Orion Center Operations and Maintenance Facility

Local Mobility Analysis

December 2021

Prepared for:

City of Carlsbad

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Executive Summary

ES.1 Study Purpose and Project Description

The purpose of this Local Mobility Analysis (LMA) is to identify and document potential transportation related impacts associated with the development of the proposed Orion Center project (the "Proposed Project"), as well as to recommend mitigation measures for any identified transportation related impacts to study area roadway segments, intersections, and multi-modal facilities.

The project proposes to construct a new maintenance and operations center at the City of Carlsbad's current operations site, located at 2600 Orion Way in the City of Carlsbad. The Proposed Project includes site improvements such as parking, grading, and landscaping, as well as operational uses such as a new 41,900 square foot 2-story operations building, warehouse storage buildings, shop facilities, a parking structure, outdoor storage shade canopies, a new vehicle wash station, and additional parking for operational and staff vehicles and improvements to an existing fueling station. It should be noted that in addition to the new facilities described above, the project would make the following improvements to existing facilities onsite:

- Remodel the existing maintenance building in the northwestern portion of the project site to raise a portion of the roof and make interior improvements.
- Improve and repurpose an existing 20,000 sq.ft. materials storage yard within the eastern portion of the project site.
- Add a shade canopy and replace the existing fuel dispensers of the existing fueling station.

Trip Generation

Project trip generation estimates were derived utilizing the trip generation rates outlined in SANDAG's *Not So Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002. Based on these rates, the Proposed Project is anticipated to generate a total of 1,120 daily trips with 147 (131-in / 16-out) during the AM peak hour and 142 (31-in / 111-out) during the PM peak hour.

ES.2 Transportation Facilities Analysis

The following summarizes the analysis results and the identified transportation related impacts associated with the proposed project, based on the City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.

Existing Conditions

Roadway

All roadway segments were identified to operate at LOS D or better during the directional peak hour analysis.

Intersection Analysis – Left-Turn Pocket Length Assessment

No physical improvements are recommended at any of the intersection approaches.

Intersection Analysis – Dual Left-Turn Lane Assessment

No additional left-turn lanes are required at any of the left-turn approaches within the study area.

Intersection Analysis – Dedicated Right-Turn Lane Assessment

No additional dedicated right-turn lanes are recommended within the study area.

Existing Plus Project Conditions

Roadway
All of the study area roadway segments are anticipated to operate at acceptable LOS D or better during directional peak hour analysis, under Existing Plus Project Conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment
The following improvements are recommended:

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of excess queue length is anticipated at this approach during the PM peak hour. **Therefore, the project shall extend the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment
No additional left-turn lanes are required at any of the study area intersections.

Intersection Analysis – Dedicated Right-Turn Lane Assessment
No additional dedicated right-turn lanes are recommended at either of the approaches.

Cumulative Conditions

Roadways
All roadway segments were identified to operate at LOS D or better during the directional peak hour analysis.

Intersection Analysis – Left-Turn Pocket Length Assessment
No physical improvements are recommended at any of the intersection approaches.

Intersection Analysis – Dual Left-Turn Lane Assessment
No additional left-turn lanes are required at any of the left-turn approaches within the study area.

Intersection Analysis – Dedicated Right-Turn Lane Assessment
No additional dedicated right-turn lanes are recommended within the study area.

Cumulative Plus Project Conditions

Roadways

All of the study area roadway segments are anticipated to operate at acceptable LOS D or better during directional peak hour analysis, under Cumulative Plus Project Conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment

Extending the left-turn lanes is recommended at the following intersections:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – A total excess of **36 feet** of queue length is calculated at this approach during the AM peak hour. The total number of vehicle trips utilizing this left-turn lane during the AM peak hour is 875, of which 262 are cumulative and 32 (or 10.9% of the total cumulative trips) are vehicle trips associated with the Proposed Project. **Therefore, the project shall pay a fair-share contribution of 10.9% to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach.**

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of queue length is anticipated at this approach during the PM peak hour. The Proposed Project is the only project adding trips to this left-turn lane. **Therefore, the project shall pay for 100% of the costs associated with extending the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment

No additional left-turn lanes are required at any of the study area intersections.

Intersection Analysis – Dedicated Right-Turn Lane Assessment

No additional dedicated right-turn lanes are recommended at either of the approaches.

MMLOS Facilities

None of the roadways within the study area are subject to Pedestrian nor Bicycle LOS standards. Therefore, these analyses are not included in this report. Transit facilities within the project study area were identified to operate at LOS D under Existing conditions.

Transportation Systems Management

Since the Proposed Project adds trips to a roadway segment exempt from vehicle LOS analysis, the project has to implement Transportation Systems Management measures. The project is anticipated to add more than 11 peak hour trips in a single direction of travel to El Camino Real between Palomar Airport Road and La Costa Avenue, therefore, extending the left-turn lanes is recommended at the following intersections:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – **The project shall reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach.** The proposed project shall pay a 10.9% fair-share contribution to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach. Additionally, the proposed project will pay for the installation of a traffic signal controller.

This recommendation increases capacity at the intersection, which increases the efficiency of traffic signals.

Transportation Demand Management

Since the Proposed Project adds trips to a roadway segment exempt from vehicle LOS analysis, the project has to implement Transportation Demand Management (TDM) measures. The Proposed Project prepared a Tier 3 TDM plan, which meets the requirements of the TDM Ordinance and Mobility Element Policy 3-P.11. A Tier 3 TDM plan requires a total of 18 points- comprised of four (4) points for required strategies, at least six (6) points for infrastructure measures, and the remaining points for programmatic strategies.

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1.0 Introduction

The purpose of this Local Mobility Analysis (LMA) is to identify and document potential transportation related impacts associated with the development of the proposed Orion Center project (the "Proposed Project"), as well as to recommend mitigation measures for any identified transportation related impacts to study area roadway segments, intersections, and multi-modal facilities.

