.159	< ==	
SB Thru	840	2	3400	840/3,400=	0.247		
SB Right	75	1	1700	75/1,700=	0.044		0.559
EB Left	176	1	1700	176/1,700=	0.104		
EB Thru	80	1	1700	244/1,700=	0.144	< ==	
EB Right	164	0	0		----		
WB Left	340	1	1700	340/1,700=	0.200	< ==	
WB Thru	80	1	1700	80/1,700=	0.047		
WB Right	244	1	1700	244/1,700=	0.144		0.344

Sum of Critical V/C Ratios	0.903
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.953**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Future Year w/ Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	66	1	1700	66/1,700= 0.040	< ==	
NB Thru	386	2	3400	484/3,400= 0.140		
NB Right	98	0	0	----		
SB Left	41	1	1700	41/1,700= 0.024		
SB Thru	471	2	3400	626/3,400= 0.184	< ==	
SB Right	155	0	0	----		0.224
EB Left	71	1	1700	71/1,700= 0.042	< ==	
EB Thru	256	1	1700	256/1,700= 0.151		
EB Right	190	1	1700	190/1,700= 0.112		
WB Left	128	1	1700	128/1,700= 0.075		
WB Thru	521	1	1700	521/1,700= 0.306	< ==	
WB Right	38	1	1700	38/1,700= 0.022		0.348

Sum of Critical V/C Ratios	0.572
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.622**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Melrose St at Crowther

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	310	1	1700	310/1,700=	0.180	< ==	
NB Thru	725	2	3400	853/3,400=	0.250		
NB Right	128	0	0		----		
SB Left	48	1	1700	48/1,700=	0.028		
SB Thru	377	2	3400	542/3,400=	0.159	< ==	
SB Right	165	0	0		----		0.339
EB Left	192	1	1700	192/1,700=	0.113		
EB Thru	610	1	1700	610/1,700=	0.359	< ==	
EB Right	157	1	1700	157/1,700=	0.092		
WB Left	139	1	1700	139/1,700=	0.082	< ==	
WB Thru	485	1	1700	485/1,700=	0.285		
WB Right	81	1	1700	81/1,700=	0.048		0.441

Sum of Critical V/C Ratios	0.780
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.830**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Future Year w/ Project | Peak Hr: 7:15 - 8:15 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	52	1	1700	52/1,700=	0.030	< ==	
NB Thru	713	3	5100	723/5,100=	0.140		
NB Right	10	0	0		----		
SB Left	351	1	1700	351/1,700=	0.206		
SB Thru	1657	2	3400	1,657/3,400=	0.487	< ==	
SB Right	278	1	1700	278/1,700=	0.164		0.517
EB Left	59	1	1700	59/1,700=	0.035		
EB Thru	233	1	1700	310/1,700=	0.182	< ==	
EB Right	77	0	0		----		
WB Left	5	1	1700	5/1,700=	0.003	< ==	
WB Thru	231	1	1700	231/1,700=	0.136		
WB Right	128	1	1700	128/1,700=	0.075		0.185

Sum of Critical V/C Ratios	0.702
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.752**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Crowther

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	125	1	1700	125/1,700=	0.070		
NB Thru	1904	3	5100	1,914/5,100=	0.380	< ==	
NB Right	10	0	0		----		
SB Left	126	1	1700	126/1,700=	0.074	< ==	
SB Thru	897	2	3400	897/3,400=	0.264		
SB Right	141	1	1700	141/1,700=	0.083		0.454
EB Left	243	1	1700	243/1,700=	0.143	< ==	
EB Thru	360	1	1700	429/1,700=	0.252		
EB Right	69	0	0		----		
WB Left	5	1	1700	5/1,700=	0.003		
WB Thru	313	1	1700	313/1,700=	0.184	< ==	
WB Right	265	1	1700	265/1,700=	0.156		0.327

Sum of Critical V/C Ratios	0.781
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.831**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Future Year w/ Project — Peak Hr: 7:15 - 8:15 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	104	1	1700	104/1,700=	0.060	< ==	
NB Thru	524	2	3400	524/3,400=	0.150		
NB Right	264	1	1700	264/1,700=	0.155		
SB Left	230	2	3400	230/3,400=	0.068		
SB Thru	380	2	3400	747/3,400=	0.220	< ==	
SB Right	367	0	0		----		0.280
EB Left	176	1	1700	176/1,700=	0.104	< ==	
EB Thru	808	3	5100	885/5,100=	0.174		
EB Right	77	0	0		----		
WB Left	142	1	1700	142/1,700=	0.084		
WB Thru	853	3	5100	853/5,100=	0.167	< ==	
WB Right	223	1	1700	223/1,700=	0.131		0.271

Sum of Critical V/C Ratios	0.551
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.601**
Level of Service (LOS) - Refer to table below	**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	94	1	1700	94/1,700=	0.060	< ==	
NB Thru	618	2	3400	618/3,400=	0.180		
NB Right	280	1	1700	280/1,700=	0.165		
SB Left	354	2	3400	354/3,400=	0.104		
SB Thru	739	2	3400	1,067/3,400=	0.314	< ==	
SB Right	328	0	0		----		0.374
EB Left	470	1	1700	470/1,700=	0.276	< ==	
EB Thru	1030	3	5100	1,152/5,100=	0.226		
EB Right	122	0	0		----		
WB Left	516	1	1700	516/1,700=	0.304		
WB Thru	1305	3	5100	1,305/5,100=	0.256	< ==	
WB Right	387	1	1700	387/1,700=	0.228		0.532

Sum of Critical V/C Ratios	0.906
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.956**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Future Year w/ Project — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	10	0	0		----		
NB Thru	8	1	1700	8/1,700=	----		
NB Right	30	1	1700	30/1,700=	0.018		
SB Left	353	1	1700	353/1,700=	0.208	< ==	
SB Thru	30	1	1700	277/1,700=	0.163		
SB Right	247	0	0		----		0.208
EB Left	174	2	3400	174/3,400=	0.051		
EB Thru	1187	3	5100	1,207/5,100=	0.237		
EB Right	20	0	0		----		
WB Left	40	1	1700	40/1,700=	0.024		
WB Thru	1030	3	5100	1,030/5,100=	0.202		
WB Right	517	1	1700	517/1,700=	0.304	< ==	0.355
Sum of Critical V/C Ratios							0.563
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.613**
Level of Service (LOS) - Refer to table below							**B**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 SB Ramps

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	8	0	0		----		
NB Thru	6	1	1700	6/1,700=	----		
NB Right	10	1	1700	10/1,700=	0.006		
SB Left	173	1	1700	173/1,700=	0.102		
SB Thru	5	1	1700	368/1,700=	0.216	< ==	
SB Right	363	0	0		----		0.216
EB Left	314	2	3400	314/3,400=	0.092	< ==	
EB Thru	1309	3	5100	1,319/5,100=	0.259		
EB Right	10	0	0		----		
WB Left	50	1	1700	50/1,700=	0.029		
WB Thru	2035	3	5100	2,035/5,100=	0.399	< ==	
WB Right	331	1	1700	331/1,700=	0.195		0.491

Sum of Critical V/C Ratios	0.707
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.757**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/ Project — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	347	0	0		----		
NB Thru	40	2	3400	387/3,400=	0.114		
NB Right	481	1	1700	481/1,700=	0.283	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.283
EB Left	200	2	3400	200/3,400=	0.059	< ==	
EB Thru	1370	3	5100	1,370/5,100=	0.269		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1346	3	5100	1,583/5,100=	0.310	< ==	
WB Right	237	0	0		----		0.369
Sum of Critical V/C Ratios							0.652
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.702**
Level of Service (LOS) - Refer to table below							**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	533	0	0		----		
NB Thru	25	2	3400	558/3,400=	0.164		
NB Right	735	1	1700	735/1,700=	0.432	< ==	
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.432
EB Left	246	2	3400	246/3,400=	0.072	< ==	
EB Thru	1301	3	5100	1,301/5,100=	0.255		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1883	3	5100	2,690/5,100=	0.527	< ==	
WB Right	807	0	0		----		0.599

Sum of Critical V/C Ratios	1.031
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.081**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Future Year w/ Project   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	254	1	1700	254/1,700=	0.150	< ==	
NB Thru	293	2	3400	369/3,400=	0.110		
NB Right	76	0	0		----		
SB Left	65	1	1700	65/1,700=	0.038		
SB Thru	472	2	3400	719/3,400=	0.211	< ==	
SB Right	247	0	0		----		0.361
EB Left	241	2	3400	241/3,400=	0.071		
EB Thru	998	3	5100	1,470/5,100=	0.288	< ==	
EB Right	472	0	0		----		
WB Left	96	2	3400	96/3,400=	0.028	< ==	
WB Thru	1090	3	5100	1,135/5,100=	0.223		
WB Right	45	0	0		----		0.316

Sum of Critical V/C Ratios	0.677
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.727**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection:	Orangethorpe Ave at Melrose St		
Scenario:	Future Year w/ Project	Peak Hr:	5:00 - 6:00 PM
Analyst:	GCW	Agency:	Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	713	1	1700	713/1,700=	0.420	< ==	
NB Thru	591	2	3400	748/3,400=	0.220		
NB Right	157	0	0		----		
SB Left	131	1	1700	131/1,700=	0.077		
SB Thru	281	2	3400	703/3,400=	0.207	< ==	
SB Right	422	0	0		----		0.627
EB Left	368	2	3400	368/3,400=	0.108	< ==	
EB Thru	1215	3	5100	1,467/5,100=	0.288		
EB Right	252	0	0		----		
WB Left	140	2	3400	140/3,400=	0.041		
WB Thru	1355	3	5100	1,489/5,100=	0.292	< ==	
WB Right	134	0	0		----		0.400

Sum of Critical V/C Ratios	1.027
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**1.077**
Level of Service (LOS) - Refer to table below	**F**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Future Year w/ Project | Peak Hr: 7:30 - 8:30 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	279	1	1700	279/1,700=	0.160	< ==	
NB Thru	550	2	3400	550/3,400=	0.160		
NB Right	80	1	1700	80/1,700=	0.047		
SB Left	55	1	1700	55/1,700=	0.032		
SB Thru	1381	2	3400	1,381/3,400=	0.406	< ==	
SB Right	341	1	1700	341/1,700=	0.201		0.566
EB Left	249	1	1700	249/1,700=	0.146		
EB Thru	568	2	3400	568/3,400=	0.167	< ==	
EB Right	514	1	1700	514/1,700=	0.302		
WB Left	260	1	1700	260/1,700=	0.153	< ==	
WB Thru	758	3	5100	793/5,100=	0.155		
WB Right	35	0	0		----		0.320

Sum of Critical V/C Ratios	0.886
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.936**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Future Year w/ Project | Peak Hr: 5:00 - 6:00 PM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	469	1	1700	469/1,700=	0.280	< ==	
NB Thru	1422	2	3400	1,422/3,400=	0.420		
NB Right	231	1	1700	231/1,700=	0.136		
SB Left	40	1	1700	40/1,700=	0.024		
SB Thru	659	2	3400	659/3,400=	0.194	< ==	
SB Right	388	1	1700	388/1,700=	0.228		0.474
EB Left	543	1	1700	543/1,700=	0.319	< ==	
EB Thru	764	2	3400	764/3,400=	0.225		
EB Right	244	1	1700	244/1,700=	0.144		
WB Left	121	1	1700	121/1,700=	0.071		
WB Thru	772	3	5100	797/5,100=	0.156	< ==	
WB Right	25	0	0		----		0.475

Sum of Critical V/C Ratios	0.949
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.999**
Level of Service (LOS) - Refer to table below	**E**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX L-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1009	603	391	2037	0	0	0	0	107	53	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1839	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1839	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1009	603	391	2037	0	0	0	0	107	53	410
RTOR Reduction (vph)	0	0	331	0	0	0	0	0	0	0	0	48
Lane Group Flow (vph)	0	1009	272	391	2037	0	0	0	0	0	160	362
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		37.4	37.4	24.0	65.4						25.6	25.6
Effective Green, g (s)		37.4	37.4	24.0	65.4						25.6	25.6
Actuated g/C Ratio		0.37	0.37	0.24	0.65						0.26	0.26
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1350	604	433	2360						470	413
v/s Ratio Prot		0.28		0.22	c0.56							
v/s Ratio Perm			0.17								0.09	c0.22
v/c Ratio		0.75	0.45	0.90	0.86						0.34	0.88
Uniform Delay, d1		27.2	23.6	36.9	13.7						30.3	35.7
Progression Factor		0.67	0.51	0.91	0.82						1.00	1.00
Incremental Delay, d2		3.7	2.4	2.8	0.4						0.4	18.3
Delay (s)		22.0	14.3	36.2	11.8						30.8	54.0
Level of Service		C	B	D	B						C	D
Approach Delay (s)		19.1			15.7			0.0			47.5	
Approach LOS		B			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	152.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1760	739	470	2089	0	0	0	0	148	105	390
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Lane Util. Factor		0.95	1.00	1.00	0.95						1.00	1.00
Frt		1.00	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (prot)		3610	1615	1805	3610						1846	1615
Flt Permitted		1.00	1.00	0.95	1.00						0.97	1.00
Satd. Flow (perm)		3610	1615	1805	3610						1846	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1760	739	470	2089	0	0	0	0	148	105	390
RTOR Reduction (vph)	0	0	171	0	0	0	0	0	0	0	0	52
Lane Group Flow (vph)	0	1760	568	470	2089	0	0	0	0	0	253	338
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2							4		4
Actuated Green, G (s)		44.5	44.5	22.0	70.5						20.5	20.5
Effective Green, g (s)		44.5	44.5	22.0	70.5						20.5	20.5
Actuated g/C Ratio		0.44	0.44	0.22	0.70						0.20	0.20
Clearance Time (s)		4.5	4.5	4.0	4.5						4.5	4.5
Vehicle Extension (s)		4.0	4.0	3.0	4.0						3.0	3.0
Lane Grp Cap (vph)		1606	718	397	2545						378	331
v/s Ratio Prot		c0.49		c0.26	0.58							
v/s Ratio Perm			0.35								0.14	c0.21
v/c Ratio		1.10	0.79	1.18	0.82						0.67	1.02
Uniform Delay, d1		27.8	23.8	39.0	10.3						36.6	39.8
Progression Factor		0.77	0.57	0.82	0.56						1.00	1.00
Incremental Delay, d2		53.4	8.6	85.3	0.3						4.5	55.2
Delay (s)		74.9	22.2	117.4	6.0						41.1	95.0
Level of Service		E	C	F	A						D	F
Approach Delay (s)		59.3			26.5			0.0			73.8	
Approach LOS		E			C			A			E	

Intersection Summary			
HCM 2000 Control Delay	46.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	174.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	286	848	0	0	1534	246	1060	48	570	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3535		1715	1637	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3535		1715	1637	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	286	848	0	0	1534	246	1060	48	570	0	0	0
RTOR Reduction (vph)	0	0	0	0	13	0	0	4	126	0	0	0
Lane Group Flow (vph)	286	848	0	0	1767	0	583	578	387	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	13.0	61.5			44.5		29.5	29.5	29.5			
Effective Green, g (s)	13.0	61.5			44.5		29.5	29.5	29.5			
Actuated g/C Ratio	0.13	0.62			0.44		0.29	0.29	0.29			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	234	2220			1573		505	482	452			
v/s Ratio Prot	c0.16	0.23			c0.50							
v/s Ratio Perm							0.34	0.35	0.25			
v/c Ratio	1.22	0.38			1.12		1.15	1.20	0.86			
Uniform Delay, d1	43.5	9.7			27.8		35.2	35.2	33.2			
Progression Factor	1.39	0.11			0.63		1.00	1.00	1.00			
Incremental Delay, d2	124.2	0.4			60.4		90.1	108.1	14.7			
Delay (s)	184.6	1.4			77.9		125.3	143.3	47.9			
Level of Service	F	A			E		F	F	D			
Approach Delay (s)		47.6			77.9			107.9			0.0	
Approach LOS		D			E			F			A	

Intersection Summary			
HCM 2000 Control Delay	81.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	152.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	476	1672	0	0	2005	391	919	28	435	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Lane Util. Factor	1.00	0.95			0.95		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.99	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	1805	3610			3522		1715	1636	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	1805	3610			3522		1715	1636	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	476	1672	0	0	2005	391	919	28	435	0	0	0
RTOR Reduction (vph)	0	0	0	0	16	0	0	3	48	0	0	0
Lane Group Flow (vph)	476	1672	0	0	2380	0	496	492	343	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases							8		8			
Actuated Green, G (s)	19.0	70.5			47.5		20.5	20.5	20.5			
Effective Green, g (s)	19.0	70.5			47.5		20.5	20.5	20.5			
Actuated g/C Ratio	0.19	0.70			0.48		0.20	0.20	0.20			
Clearance Time (s)	4.0	4.5			4.5		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	4.0			4.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	342	2545			1672		351	335	314			
v/s Ratio Prot	c0.26	0.46			c0.68							
v/s Ratio Perm							0.29	0.30	0.22			
v/c Ratio	1.39	0.66			1.42		1.41	1.47	1.09			
Uniform Delay, d1	40.5	8.1			26.2		39.8	39.8	39.8			
Progression Factor	1.35	0.24			0.93		1.00	1.00	1.00			
Incremental Delay, d2	182.4	0.5			193.2		202.0	226.3	78.1			
Delay (s)	237.0	2.4			217.6		241.8	266.1	117.9			
Level of Service	F	A			F		F	F	F			
Approach Delay (s)		54.4			217.6			215.4			0.0	
Approach LOS		D			F			F			A	

Intersection Summary			
HCM 2000 Control Delay	157.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	174.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	617	202	144	1098	145	398	481	107	229	692	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3511		1805	3473	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3511		1805	3473	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	265	617	202	144	1098	145	398	481	107	229	692	234
RTOR Reduction (vph)	0	0	77	0	0	59	0	19	0	0	33	0
Lane Group Flow (vph)	265	617	125	144	1098	86	398	569	0	229	893	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	9.1	34.0	46.0	11.5	36.4	36.4	12.0	25.7		14.3	28.0	
Effective Green, g (s)	9.1	34.0	46.0	11.5	36.4	36.4	12.0	25.7		14.3	28.0	
Actuated g/C Ratio	0.09	0.34	0.46	0.12	0.36	0.36	0.12	0.26		0.14	0.28	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	318	1227	742	207	1314	587	420	902		258	972	
v/s Ratio Prot	c0.08	0.17	0.02	0.08	c0.30		c0.11	0.16		0.13	c0.26	
v/s Ratio Perm			0.06			0.05						
v/c Ratio	0.83	0.50	0.17	0.70	0.84	0.15	0.95	0.63		0.89	0.92	
Uniform Delay, d1	44.7	26.3	15.8	42.6	29.1	21.4	43.7	32.9		42.1	34.9	
Progression Factor	0.89	0.78	0.53	1.00	1.00	1.00	1.24	0.81		1.00	1.00	
Incremental Delay, d2	13.4	1.2	0.0	7.9	6.4	0.5	29.7	1.6		27.9	13.4	
Delay (s)	53.2	21.7	8.4	50.5	35.5	21.9	83.9	28.2		69.9	48.3	
Level of Service	D	C	A	D	D	C	F	C		E	D	
Approach Delay (s)		26.9			35.6			50.7			52.6	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	41.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	335	959	305	178	909	200	543	749	176	290	694	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	3610	1615	3502	3507		1805	3465	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	3610	1615	3502	3507		1805	3465	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	335	959	305	178	909	200	543	749	176	290	694	253
RTOR Reduction (vph)	0	0	40	0	0	66	0	20	0	0	37	0
Lane Group Flow (vph)	335	959	265	178	909	134	543	905	0	290	910	0
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	1	6	7	5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	12.0	30.0	46.0	11.5	29.5	29.5	16.0	27.1		16.9	28.0	
Effective Green, g (s)	12.0	30.0	46.0	11.5	29.5	29.5	16.0	27.1		16.9	28.0	
Actuated g/C Ratio	0.12	0.30	0.46	0.12	0.29	0.29	0.16	0.27		0.17	0.28	
Clearance Time (s)	3.0	4.5	3.0	3.0	4.5	4.5	3.0	4.0		3.0	4.0	
Vehicle Extension (s)	1.5	4.0	1.5	1.5	4.0	4.0	1.5	4.0		1.5	4.0	
Lane Grp Cap (vph)	420	1083	742	207	1064	476	560	950		305	970	
v/s Ratio Prot	0.10	c0.27	0.06	0.10	c0.25		0.16	0.26		c0.16	c0.26	
v/s Ratio Perm			0.11			0.08						
v/c Ratio	0.80	0.89	0.36	0.86	0.85	0.28	0.97	0.95		0.95	0.94	
Uniform Delay, d1	42.8	33.4	17.4	43.5	33.2	27.1	41.8	35.8		41.1	35.1	
Progression Factor	0.78	0.74	0.55	1.00	1.00	1.00	1.11	0.86		1.00	1.00	
Incremental Delay, d2	6.3	7.2	0.1	27.2	8.8	1.5	27.8	17.3		38.1	16.0	
Delay (s)	39.8	32.0	9.7	70.7	42.0	28.6	74.3	48.0		79.3	51.2	
Level of Service	D	C	A	E	D	C	E	D		E	D	
Approach Delay (s)		29.4			43.9			57.7			57.8	
Approach LOS		C			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	46.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	92.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	188	310	365	259	490	115	212	558	177	120	1533	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5000		1805	5075	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5000		1805	5075	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	188	310	365	259	490	115	212	558	177	120	1533	258
RTOR Reduction (vph)	0	0	185	0	0	97	0	50	0	0	21	0
Lane Group Flow (vph)	188	310	180	259	490	18	212	685	0	120	1770	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	13.5	14.9	14.9	16.0	17.4	17.4	13.0	50.3		11.7	49.0	
Effective Green, g (s)	13.5	14.9	14.9	16.0	17.4	17.4	13.0	50.3		11.7	49.0	
Actuated g/C Ratio	0.12	0.14	0.14	0.15	0.16	0.16	0.12	0.46		0.11	0.45	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	223	493	220	265	576	258	215	2309		193	2283	
v/s Ratio Prot	0.10	0.09		c0.14	c0.14		c0.12	0.14		0.07	c0.35	
v/s Ratio Perm			0.11			0.01						
v/c Ratio	0.84	0.63	0.82	0.98	0.85	0.07	0.99	0.30		0.62	0.78	
Uniform Delay, d1	46.7	44.4	45.7	46.3	44.5	38.9	47.9	18.3		46.5	25.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.1	2.5	20.6	48.5	11.5	0.1	56.9	0.3		6.1	2.7	
Delay (s)	70.7	46.9	66.3	94.7	56.0	39.0	104.8	18.6		52.6	28.0	
Level of Service	E	D	E	F	E	D	F	B		D	C	
Approach Delay (s)		60.3			65.4			37.9			29.5	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM 2000 Control Delay	43.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	108.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↑↑↱		↰	↑↑↱	
Volume (vph)	270	431	250	160	451	176	380	1488	252	148	792	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3610	1615	1805	3610	1615	1805	5074		1805	5000	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3610	1615	1805	3610	1615	1805	5074		1805	5000	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	270	431	250	160	451	176	380	1488	252	148	792	250
RTOR Reduction (vph)	0	0	197	0	0	148	0	23	0	0	56	0
Lane Group Flow (vph)	270	431	53	160	451	28	380	1717	0	148	986	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	18.1	20.3	20.3	13.1	15.3	15.3	22.2	36.2		10.5	24.5	
Effective Green, g (s)	18.1	20.3	20.3	13.1	15.3	15.3	22.2	36.2		10.5	24.5	
Actuated g/C Ratio	0.19	0.21	0.21	0.14	0.16	0.16	0.23	0.38		0.11	0.25	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	339	762	341	246	574	257	416	1911		197	1274	
v/s Ratio Prot	c0.15	0.12		0.09	c0.12		c0.21	c0.34		0.08	0.20	
v/s Ratio Perm			0.03			0.02						
v/c Ratio	0.80	0.57	0.15	0.65	0.79	0.11	0.91	0.90		0.75	0.77	
Uniform Delay, d1	37.2	34.0	30.9	39.3	38.8	34.6	36.0	28.2		41.5	33.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	12.2	1.0	0.2	6.0	7.0	0.2	24.1	7.2		14.9	4.6	
Delay (s)	49.5	34.9	31.1	45.4	45.8	34.8	60.2	35.4		56.4	37.9	
Level of Service	D	C	C	D	D	C	E	D		E	D	
Approach Delay (s)		38.0			43.2			39.9			40.2	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	40.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	20	25	411	60	195	90	576	237	148	900	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1742		1805	1900	1615	1805	3452		1805	3610	1615
Flt Permitted	0.72	1.00		0.73	1.00	1.00	0.25	1.00		0.29	1.00	1.00
Satd. Flow (perm)	1364	1742		1383	1900	1615	483	3452		549	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	20	25	411	60	195	90	576	237	148	900	37
RTOR Reduction (vph)	0	16	0	0	0	127	0	39	0	0	0	16
Lane Group Flow (vph)	25	29	0	411	60	68	90	774	0	148	900	21
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	34.7	34.7		34.7	34.7	34.7	57.3	57.3		57.3	57.3	57.3
Effective Green, g (s)	34.7	34.7		34.7	34.7	34.7	57.3	57.3		57.3	57.3	57.3
Actuated g/C Ratio	0.35	0.35		0.35	0.35	0.35	0.57	0.57		0.57	0.57	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	473	604		479	659	560	276	1977		314	2068	925
v/s Ratio Prot		0.02			0.03			0.22			0.25	
v/s Ratio Perm	0.02			c0.30		0.04	0.19			c0.27		0.01
v/c Ratio	0.05	0.05		0.86	0.09	0.12	0.33	0.39		0.47	0.44	0.02
Uniform Delay, d1	21.7	21.7		30.4	22.0	22.3	11.2	11.8		12.5	12.1	9.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.39	0.33	0.04
Incremental Delay, d2	0.0	0.0		14.1	0.1	0.1	3.1	0.6		3.5	0.5	0.0
Delay (s)	21.8	21.7		44.5	22.1	22.4	14.3	12.3		8.4	4.4	0.4
Level of Service	C	C		D	C	C	B	B		A	A	A
Approach Delay (s)		21.7			36.0			12.5			4.8	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	80	164	340	80	244	50	893	455	270	840	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1708		1805	1900	1615	1805	3427		1805	3610	1615
Flt Permitted	0.70	1.00		0.44	1.00	1.00	0.30	1.00		0.14	1.00	1.00
Satd. Flow (perm)	1339	1708		836	1900	1615	565	3427		273	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	176	80	164	340	80	244	50	893	455	270	840	75
RTOR Reduction (vph)	0	74	0	0	0	131	0	64	0	0	0	26
Lane Group Flow (vph)	176	170	0	340	80	113	50	1284	0	270	840	49
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	27.0	27.0		27.0	27.0	27.0	65.0	65.0		65.0	65.0	65.0
Effective Green, g (s)	27.0	27.0		27.0	27.0	27.0	65.0	65.0		65.0	65.0	65.0
Actuated g/C Ratio	0.27	0.27		0.27	0.27	0.27	0.65	0.65		0.65	0.65	0.65
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	361	461		225	513	436	367	2227		177	2346	1049
v/s Ratio Prot		0.10			0.04			0.37			0.23	
v/s Ratio Perm	0.13			c0.41		0.07	0.09			c0.99		0.03
v/c Ratio	0.49	0.37		1.51	0.16	0.26	0.14	0.58		1.53	0.36	0.05
Uniform Delay, d1	30.7	29.6		36.5	27.8	28.6	6.7	9.8		17.5	8.0	6.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.69	0.30	0.00
Incremental Delay, d2	1.0	0.5		251.6	0.1	0.3	0.8	1.1		253.5	0.3	0.1
Delay (s)	31.7	30.1		288.1	28.0	29.0	7.5	10.9		265.6	2.7	0.1
Level of Service	C	C		F	C	C	A	B		F	A	A
Approach Delay (s)		30.8			161.5			10.8			62.4	
Approach LOS		C			F			B			E	

Intersection Summary			
HCM 2000 Control Delay	57.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.52		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	66	386	98	41	471	155	71	256	190	128	521	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3379		1805	3573	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3379		1805	3573	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	66	386	98	41	471	155	71	256	190	128	521	38
RTOR Reduction (vph)	0	0	65	0	0	107	0	123	0	0	5	0
Lane Group Flow (vph)	66	386	33	41	471	48	71	323	0	128	554	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	6.8	29.4	29.4	4.6	27.2	27.2	6.9	29.2		8.2	30.5	
Effective Green, g (s)	6.8	29.4	29.4	4.6	27.2	27.2	6.9	29.2		8.2	30.5	
Actuated g/C Ratio	0.08	0.34	0.34	0.05	0.31	0.31	0.08	0.33		0.09	0.35	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	140	639	543	95	591	502	142	1128		169	1246	
v/s Ratio Prot	c0.04	0.20		0.02	c0.25		0.04	0.10		c0.07	c0.16	
v/s Ratio Perm			0.02			0.03						
v/c Ratio	0.47	0.60	0.06	0.43	0.80	0.10	0.50	0.29		0.76	0.44	
Uniform Delay, d1	38.6	24.2	19.6	40.1	27.6	21.4	38.6	21.4		38.6	21.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.5	1.6	0.0	3.1	7.4	0.1	2.8	0.6		17.5	1.2	
Delay (s)	41.1	25.8	19.7	43.3	34.9	21.5	41.4	22.1		56.1	23.1	
Level of Service	D	C	B	D	C	C	D	C		E	C	
Approach Delay (s)		26.5			32.3			24.7			29.2	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	87.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	192	610	157	139	485	81	310	725	128	48	377	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1615	1805	1900	1615	1805	3529		1805	3445	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1900	1615	1805	1900	1615	1805	3529		1805	3445	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	192	610	157	139	485	81	310	725	128	48	377	165
RTOR Reduction (vph)	0	0	94	0	0	57	0	12	0	0	45	0
Lane Group Flow (vph)	192	610	63	139	485	24	310	841	0	48	497	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8						
Actuated Green, G (s)	14.2	36.2	36.2	10.6	32.6	32.6	19.0	39.7		7.1	27.8	
Effective Green, g (s)	14.2	36.2	36.2	10.6	32.6	32.6	19.0	39.7		7.1	27.8	
Actuated g/C Ratio	0.13	0.33	0.33	0.10	0.30	0.30	0.17	0.36		0.06	0.25	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	233	627	533	174	565	480	312	1278		116	873	
v/s Ratio Prot	c0.11	c0.32		0.08	0.26		c0.17	c0.24		0.03	0.14	
v/s Ratio Perm			0.04			0.01						
v/c Ratio	0.82	0.97	0.12	0.80	0.86	0.05	0.99	0.66		0.41	0.57	
Uniform Delay, d1	46.5	36.2	25.6	48.5	36.3	27.5	45.2	29.3		49.3	35.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	20.5	29.0	0.1	22.0	12.3	0.0	49.0	2.7		2.4	2.7	
Delay (s)	67.0	65.2	25.7	70.5	48.6	27.5	94.2	31.9		51.6	38.4	
Level of Service	E	E	C	E	D	C	F	C		D	D	
Approach Delay (s)		59.1			50.5			48.5			39.5	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	50.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	109.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	59	233	77	5	231	128	52	713	10	351	1657	278
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1829		1805	1900	1615	1805	5176		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1829		1805	1900	1615	1805	5176		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	59	233	77	5	231	128	52	713	10	351	1657	278
RTOR Reduction (vph)	0	12	0	0	0	101	0	1	0	0	0	104
Lane Group Flow (vph)	59	298	0	5	231	27	52	722	0	351	1657	174
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	6.6	23.9		1.1	18.4	18.4	5.0	25.7		20.2	40.9	40.9
Effective Green, g (s)	6.6	23.9		1.1	18.4	18.4	5.0	25.7		20.2	40.9	40.9
Actuated g/C Ratio	0.08	0.28		0.01	0.21	0.21	0.06	0.30		0.23	0.47	0.47
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	137	503		22	402	341	103	1530		419	1699	760
v/s Ratio Prot	c0.03	c0.16		0.00	0.12		0.03	0.14		c0.19	c0.46	
v/s Ratio Perm						0.02						0.11
v/c Ratio	0.43	0.59		0.23	0.57	0.08	0.50	0.47		0.84	0.98	0.23
Uniform Delay, d1	38.4	27.3		42.5	30.7	27.5	39.7	25.0		31.8	22.5	13.6
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	1.9		5.2	2.0	0.1	3.9	1.0		13.6	16.7	0.7
Delay (s)	40.5	29.2		47.7	32.7	27.6	43.6	26.1		45.4	39.2	14.3
Level of Service	D	C		D	C	C	D	C		D	D	B
Approach Delay (s)		31.0			31.1			27.3			37.1	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	86.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	243	360	69	5	313	265	125	1904	10	126	897	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.91		1.00	0.95	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1854		1805	1900	1615	1805	5183		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1805	1854		1805	1900	1615	1805	5183		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	243	360	69	5	313	265	125	1904	10	126	897	141
RTOR Reduction (vph)	0	6	0	0	0	176	0	1	0	0	0	91
Lane Group Flow (vph)	243	423	0	5	313	89	125	1913	0	126	897	50
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8						6
Actuated Green, G (s)	13.1	35.4		1.2	23.5	23.5	10.0	34.2		10.1	34.3	34.3
Effective Green, g (s)	13.1	35.4		1.2	23.5	23.5	10.0	34.2		10.1	34.3	34.3
Actuated g/C Ratio	0.14	0.37		0.01	0.24	0.24	0.10	0.35		0.10	0.35	0.35
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	244	677		22	460	391	186	1829		188	1277	571
v/s Ratio Prot	c0.13	c0.23		0.00	0.16		0.07	c0.37		c0.07	0.25	
v/s Ratio Perm						0.06						0.03
v/c Ratio	1.00	0.62		0.23	0.68	0.23	0.67	1.05		0.67	0.70	0.09
Uniform Delay, d1	41.9	25.3		47.4	33.3	29.4	41.9	31.4		41.8	26.9	20.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	56.1	1.8		5.2	4.1	0.3	9.2	34.3		9.0	3.2	0.3
Delay (s)	98.0	27.1		52.6	37.4	29.7	51.1	65.6		50.8	30.2	21.2
Level of Service	F	C		D	D	C	D	E		D	C	C
Approach Delay (s)		52.7			34.0			64.7			31.3	
Approach LOS		D			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	50.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	96.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	808	77	142	853	223	104	524	264	230	380	367
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5119		1805	5187	1615	1805	3610	1615	3502	3344	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5119		1805	5187	1615	1805	3610	1615	3502	3344	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	176	808	77	142	853	223	104	524	264	230	380	367
RTOR Reduction (vph)	0	11	0	0	0	162	0	0	192	0	158	0
Lane Group Flow (vph)	176	875	0	142	853	61	104	524	72	230	589	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	18.5	33.0		15.5	30.0	30.0	12.5	30.0	30.0	12.5	30.0	
Effective Green, g (s)	18.5	33.0		15.5	30.0	30.0	12.5	30.0	30.0	12.5	30.0	
Actuated g/C Ratio	0.17	0.30		0.14	0.27	0.27	0.11	0.27	0.27	0.11	0.27	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	303	1535		254	1414	440	205	984	440	397	912	
v/s Ratio Prot	0.10	c0.17		0.08	c0.16		0.06	0.15		c0.07	c0.18	
v/s Ratio Perm						0.04			0.04			
v/c Ratio	0.58	0.57		0.56	0.60	0.14	0.51	0.53	0.16	0.58	0.65	
Uniform Delay, d1	42.2	32.5		44.1	34.8	30.2	45.9	34.0	30.4	46.3	35.3	
Progression Factor	0.80	0.73		0.54	0.75	1.86	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	7.7	1.5		8.0	1.8	0.6	8.7	2.1	0.8	6.1	3.5	
Delay (s)	41.5	25.3		31.9	27.8	56.8	54.6	36.1	31.2	52.3	38.8	
Level of Service	D	C		C	C	E	D	D	C	D	D	
Approach Delay (s)		28.0			33.6			36.8			42.0	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	470	1030	122	516	1305	387	94	618	280	354	739	328
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	5105		1805	5187	1615	1805	3610	1615	3502	3444	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1805	5105		1805	5187	1615	1805	3610	1615	3502	3444	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	470	1030	122	516	1305	387	94	618	280	354	739	328
RTOR Reduction (vph)	0	14	0	0	0	170	0	0	204	0	44	0
Lane Group Flow (vph)	470	1138	0	516	1305	217	94	618	76	354	1023	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	23.5	27.1		23.5	27.1	27.1	8.2	29.9	29.9	10.5	32.2	
Effective Green, g (s)	23.5	27.1		23.5	27.1	27.1	8.2	29.9	29.9	10.5	32.2	
Actuated g/C Ratio	0.21	0.25		0.21	0.25	0.25	0.07	0.27	0.27	0.10	0.29	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	385	1257		385	1277	397	134	981	438	334	1008	
v/s Ratio Prot	c0.26	c0.22		c0.29	0.25		0.05	0.17		c0.10	c0.30	
v/s Ratio Perm						0.13			0.05			
v/c Ratio	1.22	0.91		1.34	1.02	0.55	0.70	0.63	0.17	1.06	1.02	
Uniform Delay, d1	43.2	40.2		43.2	41.5	36.1	49.7	35.2	30.6	49.8	38.9	
Progression Factor	1.14	1.14		0.62	0.60	0.60	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	120.0	10.6		165.1	26.8	3.8	15.3	1.3	0.2	65.9	32.1	
Delay (s)	169.3	56.6		191.7	51.6	25.6	65.0	36.5	30.8	115.7	71.0	
Level of Service	F	E		F	D	C	E	D	C	F	E	
Approach Delay (s)		89.3			79.8			37.6			82.2	
Approach LOS		F			E			D			F	

Intersection Summary			
HCM 2000 Control Delay	76.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	103.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	174	1187	20	40	1030	517	10	8	30	353	30	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	0.99	
Satd. Flow (prot)	3502	5174		1805	5187	1615		1849	1615	1715	1582	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	0.99	
Satd. Flow (perm)	3502	5174		1805	5187	1615		1849	1615	1715	1582	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	174	1187	20	40	1030	517	10	8	30	353	30	247
RTOR Reduction (vph)	0	1	0	0	0	266	0	0	29	0	140	0
Lane Group Flow (vph)	174	1206	0	40	1030	251	0	18	1	318	172	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	9.5	59.0		4.5	53.5	53.5		3.6	3.6	26.1	26.1	
Effective Green, g (s)	9.5	59.0		4.5	53.5	53.5		3.6	3.6	26.1	26.1	
Actuated g/C Ratio	0.09	0.54		0.04	0.49	0.49		0.03	0.03	0.24	0.24	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	302	2775		73	2522	785		60	52	406	375	
v/s Ratio Prot	c0.05	c0.23		c0.02	0.20			c0.01		c0.19	0.11	
v/s Ratio Perm						0.16			0.00			
v/c Ratio	0.58	0.43		0.55	0.41	0.32		0.30	0.02	0.78	0.46	
Uniform Delay, d1	48.3	15.4		51.8	18.1	17.2		52.0	51.5	39.3	35.9	
Progression Factor	1.03	0.43		0.94	0.71	3.46		1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.3	0.4		6.7	0.4	0.9		2.8	0.1	9.5	0.9	
Delay (s)	52.2	7.0		55.1	13.2	60.3		54.8	51.6	48.8	36.8	
Level of Service	D	A		E	B	E		D	D	D	D	
Approach Delay (s)		12.7			29.6			52.8			42.9	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	314	1309	10	50	2035	331	8	6	10	173	5	363
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Lane Util. Factor	0.97	0.91		1.00	0.91	1.00		1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5181		1805	5187	1615		1847	1615	1715	1546	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.97	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5181		1805	5187	1615		1847	1615	1715	1546	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	314	1309	10	50	2035	331	8	6	10	173	5	363
RTOR Reduction (vph)	0	0	0	0	0	111	0	0	10	0	304	0
Lane Group Flow (vph)	314	1319	0	50	2035	220	0	14	0	156	81	0
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Perm	Split	NA	
Protected Phases	5	2		1	6		7	7		8	8	
Permitted Phases						6			7			
Actuated Green, G (s)	13.3	61.9		9.2	57.3	57.3		4.2	4.2	17.9	17.9	
Effective Green, g (s)	13.3	61.9		9.2	57.3	57.3		4.2	4.2	17.9	17.9	
Actuated g/C Ratio	0.12	0.56		0.08	0.52	0.52		0.04	0.04	0.16	0.16	
Clearance Time (s)	4.0	4.8		3.5	4.8	4.8		4.0	4.0	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	423	2915		150	2701	841		70	61	279	251	
v/s Ratio Prot	c0.09	0.25		0.03	c0.39			c0.01		c0.09	0.05	
v/s Ratio Perm						0.14			0.00			
v/c Ratio	0.74	0.45		0.33	0.75	0.26		0.20	0.01	0.56	0.32	
Uniform Delay, d1	46.7	14.1		47.5	20.8	14.6		51.3	50.9	42.4	40.7	
Progression Factor	1.34	0.24		0.98	0.81	1.19		1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.6	0.3		0.1	0.2	0.1		1.4	0.0	2.4	0.8	
Delay (s)	66.2	3.6		46.5	17.0	17.5		52.7	50.9	44.8	41.4	
Level of Service	E	A		D	B	B		D	D	D	D	
Approach Delay (s)		15.6			17.6			52.0			42.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	1370	0	0	1346	237	347	40	481	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.98		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	3502	5187			5071		1715	1736	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	3502	5187			5071		1715	1736	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	200	1370	0	0	1346	237	347	40	481	0	0	0
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	39	0	0	0
Lane Group Flow (vph)	200	1370	0	0	1563	0	191	196	442	0	0	0
Turn Type	Prot	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	10.2	64.5			50.8		35.7	35.7	35.7			
Effective Green, g (s)	10.2	64.5			50.8		35.7	35.7	35.7			
Actuated g/C Ratio	0.09	0.59			0.46		0.32	0.32	0.32			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	324	3041			2341		556	563	524			
v/s Ratio Prot	c0.06	0.26			c0.31							
v/s Ratio Perm							0.11	0.11	c0.27			
v/c Ratio	0.62	0.45			0.67		0.34	0.35	0.84			
Uniform Delay, d1	48.0	12.8			23.0		28.2	28.3	34.5			
Progression Factor	1.12	1.27			0.39		1.00	1.00	1.00			
Incremental Delay, d2	3.2	0.4			1.1		0.4	0.4	11.8			
Delay (s)	57.2	16.7			10.1		28.6	28.7	46.3			
Level of Service	E	B			B		C	C	D			
Approach Delay (s)		21.9			10.1			38.4			0.0	
Approach LOS		C			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	246	1301	0	0	1883	807	533	25	735	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.95	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (prot)	3502	5187			4954		1715	1726	1615			
Flt Permitted	0.95	1.00			1.00		0.95	0.96	1.00			
Satd. Flow (perm)	3502	5187			4954		1715	1726	1615			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	246	1301	0	0	1883	807	533	25	735	0	0	0
RTOR Reduction (vph)	0	0	0	0	70	0	0	0	31	0	0	0
Lane Group Flow (vph)	246	1301	0	0	2620	0	277	281	704	0	0	0
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	11.1	61.7			47.1		38.5	38.5	38.5			
Effective Green, g (s)	11.1	61.7			47.1		38.5	38.5	38.5			
Actuated g/C Ratio	0.10	0.56			0.43		0.35	0.35	0.35			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	353	2909			2121		600	604	565			
v/s Ratio Prot	c0.07	0.25			c0.53							
v/s Ratio Perm							0.16	0.16	c0.44			
v/c Ratio	0.70	0.45			1.24		0.46	0.47	1.25			
Uniform Delay, d1	47.8	14.2			31.4		27.7	27.8	35.8			
Progression Factor	0.96	2.01			0.91		1.00	1.00	1.00			
Incremental Delay, d2	5.5	0.5			106.3		0.6	0.6	124.9			
Delay (s)	51.3	29.0			134.8		28.3	28.3	160.6			
Level of Service	D	C			F		C	C	F			
Approach Delay (s)		32.5			134.8			103.5			0.0	
Approach LOS		C			F			F			A	