1.1 Project Background

The project proposes to construct a new maintenance and operations center at the City of Carlsbad's current operations site, located at 2600 Orion Way in the City of Carlsbad. The Proposed Project includes site improvements such as parking, grading, and landscaping, as well as operational uses such as a new 41,900 SF 2-story operations building, warehouse storage buildings, shop facilities, a parking structure, outdoor storage shade canopies, a new vehicle wash station, additional parking for operational and staff vehicles and improvements to an existing fueling station. It should be noted that in addition to the new facilities described above, the project would make the following improvements to existing facilities onsite:

- Remodel the existing maintenance building in the northwestern portion of the project site to raise a portion of the roof and make interior improvements.
- Improve and repurpose an existing 20,000 sq.ft. materials storage yard within the eastern portion of the project site.

Figure 1-1 displays the Proposed Project's regional location while **Figure 1-2** displays the Proposed Project's site plan.

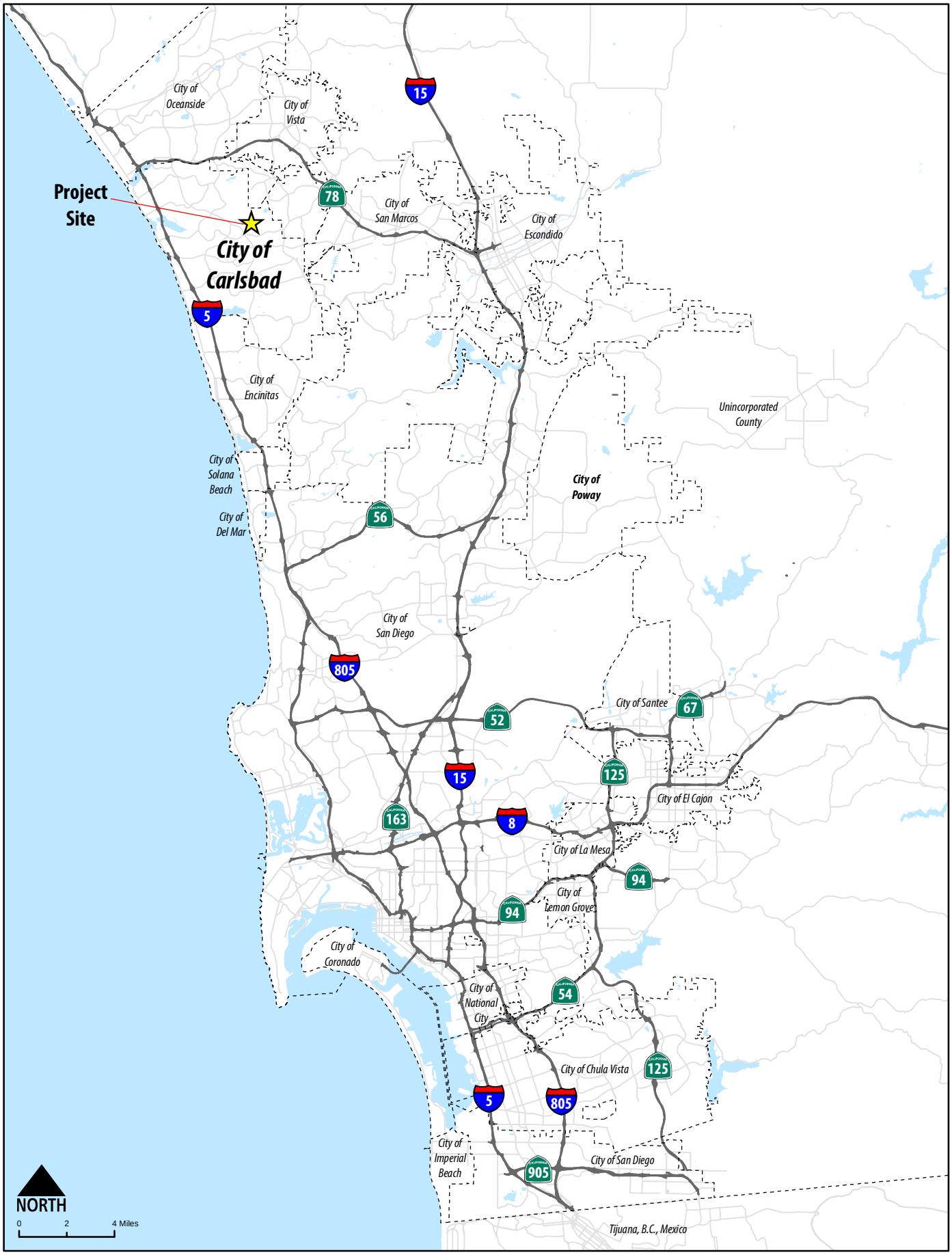
1.2 Report Organization

Following this Introduction chapter, this report is organized into the following chapters:

2.0 *Methodology* – This chapter describes the methodologies and standards utilized to analyze roadway and intersection traffic conditions.

3.0 *Proposed Project* – This chapter describes the proposed Orion Center project including trip generation, trip distribution patterns, and project trip assignments for the various traffic analysis study scenarios.

4.0 *Transportation Facilities Analysis* – This chapter describes the general overview of the City of Carlsbad's approach to the preparation of transportation impact studies to maintain consistency with its General Plan – Mobility section. This chapter describes the project study area, existing street network, traffic volumes, and analysis of existing conditions utilizing the methodology described in the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.*



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

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Figure 1-1
Project Regional Location