Intersection Summary			
HCM Average Control Delay	98.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	241	998	472	96	1090	45	254	293	76	65	472	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	4937		3502	5156		1805	3498		1805	3424	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	4937		3502	5156		1805	3498		1805	3424	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	241	998	472	96	1090	45	254	293	76	65	472	247
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	241	1470	0	96	1135	0	254	369	0	65	719	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	11.1	40.2		7.0	36.1		18.1	38.8		7.0	27.7	
Effective Green, g (s)	11.1	40.2		7.0	36.1		18.1	38.8		7.0	27.7	
Actuated g/C Ratio	0.10	0.37		0.06	0.33		0.16	0.35		0.06	0.25	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	353	1804		222	1692		297	1233		114	862	
v/s Ratio Prot	0.07	c0.30		0.03	c0.22		c0.14	0.11		0.04	c0.21	
v/s Ratio Perm												
v/c Ratio	0.68	0.81		0.43	0.67		0.86	0.30		0.57	0.83	
Uniform Delay, d1	47.7	31.5		49.6	31.8		44.7	25.8		50.0	39.0	
Progression Factor	0.92	0.83		1.47	0.73		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	3.7		0.7	1.1		20.7	0.1		6.7	7.0	
Delay (s)	48.6	29.9		73.8	24.4		65.3	25.9		56.8	46.0	
Level of Service	D	C		E	C		E	C		E	D	
Approach Delay (s)		32.5			28.2			42.0			46.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	368	1215	252	140	1355	134	713	591	157	131	281	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Lane Util. Factor	0.97	0.91		0.97	0.91		1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	5053		3502	5117		1805	3496		1805	3285	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	3502	5053		3502	5117		1805	3496		1805	3285	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	368	1215	252	140	1355	134	713	591	157	131	281	422
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	368	1467	0	140	1489	0	713	748	0	131	703	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases												
Actuated Green, G (s)	12.0	27.0		9.6	24.6		29.0	43.9		12.5	27.4	
Effective Green, g (s)	12.0	27.0		9.6	24.6		29.0	43.9		12.5	27.4	
Actuated g/C Ratio	0.11	0.25		0.09	0.22		0.26	0.40		0.11	0.25	
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	382	1240		305	1144		475	1395		205	818	
v/s Ratio Prot	0.11	c0.29		0.04	c0.29		c0.40	0.21		0.07	c0.21	
v/s Ratio Perm												
v/c Ratio	0.96	1.18		0.46	1.30		1.50	0.54		0.64	1.05dr	
Uniform Delay, d1	48.8	41.5		47.7	42.7		40.5	25.3		46.6	39.5	
Progression Factor	0.89	0.83		1.45	1.26		1.00	1.00		1.00	1.00	
Incremental Delay, d2	28.4	88.2		0.3	137.3		236.3	0.4		6.4	9.0	
Delay (s)	71.8	122.6		69.5	191.2		276.8	25.7		53.0	48.4	
Level of Service	E	F		E	F		F	C		D	D	
Approach Delay (s)		112.4			180.7			148.2			49.1	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	131.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	249	568	514	260	758	35	279	550	80	55	1381	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5153		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5153		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	249	568	514	260	758	35	279	550	80	55	1381	341
RTOR Reduction (vph)	0	0	158	0	5	0	0	0	46	0	0	169
Lane Group Flow (vph)	249	568	356	260	788	0	279	550	34	55	1381	172
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	14.0	25.7	25.7	14.0	25.7		15.3	46.9	46.9	7.4	39.0	39.0
Effective Green, g (s)	14.0	25.7	25.7	14.0	25.7		15.3	46.9	46.9	7.4	39.0	39.0
Actuated g/C Ratio	0.13	0.23	0.23	0.13	0.23		0.14	0.43	0.43	0.07	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	229	843	377	229	1203		251	1539	688	121	1279	572
v/s Ratio Prot	0.14	0.16		c0.14	0.15		c0.15	0.15		0.03	c0.38	
v/s Ratio Perm			c0.22						0.02			0.11
v/c Ratio	1.09	0.67	0.94	1.14	0.66		1.11	0.36	0.05	0.45	1.08	0.30
Uniform Delay, d1	48.0	38.3	41.5	48.0	38.1		47.3	21.4	18.5	49.4	35.5	25.6
Progression Factor	1.05	1.61	2.05	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	77.4	1.6	27.1	100.8	1.3		90.0	0.6	0.1	2.7	49.7	1.3
Delay (s)	127.9	63.4	111.9	148.8	39.4		137.4	22.0	18.6	52.1	85.2	27.0
Level of Service	F	E	F	F	D		F	C	B	D	F	C
Approach Delay (s)		94.2			66.4			57.1			73.0	
Approach LOS		F			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	74.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	97.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	543	764	244	121	772	25	469	1422	231	40	659	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3610	1615	1805	5163		1805	3610	1615	1805	3610	1615
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1805	3610	1615	1805	5163		1805	3610	1615	1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	543	764	244	121	772	25	469	1422	231	40	659	388
RTOR Reduction (vph)	0	0	170	0	3	0	0	0	99	0	0	260
Lane Group Flow (vph)	543	764	74	121	794	0	469	1422	132	40	659	128
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)	22.0	33.3	33.3	11.8	23.1		21.9	43.4	43.4	5.5	27.0	27.0
Effective Green, g (s)	22.0	33.3	33.3	11.8	23.1		21.9	43.4	43.4	5.5	27.0	27.0
Actuated g/C Ratio	0.20	0.30	0.30	0.11	0.21		0.20	0.39	0.39	0.05	0.25	0.25
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	361	1092	488	193	1084		359	1424	637	90	886	396
v/s Ratio Prot	c0.30	c0.21		0.07	0.15		c0.26	c0.39		0.02	0.18	
v/s Ratio Perm			0.05						0.08			0.08
v/c Ratio	1.50	0.70	0.15	0.63	0.73		1.31	1.00	0.21	0.44	0.74	0.32
Uniform Delay, d1	44.0	33.9	28.0	47.0	40.6		44.0	33.3	22.0	50.8	38.3	34.0
Progression Factor	1.26	1.81	7.37	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	228.2	0.2	0.0	6.2	2.6		156.7	23.5	0.7	3.5	5.6	2.1
Delay (s)	283.6	61.7	206.7	53.2	43.2		200.7	56.8	22.7	54.2	43.9	36.2
Level of Service	F	E	F	D	D		F	E	C	D	D	D
Approach Delay (s)		162.2			44.5			84.9			41.5	
Approach LOS		F			D			F			D	

Intersection Summary			
HCM 2000 Control Delay	91.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX M

LOS Analysis Worksheets – Future Buildout 2035 with Project Mitigations

APPENDIX M-1

Intersection Capacity Utilization (ICU) Methodology

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Future Year w/ Project Mitg   Peak Hr: 7:30 - 8:30 AM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB PPLT	90	1	1955	90/1,955= 0.050		
NB Thru	576	2	3400	813/3,400= 0.240	< ==	
NB Right	237	0	0	----		
SB PPLT	148	1	1955	148/1,955= 0.076	< ==	
SB Thru	900	2	3400	900/3,400= 0.265		
SB Right	37	1	1700	37/1,700= 0.022		0.316
EB PPLT	25	1	2040	25/2,040= 0.012		
EB Thru	20	1	1700	45/1,700= 0.026	< ==	
EB Right	25	0	0	----		
WB PPLT	411	1	2040	411/2,040= 0.201	< ==	
WB Thru	60	1	1700	60/1,700= 0.035		
WB Right	195	1	1700	195/1,700= 0.115		0.227

Sum of Critical V/C Ratios	0.543
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.593**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

For PPLT, the capacity was increased by 15% for the NB/SB left turns. The EB/WB PPLT capacities were increased by 20% due to the low conflicting E/W thru volumes

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Placentia at Crowther

Scenario: Future Year w/ Project Mitg Peak Hr: 5:00 - 6:00 PM

Analyst: GCW Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB PPLT	50	1	1955	50/1,955=	0.030		
NB Thru	893	2	3400	1,348/3,400=	0.400	< ==	
NB Right	455	0	0		----		
SB PPLT	270	1	1955	270/1,955=	0.138	< ==	
SB Thru	840	2	3400	840/3,400=	0.247		
SB Right	75	1	1700	75/1,700=	0.044		0.538
EB PPLT	176	1	2040	176/2,040=	0.086		
EB Thru	80	1	1700	244/1,700=	0.144	< ==	
EB Right	164	0	0		----		
WB PPLT	340	1	2040	340/2,040=	0.167	< ==	
WB Thru	80	1	1700	80/1,700=	0.047		
WB Right	244	1	1700	244/1,700=	0.144		0.311

Sum of Critical V/C Ratios	0.849
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.899**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

For PPLT, the capacity was increased by 15% for the NB/SB left turns. The EB/WB PPLT capacities were increased by 20% due to the low conflicting E/W thru volumes

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia

Scenario: Future Year w/ Project Mitg | Peak Hr: 7:15 - 8:15 AM

Analyst: GCW | Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio	Critical V/C	Total
NB Left	104	1	1700	104/1,700= 0.060	< ==	
NB Thru	524	2	3400	524/3,400= 0.150		
NB Right	264	1	1700	264/1,700= 0.155		
SB Left	230	2	3400	230/3,400= 0.068		
SB Thru	380	2	3400	747/3,400= 0.220	< ==	
SB Right	367	0	0	----		0.280
EB Left	176	2	3400	176/3,400= 0.052	< ==	
EB Thru	808	3	5100	885/5,100= 0.174		
EB Right	77	0	0	----		
WB Left	142	2	3400	142/3,400= 0.042		
WB Thru	853	3	5100	853/5,100= 0.167	< ==	
WB Right	223	1	1700	223/1,700= 0.131		0.219
Sum of Critical V/C Ratios						0.499
Adjustment for Lost Time						0.050
Intersection Capacity Utilization (ICU)						**0.549**
Level of Service (LOS) - Refer to table below						**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Placentia
Scenario: Future Year w/ Project Mitg   Peak Hr: 5:00 - 6:00 PM
Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	94	1	1700	94/1,700=	0.060	< ==	
NB Thru	618	2	3400	618/3,400=	0.180		
NB Right	280	1	1700	280/1,700=	0.165		
SB Left	354	2	3400	354/3,400=	0.104		
SB Thru	739	2	3400	1,067/3,400=	0.314	< ==	
SB Right	328	0	0		----		0.374
EB Left	470	2	3400	470/3,400=	0.138	< ==	
EB Thru	1030	3	5100	1,152/5,100=	0.226		
EB Right	122	0	0		----		
WB Left	516	2	3400	516/3,400=	0.152		
WB Thru	1305	3	5100	1,305/5,100=	0.256	< ==	
WB Right	387	1	1700	387/1,700=	0.228		0.394

Sum of Critical V/C Ratios	0.768
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.818**
Level of Service (LOS) - Refer to table below	**D**

* NOTES
Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/ Project Mitg — Peak Hr: 7:45 - 8:45 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	347	1.5	2550	347/2,550=	0.140		
NB Thru	40	1.5	2550	521/2,550=	0.200	< ==	
NB Right	481	0	0		----		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.200
EB Left	200	2	3400	200/3,400=	0.059	< ==	
EB Thru	1370	3	5100	1,370/5,100=	0.269		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1346	4	6800	1,583/6,800=	0.233	< ==	
WB Right	237	0	0		----		0.292

Sum of Critical V/C Ratios	0.492
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.542**
Level of Service (LOS) - Refer to table below	**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at SR-57 NB Ramps

Scenario: Future Year w/ Project Mitg — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	533	1.5	2550	533/2,550=	0.210		
NB Thru	25	1.5	2550	760/2,550=	0.300	< ==	
NB Right	735	0	0		----		
SB Left	0	0	0		----		
SB Thru	0	0	0		----		
SB Right	0	0	0		----		0.300
EB Left	246	2	3400	246/3,400=	0.072	< ==	
EB Thru	1301	3	5100	1,301/5,100=	0.255		
EB Right	0	0	0		----		
WB Left	0	0	0		----		
WB Thru	1883	4	6800	2,690/6,800=	0.396	< ==	
WB Right	807	0	0		----		0.468

Sum of Critical V/C Ratios	0.768
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.818**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Future Year w/ Project — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	254	2	3400	254/3,400=	0.070	< ==	
NB Thru	293	2	3400	369/3,400=	0.110		
NB Right	76	0	0		----		
SB Left	65	1	1700	65/1,700=	0.038		
SB Thru	472	2	3400	472/3,400=	0.139	< ==	
SB Right	247	1	1955	247/1,955=	0.126		0.209
EB Left	241	2	3400	241/3,400=	0.071		
EB Thru	998	3	5100	1,470/5,100=	0.288	< ==	
EB Right	472	0	0		----		
WB Left	96	2	3400	96/3,400=	0.028	< ==	
WB Thru	1090	3	5100	1,135/5,100=	0.223		
WB Right	45	0	0		----		0.316
Sum of Critical V/C Ratios							0.525
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.575**
Level of Service (LOS) - Refer to table below							**A**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour

dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Orangethorpe Ave at Melrose St

Scenario: Future Year w/ Project — Peak Hr: 5:00 - 6:00 PM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	713	2	3400	713/3,400=	0.210		
NB Thru	591	2	3400	748/3,400=	0.220	< ==	
NB Right	157	0	0		----		
SB Left	131	1	1700	131/1,700=	0.077	< ==	
SB Thru	281	2	3400	281/3,400=	0.083		
SB Right	422	1	1955	422/1,955=	0.216		0.297
EB Left	368	2	3400	368/3,400=	0.108	< ==	
EB Thru	1215	3	5100	1,467/5,100=	0.288		
EB Right	252	0	0		----		
WB Left	140	2	3400	140/3,400=	0.041		
WB Thru	1355	3	5100	1,489/5,100=	0.292	< ==	
WB Right	134	0	0		----		0.400

Sum of Critical V/C Ratios	0.697
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.747**
Level of Service (LOS) - Refer to table below	**C**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Future Year w/ Project Mitg — Peak Hr: 7:30 - 8:30 AM

Analyst: GCW — Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left PPLT	279	1	1955	279/1,955=	0.140	< ==	
NB Thru	550	3	5100	630/5,100=	0.120		
NB Right	80	0	0		----		
SB Left PPLT	55	1	1955	55/1,955=	0.028		
SB Thru	1381	3	5100	1,722/5,100=	0.338	< ==	
SB Right	341	0	0		----		0.478
EB Left	249	2	3400	249/3,400=	0.073		
EB Thru	568	2	3400	568/3,400=	0.167	< ==	
EB Right	514	1	1955	514/1,955=	0.263		
WB Left	260	1	1700	260/1,700=	0.153	< ==	
WB Thru	758	3	5100	793/5,100=	0.155		
WB Right	35	0	0		----		0.320
Sum of Critical V/C Ratios							0.798
Adjustment for Lost Time							0.050
Intersection Capacity Utilization (ICU)							**0.848**
Level of Service (LOS) - Refer to table below							**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

INTERSECTION CAPACITY UTILIZATION

Intersection: Kraemer at Orangethorpe

Scenario: Future Year w/ Project Mitg   Peak Hr: 5:00 - 6:00 PM

Analyst: GCW   Agency: Placentia

Movement	Volume	No. of Lanes	Capacity*	V/C Ratio		Critical V/C	Total
NB Left	469	1	1955	469/1,955=	0.240	< ==	
NB Thru	1422	3	5100	1,653/5,100=	0.320		
NB Right	231	0	0		----		
SB Left	40	1	1955	40/1,955=	0.020		
SB Thru	659	3	5100	1,047/5,100=	0.205	< ==	
SB Right	388	0	0		----		0.445
EB Left	543	2	3400	543/3,400=	0.160	< ==	
EB Thru	764	2	3400	764/3,400=	0.225		
EB Right	244	1	1955	244/1,955=	0.125		
WB Left	121	1	1700	121/1,700=	0.071		
WB Thru	772	3	5100	797/5,100=	0.156	< ==	
WB Right	25	0	0		----		0.316

Sum of Critical V/C Ratios	0.761
Adjustment for Lost Time	0.050
Intersection Capacity Utilization (ICU)	**0.811**
Level of Service (LOS) - Refer to table below	**D**

* NOTES

Per-lane Capacity = 1,700 vehicles/hour
dual left turn lane capacity = 3,400 vph

LOS	Maximum V/C
A	0.60
B	0.70
C	0.80
D	0.90
E	1.00
F	n/a

APPENDIX M-2

Highway Capacity Manual (HCM) Methodology

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	20	25	411	60	195	90	576	237	148	900	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.92		1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1742		1805	1900	1615	1805	3452		1805	3610	1615
Flt Permitted	0.72	1.00		0.46	1.00	1.00	0.24	1.00		0.24	1.00	1.00
Satd. Flow (perm)	1364	1742		875	1900	1615	448	3452		448	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	20	25	411	60	195	90	576	237	148	900	37
RTOR Reduction (vph)	0	23	0	0	0	144	0	37	0	0	0	19
Lane Group Flow (vph)	25	22	0	411	60	51	90	776	0	148	900	18
Turn Type	pm+pt			pm+pt		Perm	pm+pt			pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	9.8	6.9		33.2	26.3	26.3	52.2	46.1		57.4	48.7	48.7
Effective Green, g (s)	9.8	6.9		33.2	26.3	26.3	52.2	46.1		57.4	48.7	48.7
Actuated g/C Ratio	0.10	0.07		0.33	0.26	0.26	0.52	0.46		0.57	0.49	0.49
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	146	120		498	500	425	317	1591		375	1758	787
v/s Ratio Prot	0.00	0.01		c0.18	0.03		0.02	0.22		c0.03	c0.25	
v/s Ratio Perm	0.01			c0.09		0.03	0.13			0.19		0.01
v/c Ratio	0.17	0.18		0.83	0.12	0.12	0.28	0.49		0.39	0.51	0.02
Uniform Delay, d1	41.3	43.9		29.0	28.0	28.0	12.8	18.7		11.4	17.5	13.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		0.88	0.58	0.34
Incremental Delay, d2	0.6	0.7		10.7	0.1	0.1	0.5	1.1		0.5	0.8	0.0
Delay (s)	41.8	44.6		39.7	28.2	28.2	13.3	19.8		10.5	10.9	4.6
Level of Service	D	D		D	C	C	B	B		B	B	A
Approach Delay (s)		43.6			35.3			19.2			10.6	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	20.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	80	164	340	80	244	50	893	455	270	840	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.90		1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1708		1805	1900	1615	1805	3427		1805	3610	1615
Flt Permitted	0.70	1.00		0.23	1.00	1.00	0.30	1.00		0.09	1.00	1.00
Satd. Flow (perm)	1339	1708		437	1900	1615	565	3427		163	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	176	80	164	340	80	244	50	893	455	270	840	75
RTOR Reduction (vph)	0	76	0	0	0	198	0	63	0	0	0	38
Lane Group Flow (vph)	176	168	0	340	80	46	50	1285	0	270	840	38
Turn Type	pm+pt			pm+pt		Perm	pm+pt			pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)	23.1	13.4		32.4	18.7	18.7	48.2	42.6		59.6	50.0	50.0
Effective Green, g (s)	23.1	13.4		32.4	18.7	18.7	48.2	42.6		59.6	50.0	50.0
Actuated g/C Ratio	0.23	0.13		0.32	0.19	0.19	0.48	0.43		0.60	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	355	229		347	355	302	342	1460		311	1805	808
v/s Ratio Prot	0.05	0.10		c0.15	0.04		0.01	0.38		c0.11	0.23	
v/s Ratio Perm	0.07			c0.17		0.03	0.06			c0.40		0.02
v/c Ratio	0.50	0.73		0.98	0.23	0.15	0.15	0.88		0.87	0.47	0.05
Uniform Delay, d1	32.8	41.6		29.7	34.5	34.0	13.9	26.4		28.2	16.3	12.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.85	0.62	0.48
Incremental Delay, d2	1.1	11.5		42.3	0.3	0.2	0.2	7.9		14.7	0.5	0.1
Delay (s)	33.9	53.0		72.1	34.8	34.2	14.1	34.3		66.9	10.7	6.2
Level of Service	C	D		E	C	C	B	C		E	B	A
Approach Delay (s)		45.0			53.7			33.6			23.2	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	35.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	808	77	142	853	223	104	524	264	230	380	367
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5119		3502	5187	1615	1805	3610	1615	3502	3344	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5119		3502	5187	1615	1805	3610	1615	3502	3344	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	176	808	77	142	853	223	104	524	264	230	380	367
RTOR Reduction (vph)	0	10	0	0	0	142	0	0	160	0	158	0
Lane Group Flow (vph)	176	875	0	142	853	81	104	524	104	230	589	0
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	9.5	41.0		8.5	40.0	40.0	12.5	29.0	29.0	12.5	29.0	
Effective Green, g (s)	9.5	41.0		8.5	40.0	40.0	12.5	29.0	29.0	12.5	29.0	
Actuated g/C Ratio	0.09	0.37		0.08	0.36	0.36	0.11	0.26	0.26	0.11	0.26	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Grp Cap (vph)	302	1908		271	1886	587	205	952	426	398	882	
v/s Ratio Prot	c0.05	c0.17		0.04	c0.16		0.06	0.15		c0.07	c0.18	
v/s Ratio Perm						0.05			0.06			
v/c Ratio	0.58	0.46		0.52	0.45	0.14	0.51	0.55	0.24	0.58	0.67	
Uniform Delay, d1	48.3	26.1		48.8	26.7	23.5	45.9	34.9	31.9	46.2	36.2	
Progression Factor	0.83	0.65		0.60	0.89	2.34	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	7.7	0.8		6.6	0.7	0.5	8.7	2.3	1.4	6.0	4.0	
Delay (s)	47.9	17.8		36.0	24.5	55.3	54.6	37.2	33.2	52.2	40.2	
Level of Service	D	B		D	C	E	D	D	C	D	D	
Approach Delay (s)		22.8			31.5			38.0			43.0	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	33.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	470	1030	122	516	1305	387	94	618	280	354	739	328
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Lane Util. Factor	0.97	0.91		0.97	0.91	1.00	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	3502	5105		3502	5187	1615	1805	3610	1615	3502	3444	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	3502	5105		3502	5187	1615	1805	3610	1615	3502	3444	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	470	1030	122	516	1305	387	94	618	280	354	739	328
RTOR Reduction (vph)	0	13	0	0	0	185	0	0	210	0	46	0
Lane Group Flow (vph)	470	1139	0	516	1305	202	94	618	70	354	1021	0
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases						6			8			
Actuated Green, G (s)	16.5	30.1		18.2	31.8	31.8	7.5	27.5	27.5	15.2	35.2	
Effective Green, g (s)	16.5	30.1		18.2	31.8	31.8	7.5	27.5	27.5	15.2	35.2	
Actuated g/C Ratio	0.15	0.27		0.17	0.29	0.29	0.07	0.25	0.25	0.14	0.32	
Clearance Time (s)	4.5	5.0		4.5	5.0	5.0	4.5	5.0	5.0	4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	525	1397		579	1500	467	123	903	404	484	1102	
v/s Ratio Prot	0.13	c0.22		0.15	c0.25		0.05	0.17		c0.10	c0.30	
v/s Ratio Perm						0.13			0.04			
v/c Ratio	0.90	0.82		0.89	0.87	0.43	0.76	0.68	0.17	0.73	0.93	
Uniform Delay, d1	45.9	37.4		44.9	37.1	31.8	50.4	37.3	32.3	45.4	36.1	
Progression Factor	1.28	1.34		0.76	1.01	1.70	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.1	5.2		11.8	5.2	2.0	24.1	2.2	0.2	5.6	12.9	
Delay (s)	75.9	55.1		46.0	42.6	56.1	74.5	39.5	32.5	51.1	49.0	
Level of Service	E	E		D	D	E	E	D	C	D	D	
Approach Delay (s)		61.1			45.8			40.8			49.5	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM Average Control Delay	49.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	200	1370	0	0	1346	237	347	40	481	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			0.98		1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	3502	5187			5071		1715	1534	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	3502	5187			5071		1715	1534	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	200	1370	0	0	1346	237	347	40	481	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	34	34	0	0	0
Lane Group Flow (vph)	200	1370	0	0	1564	0	302	253	245	0	0	0
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	11.1	74.4			59.8		25.8	25.8	25.8			
Effective Green, g (s)	11.1	74.4			59.8		25.8	25.8	25.8			
Actuated g/C Ratio	0.10	0.68			0.54		0.23	0.23	0.23			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	353	3508			2757		402	360	360			
v/s Ratio Prot	c0.06	0.26			c0.31							
v/s Ratio Perm							c0.18	0.16	0.16			
v/c Ratio	0.57	0.39			0.57		0.75	0.70	0.68			
Uniform Delay, d1	47.2	7.8			16.6		39.1	38.6	38.3			
Progression Factor	0.96	1.50			0.66		1.00	1.00	1.00			
Incremental Delay, d2	1.9	0.3			0.7		7.7	6.1	5.0			
Delay (s)	47.4	12.0			11.7		46.8	44.6	43.4			
Level of Service	D	B			B		D	D	D			
Approach Delay (s)		16.5			11.7			45.0			0.0	
Approach LOS		B			B			D			A	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	246	1301	0	0	1883	807	533	25	735	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Lane Util. Factor	0.97	0.91			0.91		0.95	0.91	0.95			
Frt	1.00	1.00			0.95		1.00	0.89	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (prot)	3502	5187			4954		1715	1521	1534			
Flt Permitted	0.95	1.00			1.00		0.95	0.99	1.00			
Satd. Flow (perm)	3502	5187			4954		1715	1521	1534			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	246	1301	0	0	1883	807	533	25	735	0	0	0
RTOR Reduction (vph)	0	0	0	0	69	0	0	43	43	0	0	0
Lane Group Flow (vph)	246	1301	0	0	2621	0	448	383	376	0	0	0
Turn Type	Prot						Perm		Perm			
Protected Phases	5	2			6			4				
Permitted Phases							4		4			
Actuated Green, G (s)	9.1	68.1			55.5		32.1	32.1	32.1			
Effective Green, g (s)	9.1	68.1			55.5		32.1	32.1	32.1			
Actuated g/C Ratio	0.08	0.62			0.50		0.29	0.29	0.29			
Clearance Time (s)	3.5	5.3			5.3		4.5	4.5	4.5			
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)	290	3211			2500		500	444	448			
v/s Ratio Prot	c0.07	0.25			c0.53							
v/s Ratio Perm							c0.26	0.25	0.24			
v/c Ratio	0.85	0.41			1.05		0.90	0.86	0.84			
Uniform Delay, d1	49.8	10.7			27.2		37.3	36.9	36.5			
Progression Factor	0.83	1.97			0.92		1.00	1.00	1.00			
Incremental Delay, d2	18.8	0.4			28.4		18.4	15.7	12.9			
Delay (s)	60.0	21.4			53.4		55.7	52.6	49.4			
Level of Service	E	C			D		E	D	D			
Approach Delay (s)		27.5			53.4			52.6			0.0	
Approach LOS		C			D			D			A	

Intersection Summary			
HCM Average Control Delay	46.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.3
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	241	998	472	96	1090	45	254	293	76	65	472	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	3.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	0.95		1.00	0.95	1.00
Frt	1.00	0.95		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3502	4937		3502	5156		3502	3498		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3502	4937		3502	5156		3502	3498		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	241	998	472	96	1090	45	254	293	76	65	472	247
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	241	1470	0	96	1135	0	254	369	0	65	472	247
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases												4
Actuated Green, G (s)	12.1	51.9		7.8	47.6		12.1	26.3		7.0	21.2	33.3
Effective Green, g (s)	12.1	51.9		7.8	47.6		12.1	26.3		7.0	21.2	33.3
Actuated g/C Ratio	0.11	0.47		0.07	0.43		0.11	0.24		0.06	0.19	0.30
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	3.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	385	2329		248	2231		385	836		115	696	489
v/s Ratio Prot	0.07	c0.30		0.03	c0.22		c0.07	0.11		0.04	c0.13	0.06
v/s Ratio Perm												0.10
v/c Ratio	0.63	0.63		0.39	0.51		0.66	0.44		0.57	0.68	0.51
Uniform Delay, d1	46.8	21.9		48.8	22.7		47.0	35.6		50.0	41.2	31.6
Progression Factor	1.02	1.10		1.45	0.71		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.9	1.2		0.7	0.6		4.1	0.4		6.2	2.6	0.8
Delay (s)	50.6	25.2		71.6	16.6		51.0	36.0		56.3	43.9	32.4
Level of Service	D	C		E	B		D	D		E	D	C
Approach Delay (s)		28.8			20.9			42.1			41.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM Average Control Delay	30.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	368	1215	252	140	1355	134	713	591	157	131	281	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	3.0
Lane Util. Factor	0.97	0.91		0.97	0.91		0.97	0.95		1.00	0.95	1.00
Frt	1.00	0.97		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3502	5053		3502	5117		3502	3496		1805	3610	1615
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3502	5053		3502	5117		3502	3496		1805	3610	1615
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	368	1215	252	140	1355	134	713	591	157	131	281	422
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	368	1467	0	140	1489	0	713	748	0	131	281	422
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases												4
Actuated Green, G (s)	11.0	42.7		8.5	40.2		21.0	29.3		12.5	20.8	31.8
Effective Green, g (s)	11.0	42.7		8.5	40.2		21.0	29.3		12.5	20.8	31.8
Actuated g/C Ratio	0.10	0.39		0.08	0.37		0.19	0.27		0.11	0.19	0.29
Clearance Time (s)	3.0	5.5		3.0	5.5		3.0	5.5		3.0	5.5	3.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	350	1961		271	1870		669	931		205	683	467
v/s Ratio Prot	c0.11	0.29		0.04	c0.29		c0.20	0.21		0.07	0.08	c0.09
v/s Ratio Perm												0.17
v/c Ratio	1.05	0.75		0.52	0.80		1.07	0.80		0.64	0.41	0.90
Uniform Delay, d1	49.5	29.0		48.8	31.2		44.5	37.7		46.6	39.2	37.6
Progression Factor	0.98	0.95		1.36	0.97		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	58.2	2.2		1.0	2.3		53.6	5.1		6.4	0.4	20.6
Delay (s)	106.7	29.8		67.2	32.6		98.1	42.7		53.0	39.6	58.2
Level of Service	F	C		E	C		F	D		D	D	E
Approach Delay (s)		45.2			35.6			69.8			51.1	
Approach LOS		D			D			E			D	

Intersection Summary			
HCM Average Control Delay	49.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	249	568	514	260	758	35	279	550	80	55	1381	341
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91		1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.98		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	5153		1805	5088		1805	5033	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.09	1.00		0.40	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	5153		172	5088		763	5033	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	249	568	514	260	758	35	279	550	80	55	1381	341
RTOR Reduction (vph)	0	0	33	0	5	0	0	15	0	0	37	0
Lane Group Flow (vph)	249	568	481	260	788	0	279	615	0	55	1685	0
Turn Type	Prot	NA	pm+ov	Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	12.0	22.4	37.7	16.0	26.4		59.6	49.6		46.3	40.3	
Effective Green, g (s)	12.0	22.4	37.7	16.0	26.4		59.6	49.6		46.3	40.3	
Actuated g/C Ratio	0.11	0.20	0.34	0.15	0.24		0.54	0.45		0.42	0.37	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	382	735	612	262	1236		320	2294		377	1843	
v/s Ratio Prot	0.07	0.16	c0.11	c0.14	c0.15		c0.12	0.12		0.01	0.33	
v/s Ratio Perm			0.19				c0.35			0.05		
v/c Ratio	0.65	0.77	0.79	0.99	0.64		0.87	0.27		0.15	0.91	
Uniform Delay, d1	47.0	41.4	32.5	46.9	37.5		31.2	18.9		19.0	33.2	
Progression Factor	1.04	1.44	0.91	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.5	4.4	5.8	53.3	1.1		22.0	0.3		0.2	8.5	
Delay (s)	52.2	64.1	35.3	100.2	38.6		53.2	19.1		19.2	41.7	
Level of Service	D	E	D	F	D		D	B		B	D	
Approach Delay (s)		50.7			53.8			29.6			41.0	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	44.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	543	764	244	121	772	25	469	1422	231	40	659	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91		1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.98		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3610	1615	1805	5163		1805	5078		1805	5400	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.13	1.00		0.15	1.00	
Satd. Flow (perm)	3502	3610	1615	1805	5163		252	5078		290	4899	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	543	764	244	121	772	25	469	1422	231	40	659	388
RTOR Reduction (vph)	0	0	40	0	3	0	0	17	0	0	97	0
Lane Group Flow (vph)	543	764	204	121	794	0	469	1636	0	40	950	0
Turn Type	Prot	NA	pm+ov	Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	18.0	30.7	57.4	10.4	23.1		56.9	48.4		30.7	26.2	
Effective Green, g (s)	18.0	30.7	57.4	10.4	23.1		56.9	48.4		30.7	26.2	
Actuated g/C Ratio	0.16	0.28	0.52	0.09	0.21		0.52	0.44		0.28	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	573	1007	901	170	1084		507	2234		142	1286	
v/s Ratio Prot	c0.16	c0.21	0.05	0.07	0.15		c0.22	0.32		0.01	0.18	
v/s Ratio Perm			0.07				c0.25			0.07		
v/c Ratio	0.95	0.76	0.23	0.71	0.73		0.93	0.73		0.28	0.74	
Uniform Delay, d1	45.5	36.3	14.3	48.3	40.6		30.3	25.4		29.4	38.7	
Progression Factor	1.16	1.55	0.63	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.6	2.4	0.1	13.2	2.6		22.8	2.2		1.1	3.8	
Delay (s)	72.6	58.5	9.0	61.5	43.2		53.1	27.6		30.5	42.6	
Level of Service	E	E	A	E	D		D	C		C	D	
Approach Delay (s)		55.6			45.6			33.3			42.1	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	43.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX 5c

ALBERT GROVER & ASSOCIATES

January 19, 2017

Mr. Luis Estevez
Acting Director of Public Works
City of Placentia
401 E. Chapman Avenue
Placentia, California 92870

RE: Addendum to Traffic Impact Study for the Proposed Redevelopment of the Packing House Area

Dear Mr. Estevez:

Albert Grover & Associates (AGA) is pleased to present to City of Placentia the addendum to the traffic impact study for the proposed redevelopment of the Packing House area in the City of Placentia. This addendum evaluates Crowther Avenue as a two-lane arterial, as well as any potential traffic impacts of the proposed project on the surrounding intersections, and determine if any mitigation is required.

Should you have any questions regarding any aspects of this study, please contact me.

Respectfully submitted,

ALBERT GROVER & ASSOCIATES

David L. Chen, P.E.
Design Engineer

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ADDENDUM TO THE PROPOSED PACKING HOUSE AREA TRAFFIC STUDY

The Proposed Packing House Area traffic study was presented to the City of Placentia in August 2016. The Packing House Area pertains to the area south and west of the planned Metrolink Station, which is proposed to be redeveloped into a modern walkable, vibrant, and sustainable Transit Oriented Development (TOD) project. For discussion purposes, the traffic study will be defined as the "TOD traffic study." The TOD traffic study analyzed Crowther Avenue as a four-lane, undivided facility between SR-57 Freeway and the project's eastern limits with a two-way left-turn lane, Class II bike lanes on each side, and no on-street parking. The City of Placentia has decided to evaluate an alternative to the TOD traffic study where Crowther Avenue is proposed as a two-lane, divided facility between the SR-57 Freeway and the project's eastern limits. Figures 1A and 1B show a conceptual cross-section of Crowther Avenue as four lanes and two lanes, respectively. In this alternative, Crowther Avenue undergoes a road diet from four lanes down to two lanes with a raised median, which will allow Crowther Avenue to accommodate both Class II bike lanes and on-street parking. Bulbouts may also be considered in the two-lane facility design plans. Roadway right-of-way (ROW) and roadway width along Crowther Avenue remains the same as for the four-lane alternative in the TOD traffic study. Crowther Avenue as a two-lane facility will reduce vehicle speeds and allow for a more pedestrian and bicycle friendly TOD environment.

The lane geometry for all signalized intersections along Crowther Avenue as a two-lane facility is expected to remain unchanged from Crowther Avenue as a four-lane facility. It was also assumed that traffic flow patterns for Crowther Avenue as a two-lane facility remained the same as for a four-lane facility. However, the lane geometry for the three unsignalized Project Driveways – A, B, C will change due to the proposed two-lane configuration for Crowther Avenue. Therefore level of service (LOS) analysis was conducted for only the unsignalized project driveways and the segment analysis for Crowther Avenue. All the analyses utilized the traffic volumes from the TOD traffic study.

Analysis of Crowther Avenue as a two-lane facility was conducted for the following scenarios:

- Existing (Year 2016) Conditions <u>with Project</u>
- Opening Day (Year 2018) Conditions <u>with Project</u>
- Future Buildout 2035 Conditions <u>with Project</u>

For each of the three scenarios, level of service (LOS) analysis was performed at each of the Project Driveways – A, B, C using the Highway Capacity Manual (HCM) Unsignalized Two-Way Stop-Controlled Methodology. Significant impact analysis for unsignalized intersections is evaluated based on the City of Placentia's criteria of acceptable LOS of D or better. Additionally, segment analysis was evaluated based on the volume-to-capacity (V/C) ratio for Crowther Avenue from (1) West of Melrose Street and (2) East of Melrose Street. Segment analysis for existing conditions was based on the capacity guidelines from the *Orange County Highway Design Manual*. Crowther Avenue is currently designated as a secondary four-lane arterial with an LOS E capacity of 25,000 daily vehicles. For the two-lane alternative, the Orange County Highway Design Manual does not specify the capacity of a two-lane divided roadway. However, the OCTA Master Plan of Arterial Highways (MPAH) has a classification for a two-lane divided roadway with a capacity of 22,000 daily vehicles for LOS E. The capacity guidelines from both the Orange County Highway Design Manual and the OCTA Master Plan of Arterial Highways are provided in Attachment A.

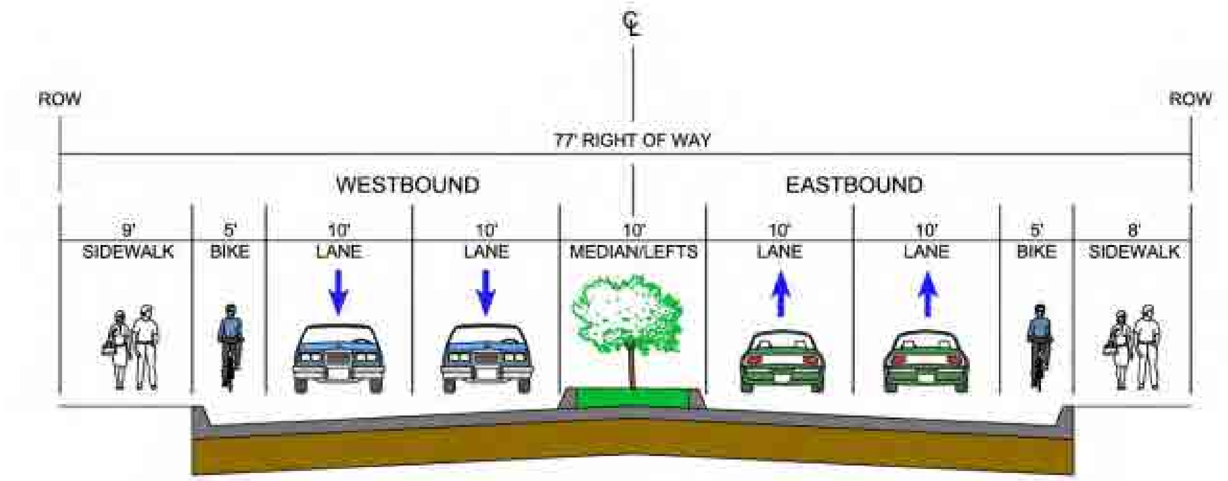


Figure 1-A. Crowther Avenue as a Four-Lane Facility

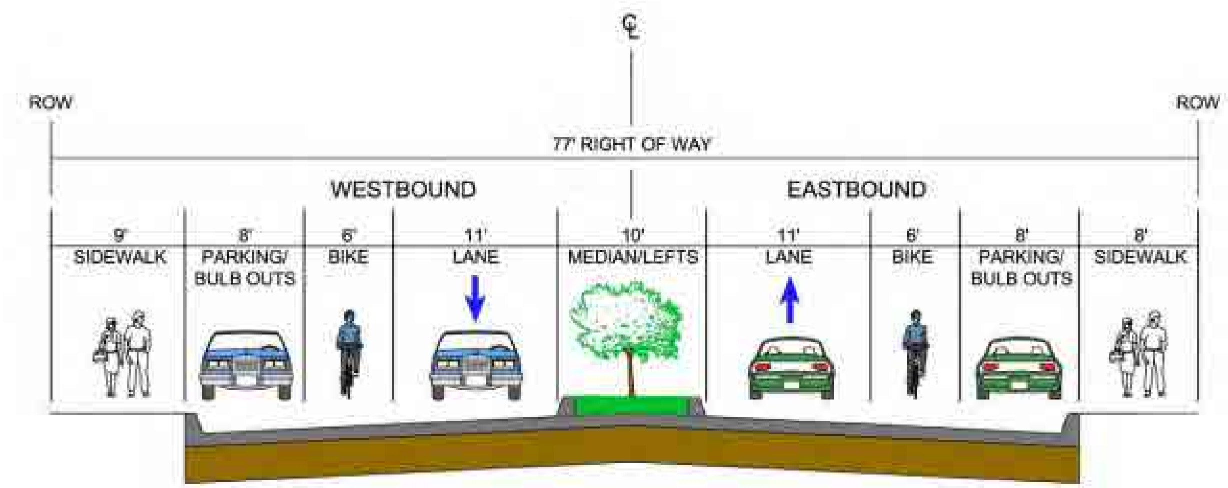


Figure 1-B. Crowther Avenue as a Two-Lane Facility

Existing 2016 with Project – Crowther Avenue as a Two-Lane Facility

Project Driveways Level of Service (LOS):

Level of service (LOS) was analyzed for all three project driveways for Existing 2016 Conditions with Project, and all three project driveways are expected to operate at LOS B for the two-lane alternative. Therefore, no significant impacts were identified at any of the project driveways. Project driveway LOS analysis results are summarized in **Table 1-A**, and LOS worksheets are provided in **Attachment B**.

Table 1-A. Existing 2016 with Project (Crowther Two-Lane Facility)[1]
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	With Project				Significant Impact
		AM Peak Hour		PM Peak Hour		
		Delay[2]	LOS[3]	Delay[2]	LOS[3]	
Project A, B, and C Driveway Locations (Unsignalized)[4]						
13	Crowther Avenue at Project Driveway A	11.0	B	11.4	B	No
14	Crowther Avenue at Project Driveway B	11.1	B	11.5	B	No
15	Crowther Avenue at Project Driveway C	11.5	B	13.0	B	No

Notes: 1. Crowther Avenue - Two lane street within the project area.
2. Delay in Seconds
3. LOS: Level of Service
4. Unsignalized Intersections were analyzed using the Highway Capacity Software (HCS), Two-way Stop Controlled LOS is based on the approach with the worst LOS.

Crowther Avenue Segment LOS:

Segment analysis for Existing 2016 with Project was conducted for Crowther Avenue from (1) West of Melrose Street and (2) East of Melrose Street to evaluate if there would be any impacts on Crowther Avenue due to the project. Based on the analysis, both segments are expected to operate at LOS A for the two-lane alternative. Segment analysis results for Crowther Avenue are summarized in **Table 1-B**. The LOS analyses utilize the LOS E capacity for the four-lane secondary arterial and the two-lane collector arterial.

Table 1-B. Existing 2016 with Project - Crowther Avenue Segment Analysis

Crowther Ave	Existing 2016 without Project				Existing 2016 with Project				
	Existing Daily Vol	LOS E Capacity - 4 Lanes	V/C	LOS	Project Daily Vol	Exist + Project Daily Vol	LOS E Capacity - 2 Lanes (Alternative)	V/C	LOS
West of Melrose St	5,100	25,000	0.204	A	1,708	6,808	22,000	0.309	A
East of Melrose St	5,100	25,000	0.204	A	2,158	7,258	22,000	0.330	A

Daily volumes are per the Proposed Packing House Area Traffic Study, Table 2-4.

Opening Day 2018 with Project – Crowther Avenue as a Two-Lane Facility

Project Driveways Level of Service (LOS):

Level of service (LOS) was analyzed for all three project driveways for Opening Day 2018 with Project, and all three project driveways are expected to operate at LOS B for the two-lane alternative. Therefore, no significant impacts were identified at any of the project driveways. Project driveway LOS analysis results are summarized in **Table 2-A**, and LOS worksheets are provided in **Attachment C**.

Table 2-A. Opening Day 2018 with Project (Crowther Two-Lane Facility)[1]
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	With Project				Significant Impact
		AM Peak Hour		PM Peak Hour		
		Delay[2]	LOS[3]	Delay[2]	LOS[3]	
Project A, B, and C Driveway Locations (Unsignalized)[4]						
13	Crowther Avenue at Project Driveway A	11.1	B	11.8	B	No
14	Crowther Avenue at Project Driveway B	11.2	B	11.6	B	No
15	Crowther Avenue at Project Driveway C	11.6	B	13.1	B	No

Notes: 1. Crowther Avenue - Two lane street within the project area.
2. Delay in Seconds
3. LOS: Level of Service
4. Unsignalized Intersections were analyzed using the Highway Capacity Software (HCS), Two-way Stop Controlled LOS is based on the approach with the worst LOS.

Crowther Avenue Segment LOS:

Segment analysis for Opening Day 2018 with Project was conducted for Crowther Avenue from (1) West of Melrose Street and (2) East of Melrose Street, to evaluate if there would be any impacts on Crowther Avenue due to the project. Based on the analysis, both segments are expected to operate at LOS A for the two-lane alternative. Segment analysis results for Crowther Avenue are summarized in **Table 2-B**.

Table 2-B. Opening Day 2018 with Project - Crowther Avenue Segment Analysis

Crowther Ave	Opening Day without Project				Opening Day with Project				
	Opening Day Daily Vol*	LOS E Capacity - 4 Lanes	V/C	LOS	Project Daily Vol	Opening Day + Project Daily Vol	LOS E Capacity - 2 Lanes (Alternative)	V/C	LOS
West of Melrose St	5,237	25,000	0.209	A	1,708	6,945	22,000	0.316	A
East of Melrose St	5,462	25,000	0.218	A	2,158	7,620	22,000	0.346	A

Daily volumes are per the Proposed Packing House Area Traffic Study, Table 3-3.

Future Buildout 2035 Conditions with Project – Crowther Avenue as a Two-Lane Facility

Project Driveway LOS:

Level of service (LOS) was analyzed for all three project driveways for Future Buildout 2035 Conditions with Project, and all three project driveways are expected to operate at LOS C/D for the two-lane alternative. Therefore, no significant impacts were identified at any of the project driveways. Project driveway LOS analysis results are summarized in Table 3-A, and LOS worksheets are provided in Attachment D.

Table 3-A. Future Buildout 2035 with Project (Crowther Two-Lane Facility)[1]
Highway Capacity Manual (HCM) Analysis
Level of Service (LOS) Summary

No.	Intersection	With Project				Significant Impact
		AM Peak Hour		PM Peak Hour		
		Delay[2]	LOS[3]	Delay[2]	LOS[3]	
Project A, B, and C Driveway Locations (Unsignalized)[4]						
13	Crowther Avenue at Project Driveway A	16.3	C	19.1	C	No
14	Crowther Avenue at Project Driveway B	16.5	C	19.7	C	No
15	Crowther Avenue at Project Driveway C	18.4	C	25.9	D	No

Notes: 1. Crowther Avenue - Two lane street within the project area.
2. Delay in Seconds
3. LOS: Level of Service
4. Unsignalized Intersections were analyzed using the Highway Capacity Software (HCS), Two-way Stop Controlled Intersection. LOS is based on the approach with the worst LOS.

Crowther Avenue Segment LOS:

Segment analysis for Future Buildout 2035 Conditions with Project was conducted for Crowther Avenue from (1) West of Melrose Street and (2) East of Melrose Street, to evaluate if there would be any impacts on Crowther Avenue due to the project. The TOD traffic study utilized the projected volumes for Future Buildout 2035 Conditions from the Draft General Plan Update – June 26, 2014. The General Plan Update utilizes the Orange County Transportation Analysis Models (OCTAM) for 2010 and 2035 respectively, to forecast future buildout projections. According to OCTAM, the traffic volumes are projected to triple to 16,000 daily vehicles on Crowther Avenue by 2035. Based on the analysis utilizing the project future volumes, both segments along Crowther Avenue (two-lane divided facility) would operate at LOS D or better. Segment analysis results for Crowther Avenue are summarized in Table 3-B.

Table 3-B. Future Buildout 2035 with Project - Crowther Avenue Segment Analysis									
Crowther Ave	Year 2035 without Project				Year 2035 with Project				
	Year 2035 Daily Vol*	LOS E Capacity - 4 Lanes	V/C	LOS	Project Daily Vol	Year 2035 + Project Daily Vol	LOS E Capacity - 2 Lanes (Alternative)	V/C	LOS
West of Melrose St	16,000	25,000	0.640	B	1,382	17,382	22,000	0.790	C
East of Melrose St	16,000	25,000	0.640	B	1,744	17,744	22,000	0.807	D

Daily volumes are per the Proposed Packing House Area Traffic Study, Table 4-5.