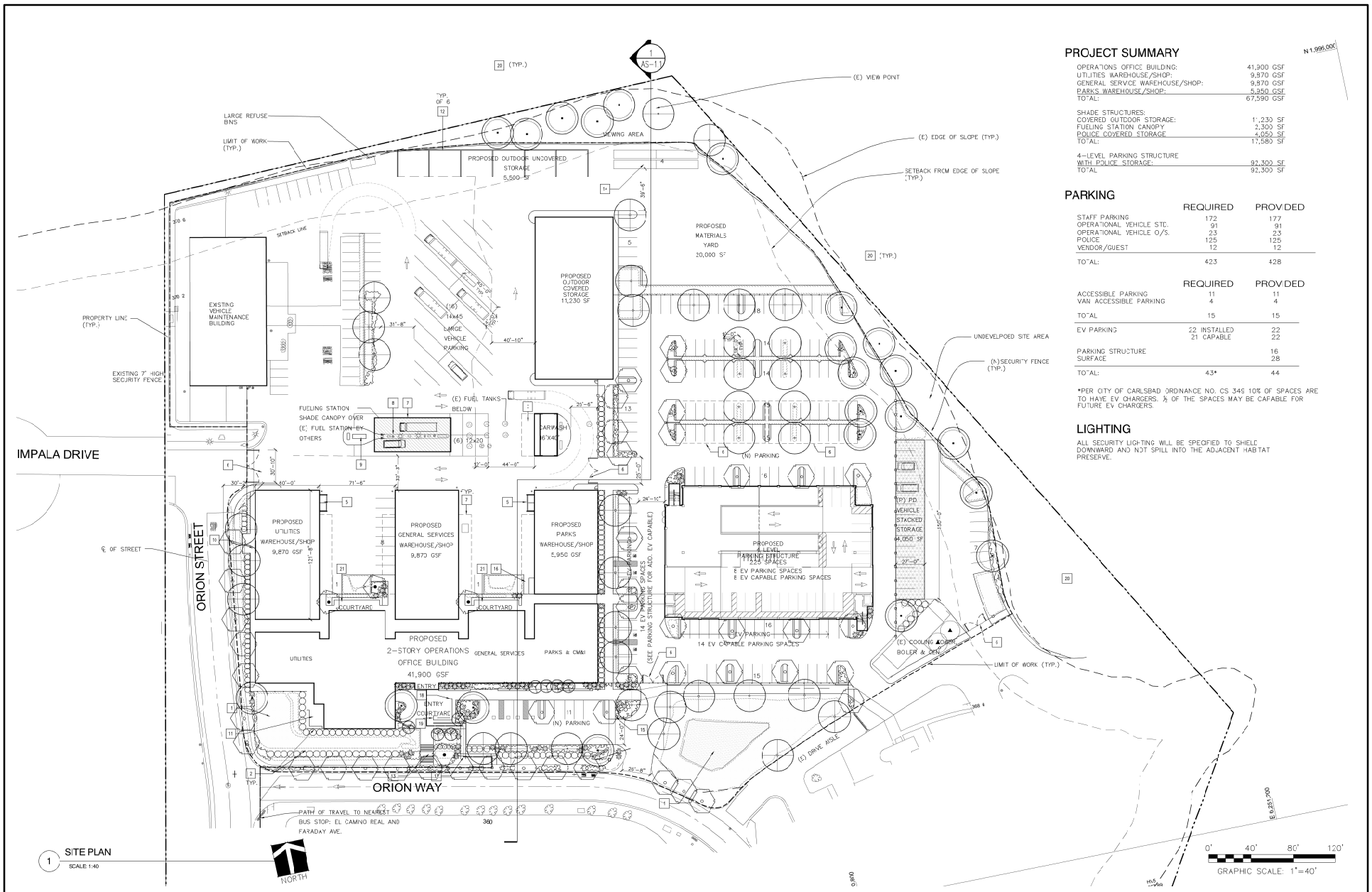

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Figure 1-2
Project Site Plan

2.0 Methodology

The methodologies included in the *City of Carlsbad Transportation Impact Analysis Guidelines* are utilized to analyze and identify the transportation related impacts to transportation facilities within the City of Carlsbad. The methodologies and standards used to analyze these impacts are discussed below.

2.1 Transportation Facilities Analysis Methodology

The Transportation Facilities Analysis is based on the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018,* which outlines evaluation of transportation facilities based on their typologies, and it defines analysis methodologies, significant impacts, and other necessary considerations. Roadway segment analysis, signalized intersection analysis (queueing at turn lanes), and Multi-Modal Level of Service (MMLOS) are analyzed and included in this report.

The *City of Carlsbad Transportation Impact Analysis Guidelines* identifies the modes that need to be evaluated based on the street typologies of the roadways connecting the project to the citywide transportation system. **Table 2.1** identified the various street typologies and illustrates the mode analysis required for each Mobility Element roadway type within the City of Carlsbad.

Table 2.1 Carlsbad Livable Streets Guide

Street Typology and Accommodated Modes		
Accommodated Modes	Subject to MMLOS Standard (Y/N)	Street Typology Description and Preferred Attributes
Freeways		
Automobile	Y	• High-speed facilities designed to accommodate vehicles and buses moving through the city and region • Bicycles and pedestrians are prohibited
Public Transit	Y	
Arterial Streets		
Automobile	Y	• These are the primary vehicle routes through the city for both local and regional vehicle trips. • Designed to safely move all modes of travel while efficiently moving vehicles and buses throughout the city. • Traffic signals shall be coordinated to optimize vehicle movements • Bicycle lanes shall be provided and can be further enhanced or complemented by other facilities or off-street pathways • Pedestrian facilities to be provided consistent with ADA requirements • Mid-block crossings should not be provided • On-street parking should be prohibited along these corridors • Vertical traffic calming techniques (such as speed tables, humps, etc.) should not be considered • Special considerations can be considered on arterials within proximity to schools to enhance Safe Routes to Schools for pedestrians and bicyclists.
Pedestrians	N	
Bicycles	N	
Public Transit	Y	

Table 2.1 Carlsbad Livable Streets Guide

Street Typology and Accommodated Modes		
Accommodated Modes	Subject to MMLOS Standard (Y/N)	Street Typology Description and Preferred Attributes
Identity Streets		
Automobile	N	• These streets provide the primary access to and from the heart of the city – the Village • Designed to safely move all modes of travel while enhancing mobility for pedestrians and bicyclists • Vehicle speeds should be managed to promote safe pedestrian and bicycle movement • No pedestrian shall cross more than five vehicular travel and/or turn lanes • In addition to ADA compliant ramps and sidewalks, sidewalks should support the adjacent land uses as follows: - Adjacent to retail uses, modified/new sidewalks should generally be a minimum of 10 feet (12 feet preferred) in width where feasible and taking into consideration the traffic volumes of the adjacent roadway, and allow for the land use to utilize the sidewalk with outdoor seating and other activities - Adjacent to residential uses, modified/new sidewalks should be a minimum of six feet in width Elsewhere, modified/new sidewalks should be a minimum of eight feet in width • Where feasible, bicycle lanes should be provided • Vehicle speeds should complement the adjacent land uses • Bicycle parking should be provided in retail areas • Bike racks should be readily provided within the public right-of-way and encouraged on private property • Traffic calming devices, such as curb extensions (bulbouts) or enhanced pedestrian crossings should be considered and evaluated for implementation • Street furniture shall be oriented toward the businesses • Mid-block pedestrian crossings could be provided at appropriate locations (e.g. where sight distance is adequate and speeds are appropriate) • On-street vehicle parking should be provided. In areas with high parking demand, innovative parking management techniques should be implemented / considered • Pedestrians should typically be “buffered” from vehicle traffic using landscaping or parked vehicles
Pedestrians	Y	
Bicycles	Y	