Based on the proposed two-lane configuration, the City can re-configure the roadway to a four-lane roadway (no on-street parking) if the future traffic demand warrants the need for additional capacity. The conversion from a two-lane facility to a four-lane facility can be accommodated since both alternatives have the same right-of-way (ROW) and roadway widths.

Currently, there are only conceptual plans for Crowther Avenue as a four-lane facility and as a two-lane facility. Engineering design plans must be prepared, which must also evaluate drainage/water runoff issues, utility relocation, and emergency vehicle access. Also, the City will need to coordinate with OCTA regarding Crowther Avenue as a two-lane facility. Currently, per the OCTA Master Plan of Arterial Highways (MPAH), Crowther Avenue is designated as a four-lane secondary arterial. An MPAH amendment may be required for Crowther Avenue to be reconfigured as a two-lane divided roadway.

Conclusions:

- All unsignalized project driveway intersections operate at acceptable LOS D or better during Existing 2016, Opening Day 2018, and Future Buildout 2035 Conditions scenarios.

- The additional traffic from the TOD project area is not expected to impact Crowther Avenue as a two-lane divided facility for Existing 2016, Opening Day 2018, and Future Buildout 2035 Conditions scenarios.

- In the future, if volumes do increase above capacity levels for a two-lane divided facility, there is adequate right-of-way (ROW) and roadway width enabling Crowther Avenue to be reconfigured to the proposed four-lane facility without on-street parking.

- Engineering design plans will also be required, which will evaluate drainage/water runoff issues, utility relocation, and emergency vehicle access. Currently, the roadway configurations for Crowther Avenue, both as a four-lane facility and as a two-lane facility, are conceptual. As development occurs within the TOD area, site plans will be established which will provide a more detailed assessment of Crowther Avenue.

- The City of Placentia will need to coordinate with OCTA regarding Crowther Avenue as a two-lane facility, and a MPAH amendment may be required for Crowther Avenue to be designated as a two-lane divided roadway.

List of Attachments

Attachment

A	**Highway Capacity Values** **- Orange County Highway Design Manual** **- OCTA Master Plan of Arterial Highways (MPAH)**
B	**Existing 2016 with Project - LOS Analysis Worksheets**
C	**Opening Day 2018 with Project - LOS Analysis Worksheets**
D	**Future Buildout 2035 with Project - LOS Analysis Worksheets**

ATTACHMENT A

Highway Capacity Values
- Orange County Highway Design Manual
- OCTA Master Plan of Arterial Highways (MPAH)

TABLE 102.1

HIGHWAY CAPACITY VALUES

Transportation Corridors

Lane Configuration	Levels of Service* D
12 lanes divided	205,000
10 lanes divided	175,000
8 lanes divided	145,000
6 lanes divided	115,000
4 lanes divided	65,000

Arterial Highways

Type of Arterial	Lane Configuration	Levels of Service* A	B	C	D	E	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	33,600	37,500	-
Secondary	4 lanes undivided	15,000	17,500	20,000	22,500	25,000	-
Commuter	2 lanes undivided	7,500	8,800	10,000	11,300	12,500	-

*The volumes shown in the table above are daily two way traffic volumes and assume that the highways are built to their ultimate typical section as shown in the Standard Plans.

(2) Levels of Service

Levels of service are usually defined as A thru F. Beyond level of service E, capacity has been exceeded, and arriving traffic will exceed the ability of a given street to accommodate it. A description of the meaning of the six Levels of Service (LOS) follows:

(a) Level of Service A indicates no physical restriction on operating speeds.

(b) Level of Service B indicates stable flow with few restrictions on operating speed.

(c) Level of Service C indicates stable flow and more restrictions on speed and lane changing due to higher volumes of traffic.

(d) Level of Service D indicates approaching unstable flow conditions with little freedom to maneuver and which may be tolerable for short periods.

(e) Level of Service E is the absolute capacity of the road. It is characterized by unstable flow, lower operating speeds than LOS D, and some momentary stoppages.

(f) Level of Service F indicates forced flow operation (more traffic demand than there is capacity on the road) where the highway acts as a storage area and many stoppages occur.

LOS D indicates a less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed. This operation may be due to adverse signal progression, high volume, or inappropriate signal timing at boundary intersections. The travel speed is between 40% and 50% of the base free-flow speed.

LOS E is characterized by unstable operation and significant delay. Such operations may be due to some combination of adverse progression, high volume, and inappropriate signal timing at the boundary intersections. The travel speed is between 30% and 40% of the base free-flow speed.

LOS F is characterized by flow at extremely low speed. Congestion is likely occurring at the boundary intersections, as indicated by high delay and extensive queuing. The travel speed is 30% or less of the base free-flow speed. Also, LOS F is assigned to the subject direction of travel if the through movement at one or more boundary intersections has a volume-to-capacity ratio greater than 1.0.

Table A-4-1 shows the roadway capacity volumes OCTA utilizes for its circulation analysis for each type of Arterial Facility Freeways are not considered a part of the MPAH and associated capacities are not shown. The data shown in the table is intended to apply to General Plan level Arterial link volumes. (A link is the portion of the roadway between two arterial intersections.) Intersection capacities usually control overall roadway capacities; therefore, the MPAH Guidance uses LOS 'C' for General Plan analysis purposes. Although LOS 'D' is more consistent with urban land uses, it has been found that using it uniformly tends to overload intersections (usually resulting in LOS 'E' or LOS 'F' at the intersections themselves). Therefore, the practice when planning the arterial system is to use LOS 'C' for link capacities, with the intent of maintaining LOS 'D' through intersections.

Table A-4-1: Arterial Highways MPAH Capacity Values

Type of Arterial		Level of Service						Assymetric Capacity / Added Lane			
		A	B	C	D	E	F	C	D	E	F
8	Lanes Divided	45,000	52,500	60,000	67,500	75,000	--	7,500	8,400	9,400	--
6	Lanes Divided	33,900	39,400	45,000	50,600	56,300	--	7,500	8,400	9,400	--
4	Lanes Divided	22,500	26,300	30,000	33,800	37,500	--	7,500	8,400	9,400	--
2	Lanes Divided	9,000	12,000	15,000	20,000	22,000	--	--	--	--	--
4	Lanes Undivided	15,000	17,500	20,000	22,500	25,000	--	5,000	5,600	6,300	--
2	Lanes Undivided	7,500	8,800	10,000	11,300	12,500	--	5,000	5,600	6,300	--

Assymetric lane capacities are calculated by dividing ADT values by the number of lanes per arterial type.

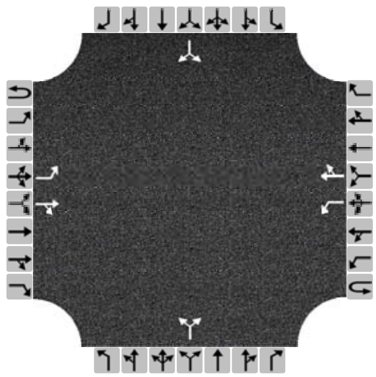
ATTACHMENT B

Existing Year (2016) with Project
- LOS Analysis Worksheets

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy A
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2016	North/South Street	Project Driveway A
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2016 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)		4	196	0	4	1	235	9		1		1		35		18
Percent Heavy Vehicles		0			0	0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

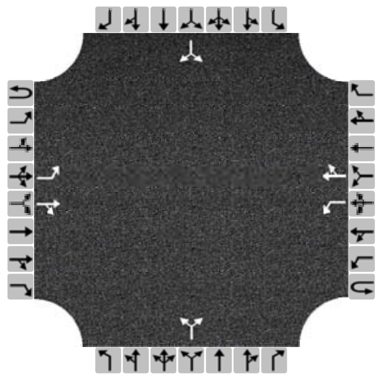
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		4				5					2				53	
Capacity		1334				1698					689				652	
v/c Ratio		0.00				0.00					0.00				0.08	
95% Queue Length		0.0				0.0					0.0				0.3	
Control Delay (s/veh)		7.7				7.1					10.2				11.0	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.2				0.1				10.2				11.0			
Approach LOS	A				A				B				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy A
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2016	North/South Street	Project Driveway A
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2016 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)		18	179	0	6	0	302	34		1		1		18		10
Percent Heavy Vehicles		0			0	0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

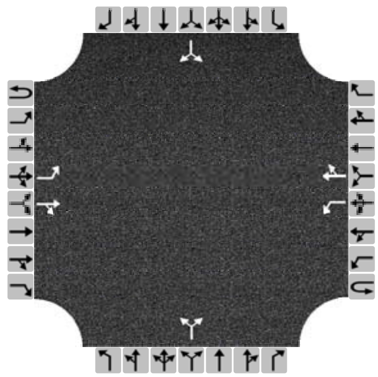
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		18				6					2				28	
Capacity		1235				1798					656				594	
v/c Ratio		0.01				0.00					0.00				0.05	
95% Queue Length		0.0				0.0					0.0				0.1	
Control Delay (s/veh)		8.0				7.0					10.5				11.4	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.7				0.1				10.5				11.4			
Approach LOS	A				A				B				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy B
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2016	North/South Street	Project Driveway B
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2016 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)	2	5	231	1		5	214	9		2		8		35		19
Percent Heavy Vehicles	0	0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

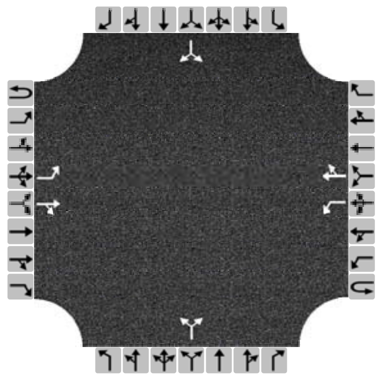
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		7				5					10				54	
Capacity		1453				1348					747				643	
v/c Ratio		0.00				0.00					0.01				0.08	
95% Queue Length		0.0				0.0					0.0				0.3	
Control Delay (s/veh)		7.5				7.7					9.9				11.1	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.2				0.2				9.9				11.1			
Approach LOS	A				A				A				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy B
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2016	North/South Street	Project Driveway B
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2016 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)	4	19	198	2		9	287	35		5		6		19		10
Percent Heavy Vehicles	0	0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		23				9					11				29	
Capacity		1317				1384					652				581	
v/c Ratio		0.02				0.01					0.02				0.05	
95% Queue Length		0.1				0.0					0.1				0.2	
Control Delay (s/veh)		7.8				7.6					10.6				11.5	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.8				0.2				10.6				11.5			
Approach LOS	A				A				B				B			

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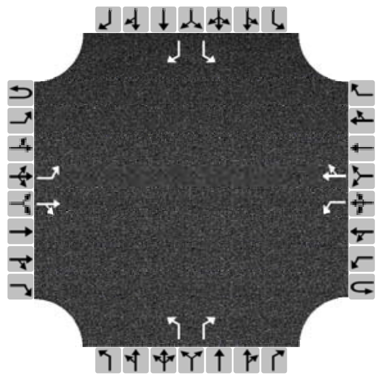
2 Lanes 2016 with Project Crowther at Dwy B PM.xtw

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy C
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2016	North/South Street	Project Driveway C
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2016 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		1	0	1		1	0	1
Configuration		L		TR		L		TR		L		R		L		R
Volume (veh/h)		17	108	20		7	200	6		80		27		23		69
Percent Heavy Vehicles		0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

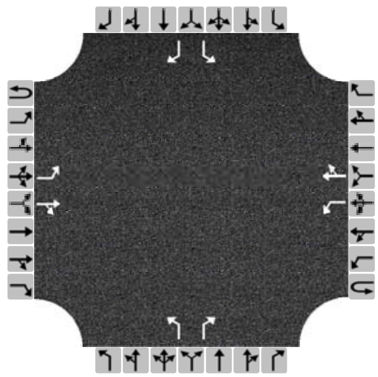
Delay, Queue Length, and Level of Service

	EB U	EB L	EB T	EB R	WB U	WB L	WB T	WB R	NB U	NB L	NB T	NB R	SB U	SB L	SB T	SB R
Flow Rate (veh/h)		17				7				80		27		23		69
Capacity		1378				1471				565		939		615		843
v/c Ratio		0.01				0.00				0.14		0.03		0.04		0.08
95% Queue Length		0.0				0.0				0.5		0.1		0.1		0.3
Control Delay (s/veh)		7.6				7.5				12.4		8.9		11.1		9.7
Level of Service (LOS)		A				A				B		A		B		A
Approach Delay (s/veh)	0.9				0.2				11.5				10.0			
Approach LOS	A				A				B				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy C
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2016	North/South Street	Project Driveway C
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2016 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		1	0	1		1	0	1
Configuration		L		TR		L		TR		L		R		L		R
Volume (veh/h)		68	148	85		21	225	23		46		11		12		37
Percent Heavy Vehicles		0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		68				21				46		11		12		37
Capacity		1330				1347				452		857		478		808
v/c Ratio		0.05				0.02				0.10		0.01		0.03		0.05
95% Queue Length		0.2				0.0				0.3		0.0		0.1		0.1
Control Delay (s/veh)		7.9				7.7				13.9		9.3		12.7		9.7
Level of Service (LOS)		A				A				B		A		B		A
Approach Delay (s/veh)	1.8				0.6				13.0				10.4			
Approach LOS	A				A				B				B			

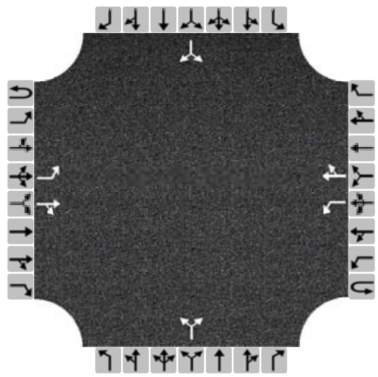
ATTACHMENT C

Opening Day (2018) with Project
- LOS Analysis Worksheets

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy A
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2018	North/South Street	Project Driveway A
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2018 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)		4	202	0	4	1	241	9		1		1		35		18
Percent Heavy Vehicles		0			0	0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

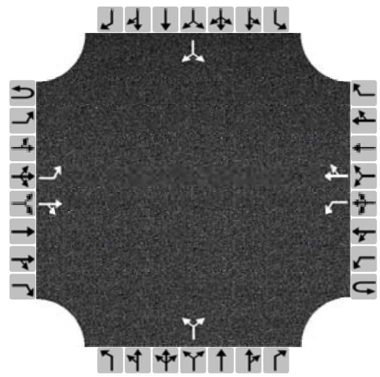
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		4				5					2				53	
Capacity		1327				1696					682				645	
v/c Ratio		0.00				0.00					0.00				0.08	
95% Queue Length		0.0				0.0					0.0				0.3	
Control Delay (s/veh)		7.7				7.1					10.3				11.1	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.1				0.1				10.3				11.1			
Approach LOS	A				A				B				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy A
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2018	North/South Street	Project Driveway A
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2018 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)		18	184	0	6	0	310	34		1		1		18		10
Percent Heavy Vehicles		0			0	0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		18				6					2				28	
Capacity		1226				1438					622				559	
v/c Ratio		0.01				0.00					0.00				0.05	
95% Queue Length		0.0				0.0					0.0				0.2	
Control Delay (s/veh)		8.0				7.5					10.8				11.8	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.7				0.1				10.8				11.8			
Approach LOS	A				A				B				B			

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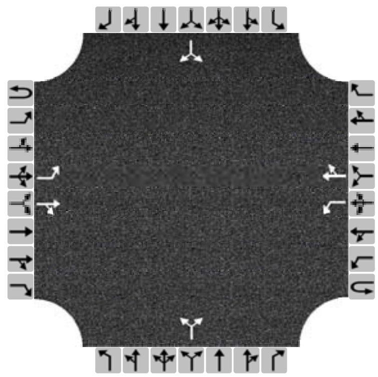
2 Lanes 2018 with Project Crowther at Dwy A PM.xtw

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy B
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2018	North/South Street	Project Driveway B
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2018 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)	2	5	237	1		5	220	9		2		8		35		19
Percent Heavy Vehicles	0	0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		7				5					10				54	
Capacity		1447				1341					740				636	
v/c Ratio		0.00				0.00					0.01				0.08	
95% Queue Length		0.0				0.0					0.0				0.3	
Control Delay (s/veh)		7.5				7.7					9.9				11.2	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.2				0.2				9.9				11.2			
Approach LOS	A				A				A				B			

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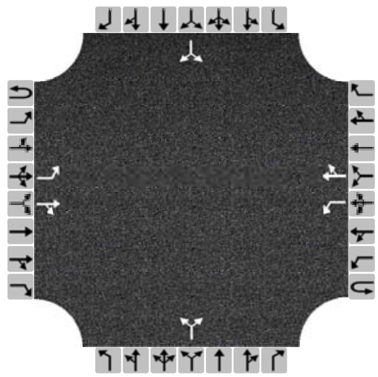
2 Lanes 2018 Opening Day with Project Crowther at Dwy B AM.xtw

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy B
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2018	North/South Street	Project Driveway B
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2018 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)	4	19	203	2		9	295	35		5		6		19		10
Percent Heavy Vehicles	0	0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		23				9					11				29	
Capacity		1310				1379					646				574	
v/c Ratio		0.02				0.01					0.02				0.05	
95% Queue Length		0.1				0.0					0.1				0.2	
Control Delay (s/veh)		7.8				7.6					10.7				11.6	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.8				0.2				10.7				11.6			
Approach LOS	A				A				B				B			

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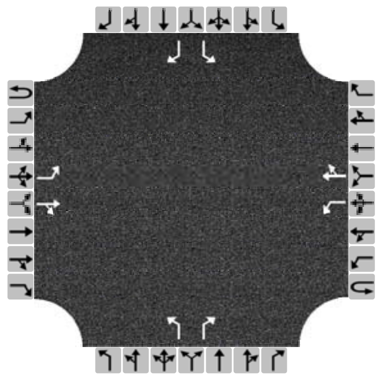
2 Lanes 2018 Opening Day with Project Crowther at Dwy B PM.xtw

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy C
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2018	North/South Street	Project Driveway C
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2018 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		1	0	1		1	0	1
Configuration		L		TR		L		TR		L		R		L		R
Volume (veh/h)		17	113	22		7	205	6		80		27		23		69
Percent Heavy Vehicles		0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

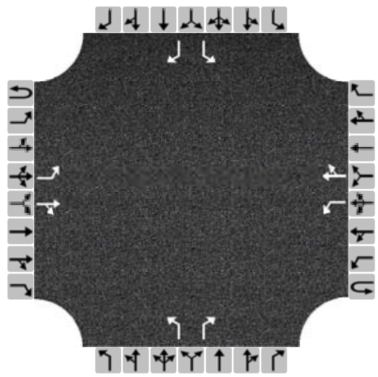
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		17				7				80		27		23		69
Capacity		1372				1462				560		932		608		838
v/c Ratio		0.01				0.00				0.14		0.03		0.04		0.08
95% Queue Length		0.0				0.0				0.5		0.1		0.1		0.3
Control Delay (s/veh)		7.7				7.5				12.5		9.0		11.2		9.7
Level of Service (LOS)		A				A				B		A		B		A
Approach Delay (s/veh)	0.9				0.2				11.6				10.1			
Approach LOS	A				A				B				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy C
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2018	North/South Street	Project Driveway C
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2018 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		1	0	1		1	0	1
Configuration		L		TR		L		TR		L		R		L		R
Volume (veh/h)		68	152	85		21	232	23		46		11		12		37
Percent Heavy Vehicles		0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		68				21				46		11		12		37
Capacity		1322				1342				447		853		472		800
v/c Ratio		0.05				0.02				0.10		0.01		0.03		0.05
95% Queue Length		0.2				0.0				0.3		0.0		0.1		0.1
Control Delay (s/veh)		7.9				7.7				14.0		9.3		12.8		9.7
Level of Service (LOS)		A				A				B		A		B		A
Approach Delay (s/veh)	1.8				0.6				13.1				10.5			
Approach LOS	A				A				B				B			

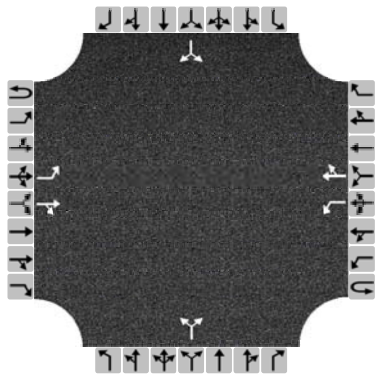
ATTACHMENT D

Future Buildout (2035) with Project
- LOS Analysis Worksheets

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy A
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2035	North/South Street	Project Driveway A
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2035 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)		4	457	0	4	1	602	9		1		1		35		18
Percent Heavy Vehicles		0			0	0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		4				5					2				53	
Capacity		978				1601					417				372	
v/c Ratio		0.00				0.00					0.00				0.14	
95% Queue Length		0.0				0.0					0.0				0.5	
Control Delay (s/veh)		8.7				7.3					13.7				16.3	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.1				0.1				13.7				16.3			
Approach LOS	A				A				B				C			

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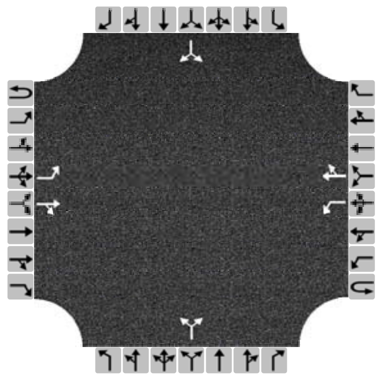
2 Lanes 2035 Crowther at Dwy A AM.xtw

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy A
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2035	North/South Street	Project Driveway A
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2035 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)		18	718	0	6	0	679	34		1		1		18		10
Percent Heavy Vehicles		0			0	0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

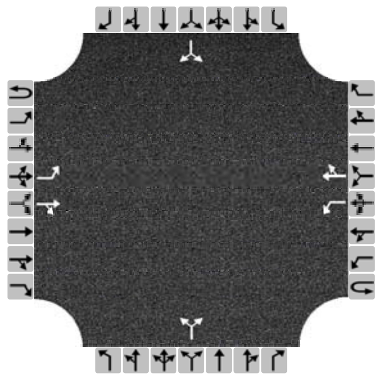
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		18				6					2				28	
Capacity		896				1796					301				284	
v/c Ratio		0.02				0.00					0.01				0.10	
95% Queue Length		0.1				0.0					0.0				0.3	
Control Delay (s/veh)		9.1				7.0					17.1				19.1	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.2				0.1				17.1				19.1			
Approach LOS	A				A				C				C			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy B
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2035	North/South Street	Project Driveway B
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2035 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)	2	5	492	1		5	581	9		2		8		35		19
Percent Heavy Vehicles	0	0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

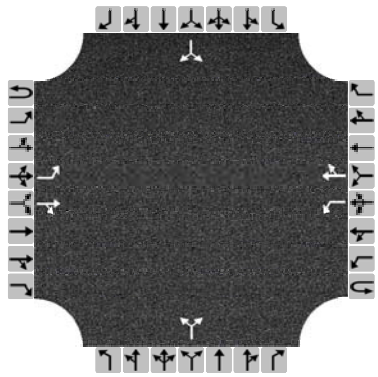
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		7				5					10				54	
Capacity		1133				1081					495				368	
v/c Ratio		0.01				0.00					0.02				0.15	
95% Queue Length		0.0				0.0					0.1				0.5	
Control Delay (s/veh)		8.2				8.3					12.4				16.5	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.1				0.1				12.4				16.5			
Approach LOS	A				A				B				C			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy B
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2035	North/South Street	Project Driveway B
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2035 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	0	0		0	0	0
Configuration		L		TR		L		TR			LR				LR	
Volume (veh/h)	4	19	737	2		9	664	35		5		6		19		10
Percent Heavy Vehicles	0	0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

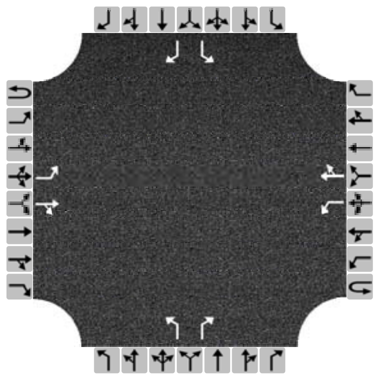
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		23				9					11				29	
Capacity		991				877					300				274	
v/c Ratio		0.02				0.01					0.04				0.11	
95% Queue Length		0.1				0.0					0.1				0.4	
Control Delay (s/veh)		8.7				9.1					17.4				19.7	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	0.3				0.1				17.4				19.7			
Approach LOS	A				A				C				C			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy C
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2035	North/South Street	Project Driveway C
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2035 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		1	0	1		1	0	1
Configuration		L		TR		L		TR		L		R		L		R
Volume (veh/h)		17	359	22		5	561	6		80		27		23		69
Percent Heavy Vehicles		0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

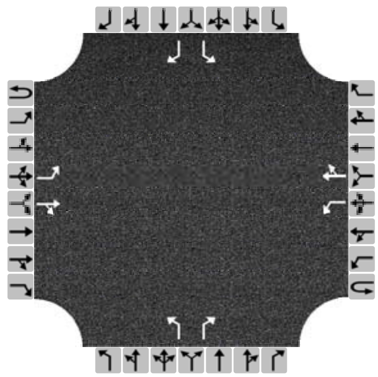
Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		17				5				80		27		23		69
Capacity		1015				1189				303		680		343		529
v/c Ratio		0.02				0.00				0.26		0.04		0.07		0.13
95% Queue Length		0.1				0.0				1.0		0.1		0.2		0.4
Control Delay (s/veh)		8.6				8.0				21.1		10.5		16.2		12.8
Level of Service (LOS)		A				A				C		B		C		B
Approach Delay (s/veh)	0.4				0.1				18.4				13.7			
Approach LOS	A				A				C				B			

HCS 2010 Two-Way Stop Control Summary Report

General Information		Site Information	
Analyst	AGA	Intersection	Crowther at Project Dwy C
Agency/Co.	Placentia	Jurisdiction	
Date Performed	4/13/2016	East/West Street	Crowther (2 Lanes)
Analysis Year	2035	North/South Street	Project Driveway C
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	2035 with Project		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		1	0	1		1	0	1
Configuration		L		TR		L		TR		L		R		L		R
Volume (veh/h)		68	665	85		21	579	23		46		11		12		37
Percent Heavy Vehicles		0				0				0		0		0		0
Proportion Time Blocked																
Right Turn Channelized	No				No				No				No			
Median Type	Left Only															
Median Storage	1															

Delay, Queue Length, and Level of Service

Flow Rate (veh/h)		68				21				46		11		12		37
Capacity		985				868				197		438		208		511
v/c Ratio		0.07				0.02				0.23		0.03		0.06		0.07
95% Queue Length		0.2				0.1				0.9		0.1		0.2		0.2
Control Delay (s/veh)		8.9				9.2				28.8		13.4		23.3		12.6
Level of Service (LOS)		A				A				D		B		C		B
Approach Delay (s/veh)	0.7				0.3				25.9				15.2			
Approach LOS	A				A				D				C			

CITY OF PLACENTIA
PACKING HOUSE DISTRICT TRANSIT ORIENTED DEVELOPMENT PROJECT
MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Implementation Schedule	Verification
Aesthetics I-1 Prior to approval of any new TOD facilities within the project area, the applicant shall submit an evaluation of the scenic value of structures that will be replaced by the new TOD facility. Based on the findings, the following actions may be required: no further action if no resource; recordation of the scenic values of a structure if merited; and integration of existing building scenic elements into the new building design. Implementation of these measures will avoid loss of any scenic resource values due to future TOD-related development within the project area.	This measure will be implemented during future review of a new project prior to approval of the project. A report of findings shall be submitted to the City to review prior to approval of any project that will remove existing structures.	The City shall review the report of findings submitted by the applicant and document compliance with one of the three performance standards included in this measure. This report shall be approved by the City and a copy of the approved report shall be retained in the project file. The approved actions to protect scenic values shall be implemented during construction and verified by City inspectors.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Aesthetics I-2 Future developers shall submit an analysis of potential glare from lighting or sunlight that may impact vehicles on adjacent roadways or structures. This analysis shall demonstrate that due to building orientation or exterior treatment of windows, no significant light or glare impacts may be caused that could adversely impact driver safety on the adjacent roadways or occupied structures in the vicinity of the new development. This analysis shall be submitted to the City for review and approval prior to issuance of the final building permit(s) for new structures within the TOD area.	This measure will be implemented during future review of a new project prior to approval of the project. A report of findings shall be submitted to the City to review prior to approval of any project that will create light or glare.	The City shall review the report of findings submitted by the applicant and document the measures required (if any) to avoid light and glare impacts. This report shall be approved by the City and a copy of the approved report shall be retained in the project file. The approved actions to reduce light and glare impacts shall be implemented during construction and verified by City inspectors.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Aesthetics I-3 Future developers shall submit an analysis that potential lighting from new structures does not create an adverse light impact on adjacent structures. This analysis shall demonstrate that based on an approved lighting plan for new structures, adjacent structures or areas are not exposed to intrusive or harmful amounts of light. This analysis shall be submitted to the City for review and approval prior to issuance of the final building permit(s) for new structures within the TOD area.	This measure will be implemented during future review of a new project prior to approval of the project. A report of findings shall be submitted to the City to review prior to approval of any project that will create light or glare.	The City shall review the report of findings submitted by the applicant and document the measures required (if any) to avoid light impacts. This report shall be approved by the City and a copy of the approved report shall be retained in the project file. The approved actions to reduce light impacts shall be implemented during construction and verified by City inspectors.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Air Quality III-1 For each future project implemented within the TOD project area, the development shall identify project construction related emissions and specific best available control measures (BACMs) identified in Rule 403 required to ensure that fugitive dust or construction equipment exhaust emissions will not exceed SCAQMD construction thresholds of significance or emission concentrations at the nearest receptors identified by local significance thresholds. The specific BACMs identified shall be made conditions of approval to ensure implementation.	The construction emission report shall be submitted to the City and approved prior to approval of the project. The BACMs identified in the report shall be implemented as project conditions of approval during construction.	The City shall review the report of findings submitted by the applicant and document the measures required (if any) to reduce construction emission to a less than significant level. This report shall be approved by the City and a copy of the approved report shall be retained in the project file. The BACMs to reduced construction emissions shall be implemented during construction and verified by City inspectors.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Air Quality III-2 Only "Low-Volatile Organic Compounds" paints (no more than 100 gram/liter of VOC) and/or High Pressure Low Volume (HPLV) applications consistent with South Coast Air Quality Management District Rule 1113 shall be used.	This measure shall be included as a condition of approval and implemented during construction.	A copy of this condition of approval shall be retained in the project file. The use of Low-Volatile Organic Compounds shall be verified by City inspectors.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Air Quality III-3 As individual projects are submitted for entitlements in the future, the City will maintain a record of each individual project's forecast trip generation and net area source emissions. When total trip generation (including the 1,247 existing trips) approaches 4,500, the City will not consider additional project entitlements within the TOD area, unless actual field monitoring of trips and area source verifies that actual trip generation is measured as being less than the SCAQMD thresholds when the verification is calculated. Field monitoring can consist of measuring trips and area source emissions from individual developments or monitoring trips on the local roadways entering and leaving the TOD area. Other verifiable measures may also be used to verify total trips, including interviews with residents or owners of businesses and verification of actual area source emissions. If the data indicate that the 5,000 trip ADT will be exceeded, the City will perform a new environmental evaluation in compliance with CEQA to assess whether continued development within the TOD area will exceed the emission significance thresholds in place at the time of measurement.	This measure shall be implemented by the City in conjunction with approvals for specific projects within the TOD project area. If monitoring indicates the maximum number of trips (5,000) is being generated, the City shall perform a follow-on environmental review of the TOD project area.	Cumulative project monitoring shall be retained in the project file. The City shall initiate and process the follow-on environmental review to address the volume of emissions that may be generated by build-out of the TOD project area.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Air Quality III-4 For each future project implemented within the TOD project area that can generate offensive odors, the development shall identify project-specific best available control measures (BACMs) for the specific odors that ensure adjacent sensitive receptors will not be exposed to odor concentrations that would conflict with residential uses. The specific BACMs identified for odor control shall be made conditions of approval to ensure implementation.	This measure shall be implemented by a project that will generate odors. BACMs identified in the report shall be installed during construction and implemented during operations.	A copy of the approved odor report shall be retained in the project file. City inspectors shall verify the odor control equipment is installed during construction and functions effectively during operations.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Cultural Resources V-1 Prior to demolition of any structure greater than 50 years in age in support of a TOD facility, the City will require a comprehensive historical resource evaluation of the structure. If it is determined that the structure has significant historical value, specific management actions will be defined to reduce impacts to a less than significant impact level. If mitigation to a less than significant historical impact level cannot be achieved, the City will require the preparation of a second tier environmental document, most probably EIR, prior to allowing the TOD project to proceed.	The historical resource evaluation shall be provided to the City prior to construction. Based on this report actions include: no action; mitigation prior to demolition; or a follow-on environmental report documenting the significant values of the structure or site.	A copy of the evaluation shall be retained in the project file. Implementation of recommendations shall be verified by City inspectors and documented in the project file.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Geology and Soils VI-1 Prior to approval of specific development projects within the TOD area in the future, the City will require comprehensive documentation of the erosion control and water quality best management practices (BMPs) that will be implemented by a proposed site specific project. This documentation shall demonstrate that erosion, sedimentation and discharge of storm water from the site during construction and after development will not cause degradation of storm water runoff from the project site that could cause or contribute to a violation of the beneficial uses and water quality standards downstream from the project site.	A copy of the erosion control report shall be submitted to the City prior to project approval. The BMPs shall be installed during construction and inspections during operations shall verify BMP effectiveness.	A copy of the approved erosion control report shall be retained in the project file. City inspectors shall verify the erosion control BMPs are installed during construction and function effectively during operations.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Geology and Soils VI-2 Concurrent with accepting an application for residential structures within the TOD area, the developer shall submit a professionally prepared geotechnical report that includes geotechnical design specifications for the proposed structure at the project site. These design specifications shall demonstrate that any site specific sources of instability can be controlled to a less than significant impact level and these requirements shall be implemented through a condition of approval imposed by the City on the proposed structure.	A copy of the report shall be submitted to the City prior to approval and the design measures shall be installed during construction.	A copy of the approved geotechnical report shall be retained in the project file. City inspectors shall verify the design measures are installed during construction and function effectively during operations.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Greenhouse Gas Emissions VII-1 As individual projects are submitted for review in the future, the City will require a GHG emission forecast for proposed construction activities. If construction-related GHG emissions exceed regionally accepted thresholds, the City will require mitigation to offset such emissions. Mitigation may be in the form of GHG emission offsets or credits obtained from other projects or mitigation banks. If the data indicate that the construction GHG emissions will exceed thresholds of significance in place at the time of construction after application of mitigation, the City will perform a new environmental evaluation in compliance with CEQA to assess whether continued development will exceed the emission significance thresholds in place at the time of measurement.	The GHG evaluation shall be provided to the City prior to construction. Based on this report actions include: no action; mitigation prior to construction; or a follow-on environmental report documenting the significant GHG emissions of the structure or site.	A copy of the GHG evaluation shall be retained in the project file. If mitigation is required, the measures shall be monitored and verified by City inspectors. If a follow-on environmental document is required, it shall be retained in the project file.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Greenhouse Gas Emissions VII-2 As individual projects are submitted for entitlements in the future, the City will require a GHG evaluation on each project and ensure that project-related GHG emissions do not exceed the 3,000 MTCO2(e) threshold. Where this threshold will be exceeded, the City will require the developer to provide project-related GHG emission reductions (such as higher energy conservation), use of recycled water or other GHG reduction measures. The City will also accept verifiable GHG emission offsets from projects. However, if the data indicate that the project specific GHG threshold will be exceeded, the City will perform a new environmental evaluation in compliance with CEQA to assess whether the development within the TOD area will exceed the emission significance thresholds.	The GHG evaluation shall be provided to the City prior to construction. Based on this report actions include: no action; mitigation prior to construction; or a follow-on environmental report documenting the significant GHG emissions of the structure or site.	A copy of the GHG evaluation shall be retained in the project file. If mitigation is required, the measures shall be monitored and verified by City inspectors. If a follow-on environmental document is required, it shall be retained in the project file.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Hazards and Hazardous Materials VIII-1 All spills or leakage of petroleum products or other hazardous materials during construction activities will be remediated in compliance with applicable state and local regulations regarding cleanup and disposal of the contaminant released. The contaminated waste will be collected and disposed of at an appropriately licensed disposal or treatment facility. This measure will be incorporated into the SWPPP or erosion control plan prepared for site specific development within the project area.	These measures shall be identified in the project Stormwater Pollution Prevention Plan (SWPPP) and implemented during construction.	A copy of the SWPPP shall be retained in the project file. Verification of implementation shall be based on field inspections by City inspection personnel that verify the SWPPP BMPs have been implemented as required in this measure. Field notes documenting verification shall be retained in the project file.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Hazards and Hazardous Materials VIII-2 Prior to approval of any project under the TOD designation, a Phase I and/or Phase II Environmental Site Assessment shall be prepared to document the potential for any residual contamination at a site being developed within the TOD area. Any identified residual contamination shall be remediated to a level that will permit residential use prior to approval of any project proposed under the TOD designation.	A copy of the ESA's shall be submitted to the City prior to approval. Proof of remediation to a level that will support the type of use proposed shall be submitted to the City prior to occupancy.	A copy of the ESA's shall be retained in the project file. Verification of implementation shall be based on field inspections by City inspection personnel that verify that any recognized environmental conditions have been remediated as required in this measure. Field notes documenting verification shall be retained in the project file.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Hydrology and Water Quality IX-1 Concurrent with individual project applications in the future, the applicant for a project in the TOD area shall submit a review of existing water consumption on the property, and a forecast of future water consumption by the proposed development. If water consumption by the new project is less than currently occurs on the property, no further action is required. If water consumption is forecast to increase by more 25% than current water demand or 5,000 gallons per day per acre, the project applicant shall fund sufficient water conservation measures within the project area (including the proposed project) to offset the increase in demand on the local water purveyor. Specific conservation measures that can by funded include, but are not limited to: use of recycled water for exterior landscaping, ultra low flush toilets; interior water fixtures that reduce water consumption, such as on-demand water heaters; replacement of existing high water demand landscaping with xeric landscaping; installation of smart landscape/irrigation management/control systems (such as drip systems); and use of onsite low water demand landscaping. To verify adequate water demand offset, the City shall consult with the local water purveyor and verify the adequacy of the offset.	A copy of the water use report shall be provided to the City with recommendations on the need for offsets. If required, the recommended water consumption reduction measures shall be installed during construction and implemented during operations/occupancy.	A copy of the approved water use report shall be retained in the project file. If offset measures must be implemented, City inspectors shall verify and document that they are installed and operational.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-1 The City shall require a noise study for each future specific project that will identify whether noise attenuation features (such as dual-paned windows with specific sound transmission features, mechanical ventilation, balcony buffers, or street level buffers) must be installed to meet the City's noise standards as identified in Table XII-2. This noise study shall be submitted with the project design and noise attenuation features shall be incorporated and identified on design plans submitted to the City for review and approval. Specific measures shall be implemented that demonstrate compliance with City noise standards, or a follow-on CEQA environmental document must be prepared for a project that cannot meet the standards.	A copy of the noise study report shall be provided to the City with recommendations on the need for mitigation. If required, the recommended permanent noise reduction measures shall be installed during construction and implemented during operations/occupancy.	A copy of the approved noise study report shall be retained in the project file. If mitigation measures must be implemented, City inspectors shall verify and document that they are installed and operational.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-2 The City shall require a vibration study for each future specific project that will identify whether noise attenuation features (such as dual-paned windows, spread footings, or other vibration features) must be installed to meet the 72 VdB vibration threshold recommended for the volume of train traffic. This vibration study shall be submitted with the project design and vibration attenuation features shall be incorporated and identified on design plans submitted to the City for review and approval. Specific measures shall be implemented that demonstrate compliance with the 72 VdB threshold, or a follow-on CEQA environmental document must be prepared for a project that cannot meet the standards.	A copy of the vibration study report shall be provided to the City with recommendations on the need for mitigation. If required, the recommended vibration reduction measures shall be implemented during construction.	A copy of the approved vibration study report shall be retained in the project file. If mitigation measures must be implemented, City inspectors shall verify and document that they are implemented during construction..

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-3 Future projects that may adversely impact noise sensitive uses shall use noise reducing barriers and other devices to reduce exterior noise levels at the nearest sensitive receptor to 65 CNEL or less during the daytime construction hours. This shall include installation of a temporary construction barrier around the source of construction noise.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that the noise attenuation measures are implemented during construction where required.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-4 No construction activities shall occur during the hours of 7 PM through 7 AM, Monday through Saturday and at no time shall construction activities occur on Sundays or holidays, unless a declared emergency exists. Stated differently, construction activities shall be limited to 7 AM to 7 PM on weekdays; and no construction activities on Sunday or federal holidays.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-5 Stationary construction equipment that generates noise above the 65 dB threshold at the nearest sensitive receptor shall be placed behind a temporary noise construction barrier while in use.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-6 The project developer shall establish a noise complaint response program and shall respond to any noise complaints received for future specific project by measuring noise levels at the affected receptor site. If the noise level exceeds an CNEL of 60 dBA exterior or an CNEL of 45 dBA interior at the sensitive receptor, the applicant will implement adequate measures (which may include portable sound attenuation walls, use of quieter equipment, shift of construction schedule to avoid the presence of sensitive receptors, etc.) to reduce noise levels to the greatest extent feasible.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-7 Project developer will require that all construction equipment be operated with mandated noise control equipment (mufflers or silencers). Enforcement will be accomplished by random field inspections by applicant personnel during construction activities.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-8 Equipment not in use for five minutes shall be shut off.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-9 Equipment shall be maintained and operated such that loads are secured from rattling or banging.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-10 Where available, electric-powered equipment shall be used rather than diesel equipment and hydraulic-powered equipment shall be used instead of pneumatic power.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-11 Construction employees shall be trained in the proper operation and use of equipment consistent with these mitigation measures, including no unnecessary revving of equipment.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-12 No radios or other sound equipment shall be used at this site unless required for emergency response by the contractor.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Noise XII-13 Public notice shall be given 10 days prior to initiating construction. This notice shall be provided to all property owners and residents within 300 feet of the project site and shall be provided to property owners/residents at least one week prior to initiating construction. The notice shall identify the dates of construction and the name and phone number of a construction supervisor (contact person) in case of complaints. One contact person shall be assigned to the project. The public notice shall encourage the adjacent residents to contact the supervisor in the case of a complaint. Resident's would be informed if there is a change in the construction schedule. The supervisor shall be available 24/7 throughout construction by mobile phone. If a complaint is received, the contact person shall take all feasible steps to remove or attenuate the sound source causing the complaint.	This measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction noise measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Public Services XIV-1 Future projects implemented under the TOD district shall submit a fiscal impact analysis focused on law enforcement and recreation demand and costs to evaluate the need for additional fees to support these two City services. The documentation shall be reviewed and approved by the City and if additional fees must be paid, the City shall impose them as conditions of approval for the future projects either directly or through creation of a community facilities district. Alternatively, if the City imposes a Public Safety Impact Fee, this fee shall provide sufficient funding for the increased demand for these services.	The fiscal impact analysis (FIA) shall be submitted and approved by the City prior to approval of the project. Any fees to offset public services shall be paid prior to occupancy.	A copy of the approved FIA shall be retained in the project file. Fees imposed and paid, regardless of source, shall be documented in the project file.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-1 Each future TOD project shall pay fair share fees for the inter-section improvement costs at the time of entitlement based on the percentage of trips contributed at each intersection. A high level "order of magnitude" cost estimate is also provided in subsequent mitigation identified in the Traffic Impact Study. These are rough estimate costs for engineering and construction and will need to be refined during future preliminary engineering phase. The mitigation measures should be re-evaluated for any refinement of the Draft General Plan Update and/or additional development of the TOD project over and beyond 5,000 trips. All significantly impacted intersections require mitigation prior to Future Buildout. Mitigation for each intersection and estimated costs are listed below: • Placentia/Crowther Avenue: Upgrade left turn signal phasing for all movements from permissive left turns to protected/permissive left turn phasing. Estimated Cost - $100,000;	Fair share circulation system fees shall be paid when entitlements are issued, or prior to occupancy.	Fees imposed and paid shall be documented in the project file.

Mitigation Measure	Implementation Schedule	Verification
• Orangethrope Avenue/Placentia Avenue: Provide east-bound/westbound dual left-turn Lanes at Orangethorpe Avenue/Placentia Avenue. Estimated Cost - $450,000; • Orangethorpe Avenue/SR-57 Northbound Ramps: Restripe Northbound Off-Ramp middle lane as shared Left-Turn/Thru/Right-Turn Lane. Estimated Cost - $50,000; • Orangethorpe Avenue/SR-57 Northbound Ramps: The westbound right turn movement is expected to increase from 550 vehicles per hour (vph) to 800 vph during the PM period for year 2035. This movement should be closely monitored and may require additional improvements to reduce congestion and queuing. An additional improvement would be to modify the existing median on Orangethorpe Avenue to add an exclusive Westbound Right-Turn Lane. Estimated Cost - $200,000; • Orangethorpe Avenue/Melrose Street: Provide an exclusive southbound right-turn lane without overlap signal phasing and northbound dual left-turn lanes at Orangethorpe Avenue/Melrose Street. Estimated Cost - $100,000; • Kraemer Boulevard/Orangethorpe Avenue: Restripe Orangethrope Avenue to provide eastbound dual left-turn lanes. Add additional north/south thru lane (three lanes each) by restriping the northbound and southbound right turn lanes to thru lanes. Consider modifying the north/south left-turn movements from protected-only left-turn phasing to protected- permissive left-turn phasing. Restripe the southbound left-turn approach to provide a positive offset for better sight distance between the north/south left turn movements. Estimated Cost - $100,000.		