Table 2.1 Carlsbad Livable Streets Guide

Street Typology and Accommodated Modes		
Accommodated Modes	Subject to MMLOS Standard (Y/N)	Street Typology Description and Preferred Attributes
Public Transit	N	
Village Streets		
Automobile	N	• Primary purpose is to move people throughout the Village; providing access to businesses, residences, transit and recreation within the Village area • Designed to safely move all modes of travel while enhancing mobility for pedestrians and bicyclists • Vehicle speeds should be managed to promote safe pedestrian and bicycle movement • Promote pedestrian and bicycle connectivity through short block lengths • Bicycle lanes should be provided • Bicycle boulevards can be considered • Pedestrians should be accommodated on sidewalks adjacent to the travel way (minimum 5' wide sidewalk) • Mid-block pedestrian crossings and traffic calming devices should be considered, but only at locations with high pedestrian activity levels or major destinations/attractions • On-street parking may be provided
Pedestrians	Y	
Bicycles	Y	
Public Transit	N	
Arterial Connector Streets		
Automobile	Y	• Primary purpose is to connect people to different areas and land uses of the city by connecting to/from arterial streets • Designed to safely move all modes of travel while enhancing mobility for pedestrians and bicyclists and efficiently moving vehicles between arterial streets • Bicycle lanes should be provided • Pedestrians should be accommodated on sidewalks adjacent to the travel way (minimum 5' wide sidewalk) • Mid-block pedestrian crossings and traffic calming devices should be considered, but only at locations with high pedestrian activity levels or major destinations/attractions • On-street parking may be provided
Pedestrians	Y	
Bicycles	Y	
Public Transit	N	
Neighborhood Connector Street		
Automobile	N	• Primary purpose is to connect people to different neighborhoods and land uses of the city • Designed to safely move all modes of travel while enhancing mobility for pedestrians and bicyclists • Vehicle speeds should be managed to promoted safe pedestrian and bicycle movement • Bicycle lanes should be provided
Pedestrians	Y	

Table 2.1 Carlsbad Livable Streets Guide

Street Typology and Accommodated Modes		
Accommodated Modes	Subject to MMLOS Standard (Y/N)	Street Typology Description and Preferred Attributes
Bicycles	Y	• Bicycle boulevards can be considered • Pedestrians should be accommodated on sidewalks adjacent to the travel way (minimum 5' wide sidewalk) • Mid-block pedestrian crossings and traffic calming devices should be considered, but only at locations with high pedestrian activity levels or major destinations/attractions • On-street parking may be provided
Public Transit	N	
Employment/Transit Connector Streets		
Automobile	N	• Primary purpose is to connect people to and from the employment areas of the city, as well as important destinations and major transit facilities • Designed to safely move all modes of travel while enhancing mobility for pedestrians and bicyclists and efficiently moving buses to employment, transit stations and major destinations • Vehicle speeds should be managed to promote safe pedestrian and bicycle movement • Direct connections to bus stops should be provided • Enhanced bus stops should be considered that include shelters, benches, and lighting • Bicycle lanes and sidewalks should be provided • Pedestrian crossing distances should be minimized • On-street parking may be provided
Pedestrians	Y	
Bicycles	Y	
Public Transit	Y	
Coastal Streets		
Automobile	N	• Primary purpose is to move people along the city's ocean waterfront and connect people to the beach, recreation, business and residences in close proximity to the waterfront. The street serves as a destination for people who seek to drive, walk and bicycle along the ocean waterfront. • Designed to safely move all modes of travel while enhancing mobility for pedestrian and bicyclists • Vehicle speeds shall be managed to support uses along the coast • Enhanced bicycle and pedestrian crossings should be provided, including: - High visibility crosswalks - Enhanced pedestrian notifications (e.g. responsive push-button devices) - Enhanced bicycle detection - Bicycle lanes shall be provided and can be further enhanced or complemented by other facilities (such as bicycle lane buffers or off-street pathways) • Pedestrian facilities should be a minimum of five feet and shall strive for six to eight feet in width and shall conform to ADA requirements • Pedestrian crossing distances should be minimized
Pedestrians	Y	
Bicycles	Y	

Table 2.1 Carlsbad Livable Streets Guide

Street Typology and Accommodated Modes		
Accommodated Modes	Subject to MMLOS Standard (Y/N)	Street Typology Description and Preferred Attributes
Public Transit	N	• Trail facilities should be encouraged • Opportunities for mid-block pedestrian crossings should be investigated • On-street parking should be provided • Transit facility and operation improvements should be encouraged
School Streets		
Automobile	N	• Primary purpose is to connect people to schools from nearby residential neighborhoods • Designed to safely move all modes of travel with an emphasis on providing safe pedestrian and bicycle access for students traveling to and from nearby schools. • Vehicle speeds shall be managed to support school uses (typically 25 MPH) • Enhanced bicycle and pedestrian crossings should be provided, including: - High visibility crosswalks - Enhanced pedestrian notifications (e.g. responsive push-button devices) - Enhanced bicycle detection - Bicycle lanes shall be provided and can be further enhanced or complemented by other facilities or off-street pathways • Pedestrian facilities should be a minimum of six feet and shall strive for eight feet in width and shall conform to ADA requirements • Pedestrian crossing distances should be minimized • Opportunities for mid-block pedestrian crossings should be investigated • Traffic calming devices that improve service levels and safety for pedestrians and bicyclists should be considered
Pedestrians	Y	
Bicycles	Y	
Public Transit	N	
Industrial Streets		
Automobile	Y	• Primary purpose is to connect people to businesses within the city's industrial parks • Designed to safely move all modes of travel while efficiently moving vehicles and buses from arterial streets and employment/transit connector streets to businesses • Traffic calming devices are generally discouraged given the propensity for larger trucks and heavy vehicles in this area • On-street parking may be provided as long as it does not interfere with the turning radii of heavy vehicles
Pedestrians	N	
Bicycles	N	
Public Transit	Y	
Local/Neighborhood Street		

Table 2.1 Carlsbad Livable Streets Guide

Street Typology and Accommodated Modes		
Accommodated Modes	Subject to MMLOS Standard (Y/N)	Street Typology Description and Preferred Attributes
Automobile	N	• Primary purpose is to connect people to and through residential neighborhoods and local areas of the city • Designed to safely move all modes of travel while enhancing mobility for pedestrians and bicyclists • Vehicle speeds should be managed to promote safe pedestrian and bicycle movement • Pedestrians should be accommodated on a sidewalk or soft surface trail (such as decomposed granite) unless those facilities are inconsistent with the existing desirable neighborhood character • Bicycles can be accommodated with a bicycle lane or route if vehicle volumes and/or speeds necessitate; otherwise bicycles can share the street • Bicycle boulevards can be considered • Traffic calming measures should be considered when supported by the neighborhood or when warranted for safety reasons • On-street parking should be considered
Pedestrians	Y	
Bicycles	Y	
Public Transit	N	

Source: City of Carlsbad Mobility Element, September 2015.

Roadway Segment Level of Service Analysis

Vehicular Level of Service (LOS) is a general measure of vehicle traffic operating conditions whereby a letter grade, from LOS A (no congestion) to F (high levels of congestion), is assigned. The flow of vehicles without significant impediments are considered "stable", whereas when traffic encounters interference that limits the capacity acutely, the flow becomes "unstable". These grades represent the perspective of drivers only and are an indication of the comfort and convenience associated with driving, as well as speed, travel time, traffic interruptions, and freedom to maneuver. The level of service grades are generally defined as follows:

- **LOS A** represents free flow travel for vehicles. Individual users are virtually unaffected by other vehicles in the traffic stream.
- **LOS B** represents stable flow, but the presence of other users in the traffic stream begins to be noticeable.
- **LOS C** represents a range in which the influence of traffic density on operations becomes noticeable. The ability to maneuver within the traffic stream and to select an operating speed is now clearly affected by the presence of other vehicles.
- **LOS D** borders on unstable flow. Speeds and ability to maneuver are severely restricted because of traffic congestion.
- **LOS E** represents unstable operating conditions at or near the capacity level where maneuverability is severely limited.
- **LOS F** is used to define forced or a breakdown traffic flow.

Based on the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018*, all non-freeway roadway segments that are subject to Auto MMLOS Criteria and expected to experience an increase in project traffic equal to 50 or more peak-hour trips in either direction of travel are to be analyzed using the

most current version of the *Highway Capacity Manual* (HCM), as outlined in the City's *General Plan Mobility Element (2015)*. Roadway Capacity Tables derived from the HCM were developed specifically for each roadway subject to MMLOS in the City of Carlsbad. The specific capacity calculated for each roadway takes into account key geometric and operational factors including number of lanes, type of facility, intersection cycle length, distance between intersections, and other factors related to lane capacity and signal operations. The capacity for each roadway segment was calculated using the ARTPLAN software, which was developed using the capacity calculations outlined in the HCM. The ARTPLAN software package is used nationally as a planning tool, but alternative methods can be used to calculate roadway segment capacity.

The City of Carlsbad Roadway Capacity Tables Report provides the directional capacity for different corridors throughout the City. To evaluate the operating conditions along a study corridor, peak hour volumes are compared to the roadway capacity tables to determine the segment operating conditions (i.e. LOS). **Appendix A** contains relevant tables from the City of Carlsbad Roadway Capacity Tables Report.

Signalized Intersection Analysis

All signalized intersections within the study area are subject to the signalized intersection analysis. The analysis addresses the adequacy of the signalized intersection geometry to serve the existing, forecast and project traffic through the intersection. All signalized intersections within 0.25 miles of the project, auto access driveway or intersection, shall be evaluated if the project adds trips to the left-turn or right-turning movements at the intersection. The signalized study area will be based on trip generation and trip assignment for the project. Analysis will be based on the following criteria:

- **Left-turn queue assessment:** Compare the left-turn volume with the length of the left-turn pocket(s). A general rule of thumb of one foot per left-turning vehicle per lane may be used for this analysis.
- **Left-turn volume:** If the left-turn volume exceeds 250 vehicles per hour, a second left-turn lane is recommended.
- **Right-turn volume:** if the right-turn volume exceeds 150 vehicles per hour, a dedicated right-turn lane is recommended.

Unsignalized Intersection Analysis

Unsignalized intersections located along corridors subject to Auto MMLOS within the project study area may require a traffic signal warrant analysis. A warrant analysis is required if:

- The unsignalized intersection provides direct access to the project site, or
- The unsignalized intersection provides direct access to a cumulative project considered in the Transportation Impact Analysis, or
- The unsignalized intersection has been identified by the City as a potential signalized intersection.

A warrant analysis is not required for right-turn in/right-turn out only intersections or driveways that are physically restricted by raised center median.

Multimodal Level of Service Analysis (MMLOS)

The City of Carlsbad MMLOS methodology provides a qualitative "grade" assigned to travel modes, ranging from a level of service (LOS) A to LOS F. LOS A reflects a high service standard for a travel mode (e.g. outstanding characteristics and experience for that mode) and LOS F would reflect a poor service standard for a travel mode (e.g. congestion for vehicles, inadequate bicycle, pedestrian, or transit facilities, etc.). The City's General Plan established a standard of LOS D or better only for the travel mode(s) subject to the MMLOS standard for the designated typology as identified in Table 2.1.