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule		Verification	
Transportation / Traffic XVI-2 Truck access for the parcel on the southwest corner of Melrose Street and Crowther Avenue must be maintained to and from this site.	When applicable, this measure shall be included as a condition of approval and implemented during construction.		City inspectors shall verify and document that construction traffic measures are implemented during construction.	
	Source	**Responsible Party**		**Status / Date / Initials**
	Initial Study	City of Placentia		

Mitigation Measure	Implementation Schedule		Verification	
Transportation / Traffic XVI-3 Construction hours should be five days a week, and in accordance with the City of Placentia Municipal Code, limited to the hours of 7 AM and 7 PM on working days (Monday through Friday).	When applicable, this measure shall be included as a condition of approval and implemented during construction.		City inspectors shall verify and document that construction traffic measures are implemented during construction.	
	Source	**Responsible Party**		**Status / Date / Initials**
	Initial Study	City of Placentia		

Mitigation Measure	Implementation Schedule		Verification	
Transportation / Traffic XVI-4 Construction truck and worker automobile traffic will utilize the proposed driveways along Melrose Street and Crowther Avenue for access to and from the project site.	When applicable, this measure shall be included as a condition of approval and implemented during construction.		City inspectors shall verify and document that construction traffic measures are implemented during construction.	
	Source	**Responsible Party**		**Status / Date / Initials**
	Initial Study	City of Placentia		

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-5 Trucks transporting materials to and from the project site must utilize the designated truck routes along Placentia Avenue, Crowther Avenue, Melrose Street, and Orangethorpe Avenue.	When applicable, this measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction traffic measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-6 Trucks entering or exiting the construction site will need to yield to public traffic at all times.	When applicable, this measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction traffic measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-7 It is unlikely that street traffic will be impacted by on-site construction activities; however, should it be necessary for temporary lane closures and/or detour routes for utility work or other such work in the public right-of-way those temporary traffic control activities are to be conducted in compliance with the requirements and guidelines outlined in the California Manual of Uniform Traffic Control Devices (MUTCD).	When applicable, his measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction traffic measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-8 Construction staging should be conducted on-site and under no circumstances will be allowed on local or residential streets.	When applicable, this measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction traffic measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-9 Construction work within the public right-of-way needs to be in compliance with City standards and the construction site shall be posted with the name, company and a phone number of a person to call for complaints.	When applicable, this measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction traffic measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Transportation / Traffic XVI-10 The applicant will be fully responsible for the repair of damages to any public facility due to the hauling or transporting of construction related materials.	When applicable, this measure shall be included as a condition of approval and implemented during construction.	City inspectors shall verify and document that construction traffic measures are implemented during construction.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule		Verification
Transportation / Traffic XVI-11 Parking for the construction trucks and worker trucks will be on-site, away from the adjacent public roadways and existing active businesses.	When applicable, this measure shall be included as a condition of approval and implemented during construction.		City inspectors shall verify and document that construction traffic measures are implemented during construction.
	Source	**Responsible Party**	**Status / Date / Initials**
	Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule		Verification
Transportation / Traffic XVI-12 The City shall coordinate with OCTA to ensure that one or more bus routes to the future Placentia Metrolink Station will serve the TOD project area.	When applicable, this measure shall be included as a condition of approval and implemented during construction.		City inspectors shall verify and document that construction traffic measures are implemented during construction.
	Source	**Responsible Party**	**Status / Date / Initials**
	Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Utilities and Service Systems XVII-1 Future projects implemented under the TOD district shall submit a detailed evaluation of water demand and wastewater generation based on the fixtures that will be installed. This information shall be compared to the current demand by existing development and a net impact determination made. This net impact shall be compared to available water supply capacity and wastewater treatment capacity of the serving utility systems. If the demand/generation exceeds the capacity of either utility system, the modifications to the system(s) shall be evaluated and a determination of indirect impact reached in a second tier environmental document. The documentation shall be reviewed and approved by the City and if specific measures must be implemented, the City shall impose them as conditions of approval for the future projects. In no instance shall a project be approved that would cause significant environmental effects on either the water or wastewater system, including adequacy of water supplies and treatment capacity. Mitigation in the form of offsets, such as funding water conservation or wastewater generation reductions at other location, shall be implemented where deemed necessary.	A copy of the utility use report shall be provided to the City with recommendations on the need for offsets. If required, the recommended water consumption reduction measures shall be installed during construction and implemented during operations/occupancy.	A copy of the approved utility use report shall be retained in the project file. If offset measures must be implemented, City inspectors shall verify and document that they are installed and operational.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

Mitigation Measure	Implementation Schedule	Verification
Utilities and Service Systems XVII-2 Future projects implemented under the TOD district shall submit a detailed evaluation of stormwater drainage from the new project relative to the existing development. If the future project will generate stormwater runoff that exceeds the existing volume or time of accumulation, onsite stormwater detention shall be installed as part of the site development of offset any increase that would exceed the capacity of the existing stormwater collection and transport systems. In no instance shall a project be approved that would cause significant environmental effects on either the existing drainage system, unless the system incremental stormwater increase is detained onsite or the drainage system altered to accommodate any change.	A copy of the stormwater generation report shall be provided to the City with recommendations on the need for offsets. If required, the recommended water consumption reduction measures shall be installed during construction and implemented during operations/occupancy.	A copy of the approved stormwater generation report shall be retained in the project file. If offset measures must be implemented, City inspectors shall verify and document that they are installed and operational.

Source	Responsible Party	Status / Date / Initials
Initial Study	City of Placentia	

TOM DODSON & ASSOCIATES
2150 N. ARROWHEAD AVENUE
SAN BERNARDINO, CA 92405
TEL (909) 882-3612 • FAX (909) 882-7015
E-MAIL tda@tdaenv.com

MEMORANDUM

March 9, 2017

From: Tom Dodson

To: Mr. Joseph Lambert

Subj: Completion of the Mitigated Negative Declaration for the General Plan Amendment (GPA) 2017-01 and Zone Change (ZC) 2017-01 to Establish the Packing House District Transit-Oriented Development Project (SCH #2017021012)

The City of Placentia (City) received six written comments on the proposed Mitigated Negative Declaration for the General Plan Amendment (GPA) 2017-01 and Zone Change (ZC) 2017-01 to Establish the Packing House District Transit-Oriented Development Project (SCH #2017021012). CEQA requires a Negative Declaration to consist of the Initial Study, copies of the comments, any responses to comments as compiled on the following pages; and any other project-related material prepared to address issues evaluated in the Initial Study.

For this project, the original Initial Study will be utilized as one component of the Final Mitigated Negative Declaration (MND) package. The attached responses to comments, combined with the Initial Study and the Mitigation Monitoring and Reporting Program, constitute the Final MND package that will be used by the City to consider the environmental effects of implementing the proposed project.

The following parties submitted comments. These letters are addressed in the attached Responses to Comments:

1. State Office of Planning and Research, State Clearinghouse
2. Gabrieleño Band of Mission Indians - Kizh Nation
3. South Coast Air Quality Management District
4. California Department of Toxic Substances Control
5. California Department of Transportation - District 12
6. Native American Heritage Commission

Because mitigation measures are required for this project to reduce potentially significant impacts to a less than significant level, the Mitigation Monitoring and Reporting Program (MMRP) attached to this package is required to be adopted as part of this Final MND package. The MMRP has been incorporated by reference to this package for approval and implementation. The City consideration of the proposed project and adoption of the Mitigated Negative Declaration is scheduled for April 4, 2017. Tom Dodson will be attending the City public meetings/hearings on this project to address any questions that City Planning Commissioners and City Council members or other parties may have regarding the adoption of the MND for the proposed project.

Do not hesitate to give me a call if you have any questions regarding the contents of this package.

Tom Dodson

Attachments

COMMENT LETTER #1

STATE OF CALIFORNIA

GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

STATE CLEARINGHOUSE AND PLANNING UNIT

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

March 7, 2017

Joseph Lambert
City of Placentia
401 East Chapman Avenue
Placentia, CA 92870

Subject: GPA 2017-01 and ZC 2017-01 to establish the Packing House District Transit-Oriented Development Project
SCH#: 2017021012

Dear Joseph Lambert:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. On the enclosed Document Details Report please note that the Clearinghouse has listed the state agencies that reviewed your document. The review period closed on March 6, 2017, and the comments from the responding agency (ies) is (are) enclosed. If this comment package is not in order, please notify the State Clearinghouse immediately. Please refer to the project's ten-digit State Clearinghouse number in future correspondence so that we may respond promptly.

Please note that Section 21104(c) of the California Public Resources Code states that:

1-1

> "A responsible or other public agency shall only make substantive comments regarding those activities involved in a project which are within an area of expertise of the agency or which are required to be carried out or approved by the agency. Those comments shall be supported by specific documentation."

These comments are forwarded for use in preparing your final environmental document. Should you need more information or clarification of the enclosed comments, we recommend that you contact the commenting agency directly.

This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. Please contact the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Enclosures
cc: Resources Agency

RESPONSES TO COMMENTS
LETTER #1
OFFICE OF PLANNING AND RESEARCH, STATE CLEARINGHOUSE

1-1 This is an acknowledgment letter verifying that the State Clearinghouse distributed the Initial Study and proposed Mitigated Negative Declaration to selected state agencies for review, and that several state agencies submitted comments through the Clearinghouse by the close of the review period, which occurred on March 6, 2017. The State assigned this project the following tracking number, SCH #2017021012. This letter is for information only and does not require additional formal response.

Document Details Report
State Clearinghouse Data Base

SCH# 2017021012
Project Title GPA 2017-01 and ZC 2017-01 to establish the Packing House District Transit-Oriented Development Project
Lead Agency Placentia, City of

Type **MND** Mitigated Negative Declaration

Description In conjunction with the county of Orange, Orange County Transit Authority, the city of Placentia will install a new train station to accommodate access for city residents to the regional passenger train system. The city proposes to support this new regional system connection by creating a transit-oriented development zone classification and land use designation in the packing house district of the city, which is located immediately adjacent to the proposed train platform. The objective of these new land use designations/classifications is to allow high density-transit oriented development in the immediate vicinity of the train platform to facilitate use of the regional system and redevelopment of the area surrounding the new station. To accomplish this, the city is proposing to adopt a TOD land use designation and zone classification.

Lead Agency Contact

Name Joseph Lambert
Agency City of Placentia
Phone (714) 993-8124 ***Fax***
email
Address 401 East Chapman Avenue
City Placentia ***State*** CA ***Zip*** 92870

Project Location

County Orange
City Placentia
Region
Lat / Long 33° 52' 05" N / 117° 52' 22" W
Cross Streets Crowther Ave/Melrose Ave/Bradford Ave
Parcel No.
Township ***Range*** ***Section*** ***Base***

Proximity to:

Highways 57
Airports
Railways BNSF
Waterways
Schools VARIOUS
Land Use industrial/manufacturing

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Drainage/Absorption; Flood Plain/Flooding; Geologic/Seismic; Landuse; Minerals; Noise; Population/Housing Balance; Public Services; Recreation/Parks; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Wetland/Riparian

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 5; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; Caltrans, District 12; Caltrans, Division of Transportation Planning; Air Resources Board, Transportation Projects; Regional Water Quality Control Board, Region 8; Native American Heritage Commission; Department of Toxic Substances Control

Date Received 02/03/2017 ***Start of Review*** 02/03/2017 ***End of Review*** 03/06/2017

Note: Blanks in data fields result from insufficient information provided by lead agency.

COMMENT LETTER #2

GABRIELENO BAND OF MISSION INDIANS - KIZH NATION

Historically known as The San Gabriel Band of Mission Indians

recognized by the State of California as the aboriginal tribe of the Los Angeles basin

AB 52 - 30-day Consultation Notice

Project name**: AB 52 Consultation General Plan Amendment 2017-01 and Zone Change 2017-01 to Establish the Packing House Transit Oriented Development District – City of Placentia**

Dear Joe Lambert ,

February 10, 2017

Please find this letter in response to your request for consultation dated January 30, 2017. I have reviewed the project site and do have
concerns for cultural resources. Your project lies in an area where the Ancestral territories of the Kizh (Kitc) Gabrieleño's prominent
villages such as Hutukngna adjoined and overlapped with each other, at least during the Late Prehistoric and Protohistoric Periods. The
Kizh Gabrieleño were probably the most influential Native American group in aboriginal southern California (Bean and Smith
1978a:538; https://nrmsecure.dfg.ca.gov/FileHandler.ashx?DocumentID=9497). Our homeland was centered in the Los Angeles
2-1 Basin, and reached as far east as the San Bernardino-Riverside area. The homeland of our neighbors, the Serranos, was primarily the
San Bernardino Mountains, including the slopes and lowlands on the north and south flanks. Whatever the linguistic affiliation, Native
Americans in and around the project area exhibited similar organization and resource procurement strategies. Villages were based on
clan or lineage groups. Their home base sites are marked by midden deposits often with bedrock mortars. During their seasonal rounds
to exploit plant resources, small groups would migrate within their traditional territory in search of specific plants and animals. Their
gathering strategies of ten left behind signs of special use sites, usually grinding slicks on bedrock boulders, at the locations of the
resources.

Due to the project location and the high sensitivity of the area location, we would like to request one of our certified Native American
monitors to be on site during any and all ground disturbances (including but not limited to pavement removal, post holing, auguring,
boring, grading, excavation and trenching) to protect any cultural resources which may be affected during construction or development.
When the Native American Heritage Commission states there are "no records of sacred sites in the project area," they will always refer
lead agencies to the respective Native American Tribe. The NAHC is only aware of general information and are not the experts on
each California Tribe. Our Elder Committee & Tribal Historians are the experts for our Tribe and are able to provide a more complete
2-2 history (both written and oral) regarding the location of historic villages, trade routes, cemeteries and sacred/religious sites in the project
area. In some instances, the project location may be in an area that has been previously developed and one may question the need for
monitoring. Unfortunately, we have numerous examples that we can share where cultural resources including human remains were
outright destroyed or at least significantly impacted before a Tribe was present. Please note, if sacred sites haven't been listed with the
NAHC, it doesn't mean that they aren't there. Not everyone reports what they know.

The recent implementation of AB52 dictates that lead agencies consult with Native American Tribes who can prove and document
traditional and cultural affiliation with the area of said project. Our tribe is connected ancestrally to your project location area. What
2-3 does "ancestrally" or "ancestral" mean? It simply means the people who were in your family in past times - of, belonging to, inherited
from, or denoting an ancestor or ancestors (see http://www.thefreedictionary.com/ancestral). Our main priority is to avoid and protect
cultural and biological resources that still exist in our ancestral land for the benefit and education of future generations. We hold
strongly to the values of accomplishing this goal without delay or conflicts to the lead agency and project manager.

At your convenience, we are available for consultations via phone or in person. Thank you.

CC: NAHC

With respect,

Andrew Salas, Chairman | Nadine Salas, Vice-Chairman | Christina Swindall Martinez, secretary

Albert Perez, treasurer I | Martha Gonzalez Lemos, treasurer II | Richard Gradias, Chairman of the council of Elders

PO Box 393 Covina, CA 91723 www.gabrielenoindians@yahoo.com gabrielenoindians@yahoo.com

Andrew Salas, Chairman
cell (626)926-4131

RESPONSES TO COMMENTS
LETTER #2
GABRIELEÑO BAND OF MISSION INDIANS - KIZH NATION

2-1 The City of Placentia (City) includes this response from the Kizh Nation to the requirement by AB 52 to consult with Native American tribes with historic ties to the project area. This comment provides evidence of the Kizh Nation's ancestral affiliation with the project area. Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project.

2-2 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. The City will fulfill the request by the Kizh Nation to utilize monitors on future projects within the TOD project area. The following mitigation will be added to the Mitigation Monitoring and Reporting Program:

> ***During ground disturbing activities (including but not limited to pavement removal, pot-holing, grading, excavation, trenching and initial well site disturbance) at least one Native American Monitor will be present at the project site to monitor subsurface areas as they are exposed. The monitors shall compile a monitoring log on a daily basis that will provide descriptions of daily activities, including construction activities, locations, soil characteristics and any cultural materials exposed and identified. The monitors shall photo-document the ground disturbing activities on a daily basis. If any cultural materials are exposed, the monitors shall have the authority to redirect construction activities until the extent and importance of the materials are assessed. Subsequent management of any Native American cultural materials shall be determined through consultation between the City, property owner and the Native American Band supplying the monitor. Any human remains encountered shall be handled through the County Coroner's office and if necessary, in conjunction with the Native American Heritage Commission and Native American Band supplying the monitor.***

2-3 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project.

COMMENT LETTER #3

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 · www.aqmd.gov

SENT VIA E-MAIL AND USPS: March 3, 2017

joe.lambert@placentia.org
Joe Lambert, Director of Development Services
City of Placentia
401 E. Chapman Ave.,
Placentia, CA 92870

Mitigated Negative Declaration (MND) for the Proposed
Packing House District Transit Oriented Development District

The South Coast Air Quality Management District (SCAQMD) staff appreciates the opportunity to comment on the above-mentioned document. The following comment is meant as guidance for the Lead Agency and should be incorporated into the Final MND.

3-1

Project Description

The proposed project creates a Transit Oriented Development (TOD) zone classification and land use designation in the Packing House District. The objective of these new land use designations would allow high density transit oriented development that may consist of mixed use commercial and 752 high density residential dwellings. The proposed area is currently bounded by the railroad right of way to the north, State Highway 57 to the west, and industrial operations to the south and east.

3-2

Health Risk Assessment

When specific development is reasonably foreseeable as result of the goals, policies, and guidelines in the proposed project, the Lead Agency should identify any potential adverse health risk impacts using its best efforts to find out and a good-faith effort at full disclosure in the CEQA document. Based on a review of aerial photographs, the SCAQMD staff found that the proposed project would facilitate the siting of future residents approximately 10 feet from State Highway 57, which has an average daily volume of 279,300 vehicles[1] including approximately 17,151 diesel fueled trucks. Because of the close proximity to the existing freeway, residents would be exposed to diesel particulate matter (DPM), which is a toxic air contaminant and a carcinogen. Additionally, the proposed project is located just south of railroad tracks operated by the BNSF. A federal database[2] indicates that these railroad tracks show daily train activity including approximately 82 trains powered by diesel-fueled locomotive engines. Diesel particulate matter emitted from diesel powered engines (such as trucks and locomotives) has been classified by the state as a toxic air contaminant and a carcinogen. Furthermore, the proposed project is located within a manufacturing zone (M Zone), which includes several SCAQMD permitted facilities within one quarter mile.

3-3

Since future residences of the proposed project would be exposed to toxic emissions from the nearby sources of air pollution (e.g., highway, railroads, and industries), the SCAQMD staff recommends that the Lead Agency estimate potential health risks to these future residents from these sources. Otherwise, the Lead Agency has not demonstrated, supported by substantial evidence, that public health will not be significantly impacted by this project. Therefore, the SCAQMD staff recommends that the Lead Agency

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[1] Caltrans 2015 annual average daily traffic (Annual ADT) and truck volumes: http://www.dot.ca.gov/trafficops/census/.
[2] http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/crossing/xingqryloc.aspx

RESPONSES TO COMMENTS
LETTER #3
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

3-1 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project.

3-2 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. The background information provided in this comment correctly states the existing environmental setting at the TOD project area.

3-3 The City concurs with this recommendation and believes that the appropriate time for evaluation of this issue is when specific projects proposed for implementation in the future. To address this issue the City will implement the following mitigation measure:

> ***Prior to approval of a specific development project within the new TOD project area, as part of the required air quality study, a health risk assessment (HRA) shall be provided to the City indicating what measures will need to be implemented to reduce exposure to any toxics to less than significant impact. Also, as part of the mitigation, the City shall require that a permanent funding source be identified to ensure that the mitigation systems are maintained and do not degrade to the point of being ineffective at controlling exposure to potential toxics to a less than significant exposure level.***

3-3 cont. conduct a health risk assessment (HRA)[3] to disclose the potential health risks to the residents from the freeway, railroad, and industrial sources.

3-4 Notwithstanding the court rulings, the SCAQMD staff recognizes that the Lead Agencies that approve CEQA documents retain the authority to include any additional information they deem relevant to assessing and mitigating the environmental impacts of a project. Because of SCAQMD's concern about the potential public health impacts of siting sensitive populations within close proximity of freeways, the SCAQMD staff will continue to recommend that, prior to approving the project, Lead Agencies consider the impacts of air pollutants on people who will live in a new project and provide mitigation where necessary.

3-5 <u>Guidance Regarding Residences Sited Near a High-Volume Freeway or Other Sources of Air Pollution</u>
The SCAQMD staff recognizes that there are many factors Lead Agencies must consider when making local planning and land use decisions. To facilitate stronger collaboration between Lead Agencies and the SCAQMD to reduce community exposure to source-specific and cumulative air pollution impacts, the SCAQMD adopted the Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning in 2005. This Guidance Document provides suggested policies that local governments can use in their General Plans or through local planning to prevent or reduce potential air pollution impacts and protect public health. The SCAQMD staff recommends that the Lead Agency review this Guidance Document as a tool when making local planning and land use decisions. This Guidance Document is available on SCAQMD's website at: http://www.aqmd.gov/home/library/documents-support-material/planning-guidance/guidance-document. Additional guidance on siting incompatible land uses (such as placing homes near freeways or other polluting sources) can be found in the California Air Resources Board's *Air Quality and Land Use Handbook: A Community Perspective*, which can be found at: http://www.arb.ca.gov/ch/handbook.pdf.

Numerous health studies have demonstrated potential adverse health effects associated with living near highly travelled roadways. In traffic-related studies, the additional non-cancer health risk attributable to proximity is seen within 1,000 feet and is strongest within 300 feet[4]. California freeway studies show about a 70% drop off in particulate pollution levels at 500 feet[5]. As a result of these studies, the California Air Resources Board (CARB) developed a Land Use Handbook[6] that recommends avoiding new sensitive land uses (such as housing) within 500 feet of a freeway. Additional research has shown that the near roadway environment also contains elevated levels of many pollutants that adversely affect human health, including some pollutants that are unregulated (e.g., ultrafine particles) and whose potential health effects are still emerging[7].

3-6 <u>Limits to Enhanced Filtration Units</u>
While the health science behind recommending against placing new homes in close proximity to freeways is clear, the SCAQMD staff recognizes that there are many factors Lead Agencies must consider when making local planning and land use decisions such as siting new housing. Further, many mitigation measures have been proposed for other projects to reduce exposure, including building filtration systems, sounds walls, vegetation barriers, etc. However, because of the potential adverse health risks involved with siting housing near a freeway, it is essential that any proposed mitigation must be carefully evaluated in order to determine if those health risks would be brought below recognized significance thresholds.

---

3 "Health Risk Assessment Guidance for Analyzing Cancer Risk from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis" accessed at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mobile-source-toxics-analysis.

4 California Air Resources Board. April 2005. "Air Quality and Land Use Handbook: A Community Health Perspective." Accessed at: http://www.arb.ca.gov/ch/landuse.htm.

5 Ibid.

6 Ibid.

7 See Chapter 9 of the 2012 AQMP for further information. Accessed at: http://www.aqmd.gov/aqmp/2012aqmp/Final-February2013/Ch9.pdf.

3-4 Please refer to the City's response to comment 3-3.

3-5 The City will require the referenced data bases (the Guidance Document and CARB's Land Use Handbook to be considered and incorporated into the future HRAs.

3-6 The new mitigation measure identified in response to comment 3-3 incorporates that careful evaluation for potential exposures and ensures a mechanism to protect public health over the long term.

3-7 In the event that enhanced filtration units on housing residents are proposed as a mitigation measure, the Lead Agency should consider the limitations of the enhanced filtration. For example, in a study that SCAQMD conducted to investigate filters[8], costs were expected to range from $120 to $240 per year to replace each filter. In addition, because the filters would not have any effectiveness unless the HVAC system is running, there may be increased energy costs to the resident. It is typically assumed that the filters operate 100 percent of the time while residents are indoors, and it does not account for the times when the residents have their windows or doors open or are in common space areas of the project. These filters also have no ability to filter out any toxic gases from vehicle exhaust. The presumed effectiveness and feasibility of any filtration units, if proposed as a mitigation measure, should therefore be evaluated in more detail prior to assuming that they will sufficiently alleviate near roadway exposures.