In 2016, the City developed a method for evaluating MMLOS. Each non-auto travel mode (pedestrian, bicycle, and transit) receives its own LOS score and corresponding letter grade as shown in **Table 2.2.** The City strives to maintain LOS D or better on each roadway for each mode of travel that is subject to this standard.

Table 2.2 MMLOS Level of Service Thresholds

Point Score	LOS
90-100	A
80-89	B
70-79	C
60-69	D
50-59	E
0-49	F

Source: City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.

The City has developed a detailed MMLOS Tool to aid in MMLOS analysis methodology. The following is a description of the MMLOS methodology and criteria outlined in the City's MMLOS Tool:

Pedestrian MMLOS for pedestrian priority streets, the MMLOS criteria evaluates the *quality* of the pedestrian system (e.g. number of vehicle lanes that need to be crossed and the speed of adjacent traffic) and the *friendliness* of the infrastructure at intersections (e.g. pedestrian countdown heads, dedicated pedestrian phases [e.g. a scramble phase], curb extensions, refuge median). In addition, the connectivity and contiguity of the pedestrian system along street sections (particularly ADA-compliant connectivity/contiguity) is a critical component of pedestrian priority streets. The following criteria are to be employed for the selection of pedestrian facilities to be analyzed:

- All pedestrian facilities that are directly connected to project access points will be included in the study area.
- All pedestrian facilities adjacent to the project development site that provide direct pedestrian access to the project site will be included in the study area.
- The analysis of each pedestrian facility will extend in each direction to the nearest intersection or connection point to a multiuse trail or path. The study area will extend from the project site (northbound and southbound OR eastbound and westbound) until a Mobility Element Road or Class I trail is reached in each direction.
- Pedestrian facilities shall include all existing and proposed sidewalks, crosswalks, signalized pedestrian phases, and ADA-compliant facilities.

- Pedestrian analysis need only be conducted for the side of the street where the project is located unless the project is located on both sides of the street, in which case both sides of the street should be studied.
- Pedestrian analysis shall be conducted for all roadway segments included in the study area that are subject to the Pedestrian MMLOS standards (see Table 2.1).

Bicycle MMLOS for bicycle priority streets, the MMLOS criteria evaluates the *quality* of the bicycle system (e.g. bicycle route, bicycle lanes, or bicycle pathway; presence of bicycle buffers from the vehicle travel way), the *amenities* of the system (e.g. presence of bicycle parking), and the *friendliness* of the infrastructure (e.g. bicycle detection at intersections, pavement conditions, presence of vehicle parking). In addition, the connectivity and contiguity of the bicycle system along street sections is a critical component of pedestrian priority streets. The following criteria are to be employed for the selection of bicycle facilities to be analyzed:

- All facilities that bicyclists can legally use shall be included in the study area from each project access point extending in each direction of travel to the nearest intersection, dedicated bicycle facility, or connection point to a multiuse trail or path. Inventory and evaluation shall include all off-street and on-street bicycle paths, lanes and routes.
- Bicycle analysis shall be conducted for both directions of travel (e.g., both sides of the street) of each facility included in the study area.
- Bicycle analysis shall be conducted for roadway segments subject the Bicycle MMLOS standards (see Table 2.1).

Transit MMLOS for transit priority streets, the MMLOS criteria evaluates the *transit vehicle right-of-way* (e.g. dedicated or shared, signal priority), *hours and frequency of service* (e.g. weekday/weekend hours, peak period highway); *performance* (e.g. on-time or late); *amenities and safety* (e.g. lighting, covered stop, bench, on-board bike/surfboard storage); and *connectivity* (e.g. to other transit routes, employment areas, schools, visitor attractions, and other major destinations). The following criteria are to be employed for the selection of transit facilities to be analyzed:

- All existing transit lines and transit stops within a ½ mile walking distances of the project site shall be included in the study area.
- If the roadways within the study area are not subject to Transit MMLOS standards no further transit analysis is required.
- All transit lines located within a ½ mile walking distance of the project site will be analyzed.
- All pedestrian routes linking the project site to a transit line within the ¼ mile walking distance boundary.
- If no transit lines are provided, but the roadways within the study area are identified as subject to transit MMLOS, the project shall complete the MMLOS worksheet for "No Transit Located within ½ Mile Walk from Subject Site or Roadway Segment".
- Transportation Demand Management Measures shall be identified for the project, which may include on-demand transit, flex or other measures.

2.2 Thresholds of Significance

City of Carlsbad Growth Management Program

The City of Carlsbad Growth Management Program "Citywide Facilities and Improvements Plan (last amended August 22,2017)" states that the performance standard for the circulation system is as follows:

> *Implement a comprehensive livable streets network that serves all users of the system – vehicles, pedestrians, bicycles and public transit. Maintain LOS D or better for all modes that are subject to this multi-modal level of service (MMLOS) standard, as identified in Table 3-1 of the General Plan Mobility Element, excluding LOS exempt intersections and streets approved by the City Council.*

Section 21.90.080 of the Carlsbad Municipal Code (Growth Management) states that:

> *If at any time after preparation of the local facilities management plan the performance standards established by a plan are not met then no development permits or building permits shall be issued within the local zone until the performance standard is met or arrangements satisfactory to the City Council guaranteeing the facilities and improvement have been made.*

To comply with the Growth Management Program, all roadway facilities identified as not meeting performance standard (LOS D) in the existing conditions scenario must be fully mitigated regardless of the project impact to that facility, or the TIA must request an exemption from the LOS D standard according to the Mobility Element Implementing Policy 3-P.9.

> *Develop and maintain a list of street facilities where specific modes of travel are exempt from the LOS standard (LOS exempt street facilities), as approved by the City Council. For LOS exempt street facilities, the City will not implement improvements to maintain the LOS standard outlines in Policy 3-P.4 if such improvements are beyond what is identified as appropriate at build out of the General Plan. In the case of street facilities where the vehicle mode of travel is exempt from the LOS standard, other than non-vehicle capacity-building improvements will be required to improve mobility through implementation of transportation demand and transportation system management measures as outlined in Policy 3-P.11, to the extent feasible, and/or to implement the livable streets goals and policies of this Mobility Element. Evaluate the list of exempt street facilities, as part of the Growth Management monitoring program, to determine if such exemptions are still warranted.*
>
> *To exempt the vehicle mode of travel from the LOS standard at a particular street intersection or segment, the intersection or street segment must be identified as built-out by the City Council because:*
>
> a. *Acquiring the right-of-way is not feasible; or*
> b. *The proposed improvements would significantly impact the environment in an unacceptable way and mitigation would not contribute to the nine core values of the Carlsbad Community Vision; or*
> c. *The proposed improvements would result in unacceptable impacts to other community values or General Plan policies; or*
> d. *The proposed improvements would require more than three through travel lanes in each direction.*

The project causes a significant impact to the transportation facility in the study area if one or more of the following criteria is met:

- The roadway facility is projected to exceed the LOS D standard and the project's traffic meets or exceeds the thresholds of significance listed in **Table 2.3**;
- A ramp meter delay exceeds 15 minutes and the project's traffic meets or exceeds the thresholds or significance listed in Table 2.3; or
- The addition of project results in a change in LOS from acceptable (LOS D or better) to deficient (LOS E or F) on a roadway segment, freeway segment or ramp; or
- The project results in a change in conditions on a roadway segment, freeway segment or ramp that exceeds the allowable thresholds for locations operating at a deficient LOS without the project (baseline conditions).

Table 2.3 Measure of Significant Project Traffic Impacts Roadways Subject to the Vehicle MMLOS Standard

Auto Facility Subject to MMLOS Thresholds	Threshold of Significance
Roadway Segment	Any trip added to a segment forecast to operate at deficient LOS requires project mitigation; Project mitigation will be determined based on project contribution to the identified impact.
Freeway Segment	1% increase in V/C or 1 mph decrease in speed
Ramp Meter	2-minute increase

Source: City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.

The project can have either a direct or cumulative impact as follows:

- **Direct Impacts:** any significant impact identified under existing conditions. Direct impacts shall be fully mitigated by the project.
- **Cumulative Impacts:** any significant impact identified under Cumulative and Horizon Year conditions. Cumulative impacts may be mitigated through fair share contribution. Projects identified for fair share contribution should be included in the City's Capital Improvement Program (CIP) or Transportation Impact Fee (TIF) program.

Any roadway section that is identified as having a significant impact must either:

- Mitigate the traffic impact to pre-project conditions, or
- Request LOS exemption from City Council for the LOS standard and identify feasible TSM & TDM mitigation.

Signalized and Unsignalized Intersection Operational Improvements

Operational improvements may be necessary at signalized and unsignalized intersections that have been identified as exceeding the operational standards previously outlined. The following will be used to determine the need for operational improvements at intersections included in the study area:

Signalized Intersections: The project will identify specific operational issues (e.g., queues projected to exceed storage capacity). Working with the City Traffic Engineer / City Engineer improvements will be identified to address the operational issues.

Unsignalized Intersections: The project will identify if signal warrants are met for all project scenarios evaluated. Based on the findings of the warrant analysis and the timing of the warrants met, the City Engineer/City Traffic Engineer will determine if a traffic signal is needed and the project responsibility for contributing or constructing the traffic signal.

Significance of Pedestrian, Bicycle, and Transit System Impacts to Consider Mitigation

This section presents the methodology to identify project-related impacts to pedestrian, bicycle and transit systems that would require mitigation measures. The following criteria are used to identify pedestrian, bicycle and transit system impacts in the defined study area:

- Pedestrian, bicycle and transit facilities within the study area where the existing condition is LOS E or F; or
- Identification of any "gaps" in the pedestrian and bicycle networks

Potential mitigation measures could include constructing or a fair share contribution toward the financing of feasible capital improvement projects related to pedestrian, bicycle, and transit facilities. Where applicable a project could contribute a fee toward local or citywide transit capital improvements or participate in Transportation Demand Management (TDM) measures that support transit operations.

Because of the qualitative nature of the MMLOS methodology, a project is significant if an existing pedestrian, bicycle or transit facility is determined to not meet the LOS D standard regardless of the forecasted number of project trips expected to use the facility. An impact occurs and is deemed significant if:

- An existing facility in the project study area does not meet the pedestrian, bicycle or transit LOS standard, or
- The project causes a standard facility to become substandard (e.g., removal of an existing bike lane or bus stop, or blocking pedestrian access), or
- A gap is identified in or directly adjacent to the study area related to pedestrian, bicycle or transit service to the project site.

3.0 Proposed Project

The project proposes to construct a new maintenance and operations center at the City of Carlsbad's current operations site, located at 2600 Orion Way in the City of Carlsbad. The Proposed Project includes site improvements such as parking, grading, and landscaping, as well as operational uses such as a new 41,900 SF 2-story operations building, warehouse storage buildings, shop facilities, a parking structure, outdoor storage shade canopies, a new vehicle wash station, parking for operational and staff vehicles and improvements to an existing fueling station. It should be noted that in addition to the new facilities described above, the project would make the following improvements to existing facilities onsite:

- Remodel the existing maintenance building in the northwestern portion of the project site to raise a portion of the roof and make interior improvements.
- Improve and repurpose an existing 20,000 sq.ft. materials storage yard within the eastern portion of the project site.
- Add a shade canopy and replace the existing fuel dispensers of the existing fueling station.

See Figure 1-2 for Proposed Project site plan.

Trip Generation

Project trip generation estimates were derived utilizing the trip generation rates outlined in SANDAG's *Not So Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region, April 2002*. The following trip rates are proposed:

- 41,900 sq.ft. of Office – The offices would be utilized by City of Carlsbad Operations and Maintenance employees; however, as a conservative approach, the standard commercial office trip rate of less than 100,000 sq.ft. found in SANDAG's *Not So Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region* was utilized to determine the number of trips generated.