3-8 SCAQMD staff is available to work with the Lead Agency to address any other air quality and health risk questions that may arise. Please contact Jack Cheng, Air Quality Specialist, CEQA IGR, at (909) 396-2448, if you have any questions regarding these comments.

Sincerely,

Lijin Sun

Lijin Sun, J.D.
Program Supervisor, CEQA IGR
Planning, Rule Development & Area Sources

LS:JC
ORC170207-03
Control Number

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[8] This study evaluated filters rated MERV 13+ while the proposed mitigation calls for less effective MERV 12 or better filters. Accessed at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/aqmdpilotstudyfinalreport.pdf.

3-7 The new mitigation measure identified in response to comment 3-3 incorporates that careful evaluation for potential exposures and ensures a mechanism to protect public health over the long term.

3-8 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project.

COMMENT LETTER #4

Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
Environmental Protection

Barbara A. Lee, Director
5796 Corporate Avenue
Cypress, California 90630

Edmund G. Brown Jr.
Governor

March 3, 2017

Mr. Joseph Lambert
Director of Development Services
City of Placentia
401 East Chapman Avenue
Placentia, California 92870

INITIAL STUDY AND PROPOSED MITIGATED NEGATIVE DECLARATION (ND) FOR GENERAL PLAN AMENDMENT (GPA) 2017-01 AND ZONE CHANGE (ZC) 2017-01 TO ESTABLISH THE PACKING HOUSE DISTRICT TRANSIT-ORIENTED DEVELOPMENT PROJECT (SCH# 2017021012)

Dear Mr. Lambert:

4-1 The Department of Toxic Substances Control (DTSC) has reviewed the subject ND. The following project description is stated in the ND: "In conjunction with the County of Orange, Orange County Transit Authority (OCTA), the City of Placentia (City) will install a new train station to accommodate access for City residents to the regional passenger train (Metrolink and Surfliner) system. The City proposes to support this new regional system connection by creating a Transit-Oriented Development (TOD) zone classification and land use designation in the Packing House District of the City, which is located immediately adjacent to the proposed train platform. The objective of these new land use designations/classifications is to allow high-density transit-oriented development in the immediate vicinity of the train platform to facilitate use of the regional system and redevelopment of the area surrounding the new station. To accomplish this, the City is proposing to adopt a TOD land use designation."

Based on the review of the submitted document DTSC has the following comments:

4-2 1. The ND should identify and determine whether current or historic uses at the project site may have resulted in any release of hazardous wastes/substances. DTSC recommends a Phase I Environmental Site Assessment (Phase I) to identify any recognized environmental conditions.

4-3 2. If there are any recognized environmental conditions in the project area, then proper investigation, sampling and remedial actions overseen by the appropriate regulatory agencies should be conducted prior to the new development or any construction.

RESPONSES TO COMMENTS
LETTER #4
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

4-1 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. This is an accurate summary of the TOD project.

4-2 Please refer to pages 42 and 43. At a broad level contaminated sites have been identified and mitigation measure VIII-2 requires additional site assessment, and if necessary remediation, prior to approval of any site specific project. The City believes this fulfills the requirements outlined in this comment.

4-3 Please refer to response to comment 4-2. Recognized environmental conditions (RECs) will be address prior to site development under mitigation measure VIII-2.

4-4

3. The ND states: "The approximate 28.2-acre area where the TOD land use designation will be established is located north and south of Crowther Avenue, east of the State Highway 57 Freeway, south of the BNSF railroad tracks, and west of the extension of Bradford Avenue in the City of Placentia." Railroad easements and rail yards are commonly underlain by contaminated soil and groundwater due to spillage of chemicals, fuels, and lubricants, and use of pesticides and herbicides along the tracks for weed control. Proper investigation and/or mitigation activities, if necessary, should be implemented at the project area prior to construction. This information should be addressed in the ND.

4-5

4. The ND further states: "This is an old area of the City that contains older structures, some dating back to 1910." If planned activities include building modifications/demolitions, lead-based paints or products, mercury, and asbestos containing materials (ACMs) should be addressed in accordance with all applicable and relevant laws and regulations. Mitigation measures should be included in the ND. In addition, evaluate whether polychlorinated biphenyls (PCBs) containing materials are present in onsite buildings and address as necessary to protect human health and the environment.

4-6

5. If soil contamination is suspected or observed in the project area and planned activities include export/disposal of soil, then excavated soil should be sampled prior to export/disposal. If the soil is contaminated, it should be disposed of properly in accordance with all applicable and relevant laws and regulations. In addition, if the project proposes to import soil to backfill the excavated areas, proper evaluation and/or sampling should be conducted to make sure that the imported soil is free of contamination.

4-7

6. If the project plans include discharging wastewater to a storm drain, you may be required to obtain an NPDES permit from the overseeing Regional Water Quality Control Board (RWQCB).

4-8

7. If during construction/demolition of the project, soil and/or groundwater contamination is suspected, construction/demolition in the area should cease and appropriate health and safety procedures should be implemented. If it is determined that contaminated soil and/or groundwater exist, the ND should identify how any required investigation and/or remediation will be conducted, and the appropriate government agency to provide regulatory oversight.

If you have any questions regarding this letter, please contact me at (714) 484-5476 or email at Johnson.Abraham@dtsc.ca.gov.

Sincerely,

Johnson P. Abraham
Project Manager
Brownfields Restoration and School Evaluation Branch
Brownfields and Environmental Restoration Program - Cypress

ed/sh/ja

cc: Governor's Office of Planning and Research (via e-mail)
State Clearinghouse
P.O. Box 3044
Sacramento, California 95812-3044
State.clearinghouse@opr.ca.gov

Mr. Guenther W. Moskat, Chief (via e-mail)
Planning and Environmental Analysis Section
CEQA Tracking Center
Department of Toxic Substances Control
Guenther.Moskat@dtsc.ca.gov

Mr. Dave Kereazis (via e-mail)
Office of Planning & Environmental Analysis
Department of Toxic Substances Control
Dave.Kereazis@dtsc.ca.gov

Mr. Shahir Haddad, Chief (via e-mail)
Schools Evaluation and Brownfields Cleanup
Brownfields and Environmental Restoration Program - Cypress
Shahir.Haddad@dtsc.ca.gov

CEQA# 2017021012

4-4 The TOD does not encompass any rail property and does not affect any development within the rail right-of-way (ROW). Property within the TOD and in close proximity to the rail ROW will be examined in accordance with mitigation measure VIII-2.

4-5 It is anticipated that the Phase 1 Environmental Site Assessments (ESA) prepared in accordance with measure VIII-2 will identify the presence of all hazardous materials on each property proposed for development. Specific remediation or hazardous waste management requirements will be detailed in these studies prior to development. The City will use the future ESAs to establish conditions of approval that will ensure site development protects public health, for all RECs.

4-6 It is anticipated that the Phase 1 Environmental Site Assessments (ESA) prepared in accordance with measure VIII-2 will identify the presence of any contaminated soil. Specific remediation requirements will be detailed in these studies for handling any contaminated soils prior to development. The City will use the future ESAs to establish conditions of approval that will ensure contaminated soil is managed properly to protect human health.

4-7 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. Due to the depth to groundwater, it is not anticipated that any wastewater will be discharged to a storm drain. However, it such discharge will occur, an appropriate discharge permit will be obtained from the Santa Ana Regional Water Quality Control Board.

4-8 The existing data on contamination within the TOD project area indicates that the potential to encounter such contamination is very low. Regardless, the City concludes that sufficient regulations are already in place to ensure that newly discovered contamination will be reported; properly managed; and remediated prior to new residents or other sensitive uses being located within the TOD area.

COMMENT LETTER #5

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 12
1750 EAST FOURTH STREET, SUITE 100
SANTA ANA, CA 92705
PHONE (657) 328-6267
FAX (657) 328-6510
TTY 711
www.dot.ca.gov

Serious drought.
Help save water!

March 6, 2017

File: IGR/CEQA
SCH#: 2017021012
12-ORA-2017-00445
SR-57/91

Mr. Joseph Lambert
City of Placentia
401 East Chapman Avenue
Placentia, CA 92870

Dear Mr. Lambert:

5-1 Thank you for including the California Department of Transportation (Caltrans) in the review of the Mitigated Negative Declaration (MND) for the proposed Packing House District Transit-Oriented Development Project (SCH #2017021012). The mission of Caltrans is to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. The Local Development-Intergovernmental Review (LD-IGR) Program reviews land use projects and plans to ensure consistency with our mission and state planning priorities of infill, conservation, and efficient development. In conjunction with the County of Orange, Orange County Transit Authority (OCTA), the City of Placentia will install a new train station to accommodate access for city residents to the regional passenger train system. The City proposes to support this new regional system connection by creating a transit-oriented development (TOD) zone classification and land use designation in the packing house district of the city, which is located immediately adjacent to the proposed train platform. The objective of these new land use designations/classifications is to allow high density-TOD in the immediate vicinity of the train platform to facilitate use of the regional system and redevelopment of the area surrounding the new station. The project is in proximity to State Route 57 (SR-57), and SR-91. Caltrans is a responsible agency on this project, and has the following comments on the MND and Transportation Impact Study (TIS):

Comments from Traffic Operations on MND Appendix 5a – TIS:

5-2
1. With the added volume from the proposed project, a concern is adequate storage length at the studied intersections. The TIS should include a queue analysis of the on/off-ramps for Caltrans facilities using actual signal timing, not optimal (default) signal timing. For queue analysis on Caltrans off-ramps and intersections, refer to the Highway Capacity Manual (HCM 2010) methodology, and utilize Highway Capacity Software (HCS) 2010. For queue/storage length analysis on Caltrans on-ramps, refer to the Caltrans Ramp Meter Design Manual (RMDM) methodology.

RESPONSES TO COMMENTS
LETTER #5
CALIFORNIA DEPARTMENT OF TRANSPORTATION
DISTRICT 12

5-1 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. This is an accurate summary of the TOD project.

5-2 The traffic study focused on the collective trip generation and identified 12 mitigation measures including measure XVI-1, which acknowledges the possible need for additional improvements to reduce congestion and queuing. As development occurs, the City must monitor project-related trip generation and effects on the City's and the regional circulation system. When development begins additional traffic data will be submitted to the City and where appropriate the City will conduct the additional evaluations in accordance with the recommendations in this comment.

5-3 2. The analysis uses the HCM methodology. Please confirm that for facilities within Caltrans jurisdiction HCM 2010 is used.

5-4 3. The intersection analysis uses a Peak Hour Factor (PHF) of 1.0 for all study scenarios. What is the justification for the use of this value (PHF = 1.0)? For locations with existing counts PHF can be derived, and for future conditions a PHF in the range of 0.92 to 0.95 could be used.

5-5 4. For Tables 2-2a, 2-2b, 2-2c, and 4-2, the description for ITE 220 is Apartments not Single-Family.

5-6 5. For Table 2-2c: The Northwest Area does not have the existing residential component. The Southeast Area only has residential uses (which are not visible from aerial maps) and does not include any of the warehousing component. The Northeast Area is vacant land but has the warehousing component, this area is vacant and not generating any trips.

5-7 6. Tables 2-2c and 4-2 do not apply the reported rates, from ITE 9th Edition, for development type ITE 150 (Daily 3.56, AM 0.3, and PM 0.32). For example the reported trips (Daily 441, AM 77, and PM 55) are greater than those using the rates from ITE (Daily 313, AM 26, and PM 28).

5-8 7. Page 6 - Study Intersections: The study intersections do not include SR-91 ramps and ramp intersections. Study boundary of the traffic study report should expand to the area required by "The Guide for the Preparation of Traffic Impact Studies" in Section III-A, Boundary of the Traffic Studies. Web link to the guide is at:http://www.dot.ca.gov/hq/tpp/offices/ocp/igr_ceqa_files/tisguide.pdf

5-9 8. Please resubmit the requested impact analysis for the State Highway System (SHS) for review by Caltrans.

5-10 9. Although the City has proposed mitigation measures for significant impacts to Caltrans facilities, the City will need to coordinate with Caltrans Traffic Operations to identify appropriate mitigation measures on Caltrans facilities.

Comments from Transit Planning on MND:

5-3 The Synchro program was utilized for the HCM level-of-service analyses. The HCM 2010 states that an intersection with a volume-to-capacity (v/c) ratio greater than 1.0 is LOS F, regardless of the delay. Since the HCM 2010 report does not report the v/c ratio, the HCM 2000 report, which does state the intersection v/c ratio, was utilized.

5-4 The PHF of 1.0 was utilized per direction by City staff.

5-5 There are no single-family dwelling units for the project.

5-6 The existing trip generation was based on actual land use data provided by the City. Thus, the data and trip generation values are correct, but the table titles were wrong. The corrected table is provided as an attachment to this page.

5-7 The trip generation utilized is a conservative assessment.

5-8 The SR-91 interchange was not evaluated since the number of project trips (AM or PM) is less than 50 trips in that area.

5-9 Prior to authorizing any additional trips within the TOD project area, the City will provide the additional State Highway System (SHS) impact analysis.

5-10 The City will coordinate recommended final designs for improvements to Caltrans facilities with the District 12. It is understood that any improvements will require concurrence and approval from District 12.

Table 2-2c – Net Project Trip Generation

Scenario	Quantity	Daily Trips	AM Peak Hour Trips	PM Peak Hour Trips	AM Peak Hour Trips		PM Peak Hour Trips	
					In	Out	In	Out
Existing Land Use								
Northwest Area								
Industrial: Warehousing (ITE 150)	87.94 KSF GFA	441	77	55	61	16	14	41
Residential: Single-Family (ITE 210)	13 DU	124	11	13	3	8	8	5
Residential: Apartment (ITE 220)	4 DU	27	2	2	0	2	1	1
Southeast Area								
Industrial: Warehousing (ITE 150)	139.22 KSF GFA	655	99	74	78	21	19	56
Total		1,247	189	144	142	47	42	103
100% Residential: Single-Family (ITE 220) - 752 DU **TOD Project, 5,000 Daily Trips**								
Northwest Area (35%)		1,750	134	163	27	107	106	57
Southeast Area (35%)		1,750	134	163	27	107	106	57
Northeast Area (30%)		1,500	115	140	23	92	91	49
Total		5,000	383	466	77	306	303	163
Net Trip Generation		**3,753**	**194**	**322**	**-65**	**259**	**261**	**60**

Trip Distribution and Assignment

After the net proposed project trips are evaluated, the next step is to distribute those trips over the roadway network. A graphical summary of trip distribution by percentage is illustrated in Figure 2-2. Based on the trip distribution percentages new trips were then assigned to the network. Figure 2-3 illustrate the morning (AM) and afternoon (PM) peak-hour net project trips (i.e., the net difference after subtracting existing land-use trips from gross project trips) as assigned to various streets and intersections.

5-11 10. Please continue to coordinate with OCTA, and other stakeholders to discuss/determine viable opportunities to enable employees and visitors within the Placentia Packing House District Transit-Oriented Development Project to choose alternative modes of transportation and for implementation of proposed Transportation Demand Management (TDM) strategies including proposed Mitigation Measure XVI-12.

Encroachment Permits:

5-12

11. Any work performed within Caltrans Right-of-Way (R/W) will require discretionary review and approval by Caltrans and an encroachment permit will be required for any work within the Caltrans R/W prior to construction.

12. For specific details on Caltrans Encroachment Permits procedure, please refer to Caltrans Encroachment Permits Manual. The latest edition of the Manual is available on the web site: http://www.dot.ca.gov/trafficops/ep/index.html

13. Additional information regarding encroachment permits may be obtained by contacting the Caltrans Permits Office at (657) 328-6553. Early coordination with Caltrans is strongly advised for all encroachment permits.

5-13 We would be happy to meet with the City in person to discuss all of these comments. Please contact Aileen Kennedy at (657) 328-6276 or aileen.kennedy@dot.ca.gov to set up this meeting or for additional questions.

Sincerely,

Maureen El Harake

MAUREEN EL HARAKE
Branch Chief, Regional-IGR-Transit Planning
District 12

Enclosures

c: OPR State Clearinghouse
Dan Phu, OCTA

5-11 Please refer to mitigation measure XVI-12 regarding the requirement to enhance bus service to the TOD Project area.

5-12 The City looks forward to working with Caltrans for any work performed within the Caltrans ROW. The City will utilize the Encroachment Permits Manual to compile and submit any proposed work effort within this ROW. It is understood that such permits are discretionary on the part of District 12.

5-13 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project.

COMMENT LETTER #6

Edmund G. Brown Jr., Governor

STATE OF CALIFORNIA
NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone (916) 373-3710
Fax (916) 373-5471
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

RECEIVED
MAR 06 2017
PLANNING

February 28, 2017

Joseph Lambert
City of Placentia
401 E. Chapman Avenue
Placentia, CA 92870

Re: SCH# 2017021012 GPA 2017-01 and ZC 2017-01 Packing House District Transit, Orange County.

Dear Mr. Lambert:

The Native American Heritage Commission (NAHC) has reviewed the Mitigated Negative Declaration (MND) prepared for the project referenced above.

6-1 The California Environmental Quality Act (CEQA)[1], specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment.[2] If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared.[3] In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

6-2 CEQA was amended in 2014 by Assembly Bill 52. (AB 52).[4] **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** AB 52 created a separate category for "tribal cultural resources"[5], that now includes "a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment.[6] Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource.[7] Your project may also be subject to **Senate Bill 18 (SB 18)** (Burton, Chapter 905, Statutes of 2004), Government Code 65352.3, if it also involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space. **Both SB 18 and AB 52 have tribal consultation requirements.** Additionally, if your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966[8] may also apply.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

6-3 Agencies should be aware that AB 52 does not preclude agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52. For that reason, we urge you to continue to request Native American Tribal Consultation Lists and Sacred Lands File searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/. Additional information regarding AB 52 can be found online at http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf, entitled "Tribal Consultation Under AB 52: Requirements and Best Practices".

The NAHC recommends lead agencies consult with all California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources.

A brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments is also attached.

Please contact me at katy.sanchez@nahc.ca.gov or call (916) 373-3712, if you have any questions.

Sincerely,

Katy Sanchez

Katy Sanchez
Associate Environmental Planner

Attachment
cc: State Clearinghouse

---

1 Pub. Resources Code § 21000 et seq.
2 Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, § 15064.5 (b); CEQA Guidelines Section 15064.5 (b)
3 Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd.(a)(1); CEQA Guidelines § 15064 (a)(1)
4 Government Code 65352.3
5 Pub. Resources Code § 21074
6 Pub. Resources Code § 21084.2
7 Pub. Resources Code § 21084.3 (a)
8 154 U.S.C. 300101, 36 C.F.R. § 800 et seq.

RESPONSES TO COMMENTS
LETTER #6
NATIVE AMERICAN HERITAGE COMMISSION

6-1 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. The City's proposed General Plan Amendment and Zone Change for the TOD project area does not approve any activities that would physically change the existing developed environment. Therefore, the determination of whether a future project will cause a substantial adverse change in the significance of a historical resource is assigned to future site specific projects proposed for development under the TOD land use designation and zone classification. Mitigation measure VI-1 ensure that any historical resources are given proper recognition and attention.

6-2 The City initiated AB 52 consultation with tribes that requested such consultation and received a letter from the Kizh Nation requesting additional mitigation. Please refer to Comment Letter #2 in this package. Additional mitigation has been added in response to this request.

6-3 Your comment is noted and will be made available to the City decision-makers prior to a decision on the proposed project. The suggested consultation has been completed.

Pertinent Statutory Information:

Under AB 52:
AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:
Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a **lead agency** shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice.
A **lead agency** shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project.[9] and **prior to the release of a negative declaration, mitigated negative declaration or environmental impact report**. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18).[10]
The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

a. Alternatives to the project.
b. Recommended mitigation measures.
c. Significant effects.[11]

1. The following topics are discretionary topics of consultation:
   a. Type of environmental review necessary.
   b. Significance of the tribal cultural resources.
   c. Significance of the project's impacts on tribal cultural resources.

If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency.[12]
With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process **shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10.** Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public.[13]
If a project may have a significant impact on a tribal cultural resource, **the lead agency's environmental document shall discuss** both of the following:

a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource.[14]

Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached.[15]

Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 **shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program**, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable.[16]
If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, **the lead agency shall consider feasible mitigation** pursuant to Public Resources Code section 21084.3 (b).[17]
An environmental impact report **may not be certified**, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days.[18]

This process should be documented in the Tribal Cultural Resources section of your environmental document.

Under SB 18:
Government Code § 65352.3 (a) (1) requires consultation with Native Americans on general plan proposals for the purposes of "preserving or mitigating impacts to places, features, and objects described § 5097.9 and § 5091.993 of the Public Resources Code that are located within the city or county's jurisdiction. Government Code § 65560 (a), (b), and (c) provides for consultation with Native American tribes on the open-space element of a county or city general plan for the purposes of protecting places, features, and objects described in Sections 5097.9 and 5097.993 of the Public Resources Code.

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[9] Pub. Resources Code § 21080.3.1, subds. (d) and (e)
[10] Pub. Resources Code § 21080.3.1 (b)
[11] Pub. Resources Code § 21080.3.2 (a)
[12] Pub. Resources Code § 21080.3.2 (a)
[13] Pub. Resources Code § 21082.3 (c)(1)
[14] Pub. Resources Code § 21082.3 (b)
[15] Pub. Resources Code § 21080.3.2 (b)
[16] Pub. Resources Code § 21082.3 (a)
[17] Pub. Resources Code § 21082.3 (e)
[18] Pub. Resources Code § 21082.3 (d)

- SB 18 applies to **local governments** and requires them to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf
- Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.**[19]
- There is no Statutory Time Limit on Tribal Consultation under the law.
- Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research,[20] the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction.[21]
- Conclusion Tribal Consultation: Consultation should be concluded at the point in which:
  - The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
  - Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation.[22]

NAHC Recommendations for Cultural Resources Assessments:

- Contact the NAHC for:
  - A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
  - A Native American Tribal Contact List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.
    - The request form can be found at http://nahc.ca.gov/resources/forms/.
- Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
  - If part or the entire APE has been previously surveyed for cultural resources.
  - If any known cultural resources have been already been recorded on or adjacent to the APE.
  - If the probability is low, moderate, or high that cultural resources are located in the APE.
  - If a survey is required to determine whether previously unrecorded cultural resources are present.
- If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
  - The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

Examples of Mitigation Measures That May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

- Avoidance and preservation of the resources in place, including, but not limited to:
  - Planning and construction to avoid the resources and protect the cultural and natural context.
  - Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
- Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
  - Protecting the cultural character and integrity of the resource.
  - Protecting the traditional use of the resource.
  - Protecting the confidentiality of the resource.
- Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
- Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed.[23]
- Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated.[24]

The lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.

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[19] (Gov. Code § 65352.3 (a)(2)).
[20] pursuant to Gov. Code section 65040.2.
[21] (Gov. Code § 65352.3 (b)).
[22] (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).
[23] (Civ. Code § 815.3 (c)).
[24] (Pub. Resources Code § 5097.991).

- Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources.[25] In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
- Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
- Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

[25] per Cal. Code Regs., tit. 14, section 15064 5(f) (CEQA Guidelines section 15064.5(f)).