- 26,330 sq.ft. of Industrial Park – This includes utilities warehouse/shop (9,870 sq.ft.), general service warehouse/shop (9,870 sq.ft.), a warehouse/shop (5,950 sq.ft.) for the Parks & Recreation Department, and a carwash (640 sq.ft.). Neither the SANDAG Not So Brief Guide to Vehicular Trip Generation nor the latest Institute of Transportation Engineers (ITE) *Trip Generation Manual* contain trip rates for the different components of the Proposed Project, such as shop facilities, a vehicle washing station, and fueling station that are only accessible to specific users (i.e. City of Carlsbad Operations and Maintenance staff) and not the public. However, the ITE *Trip Generation Manual* does contain an Industrial Park land use and average trip rate (6.83 trips / 1000 sq.ft.) which relates to a number of industrial facilities including a mix of manufacturing, service and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. See **Appendix B** for relevant excerpts from the ITE *Trip Generation Manual*.

  Given that the trip rates between SANDAG and the ITE Trip Generation Manual are similar, SANDAG's *Not So Brief Guide to Vehicular Trip Generation* rate was used to be consistent with the San Diego region.

- 35,280 sq.ft. of Storage – This includes vehicle storage shelter (4,050 sq.ft.), outdoor covered storage (11,230 sq.ft.) for Public Works Utilities, Fleet & Facilities and Parks & Recreation personnel, and a materials yard (20,000 sq.ft.). Given the description of the maintenance operations, the storage trip rates found in the SANDAG Not So Brief Guide to Vehicular Trip Generation were utilized to account for vehicles being transported to the project site to use the auto shop or for vehicles transporting materials to be stored at the yard.

Table 3.1 displays the Proposed Project's anticipated trip generation.

Table 3.1 Proposed Project Trip Generation

Land Use	Quantity	Trip Rate	Daily Trips	AM		PM	
				%	Trips	%	Trips
Office	41,900	20 / ksf	838	14%	118 (106-in / 12-out)	13%	109 (22-in / 87-out)
Industrial Park	26,330	8 / ksf	211	11%	24 (22-in / 2-out)	12%	26 (5-in / 21-out)
Storage	35,280	2 / ksf	71	6%	5 (3-in / 2-out)	9%	7 (4-in / 3-out)
Vehicle Maintenance Facility			Existing Facility				
Fueling Station			Existing Facility				
Net Total			1,120	-	147 (131-in / 16-out)		142 (31-in / 111-out)

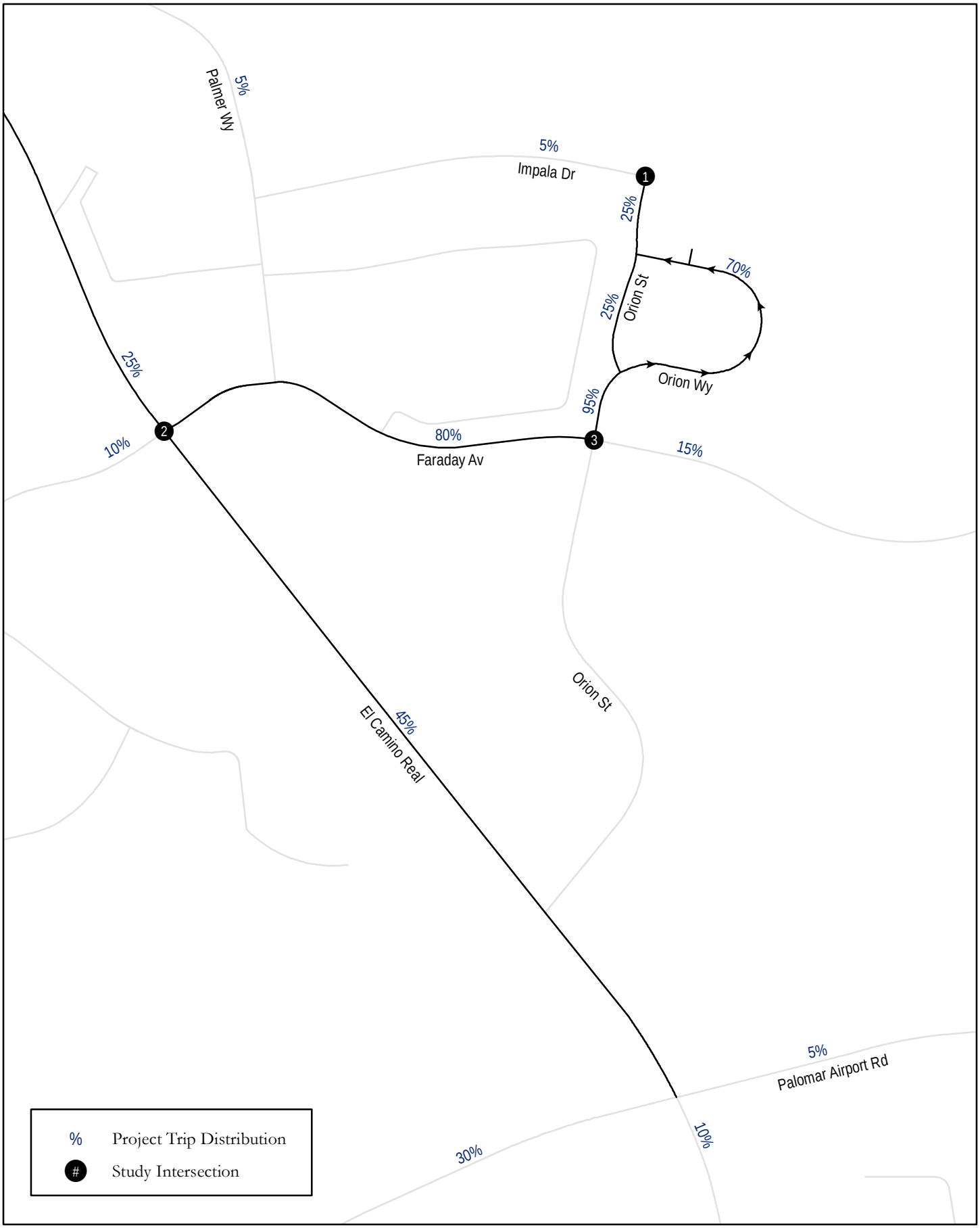
Source: CR Associates, December 2021.

Note:
KSF = thousand square feet.

As shown in the table above, the Proposed Project is anticipated to generate a net total of 1,120 daily trips with 147 (131-in / 16-out) during the AM peak hour and 142 (31-in / 111-out) during the PM peak hour.

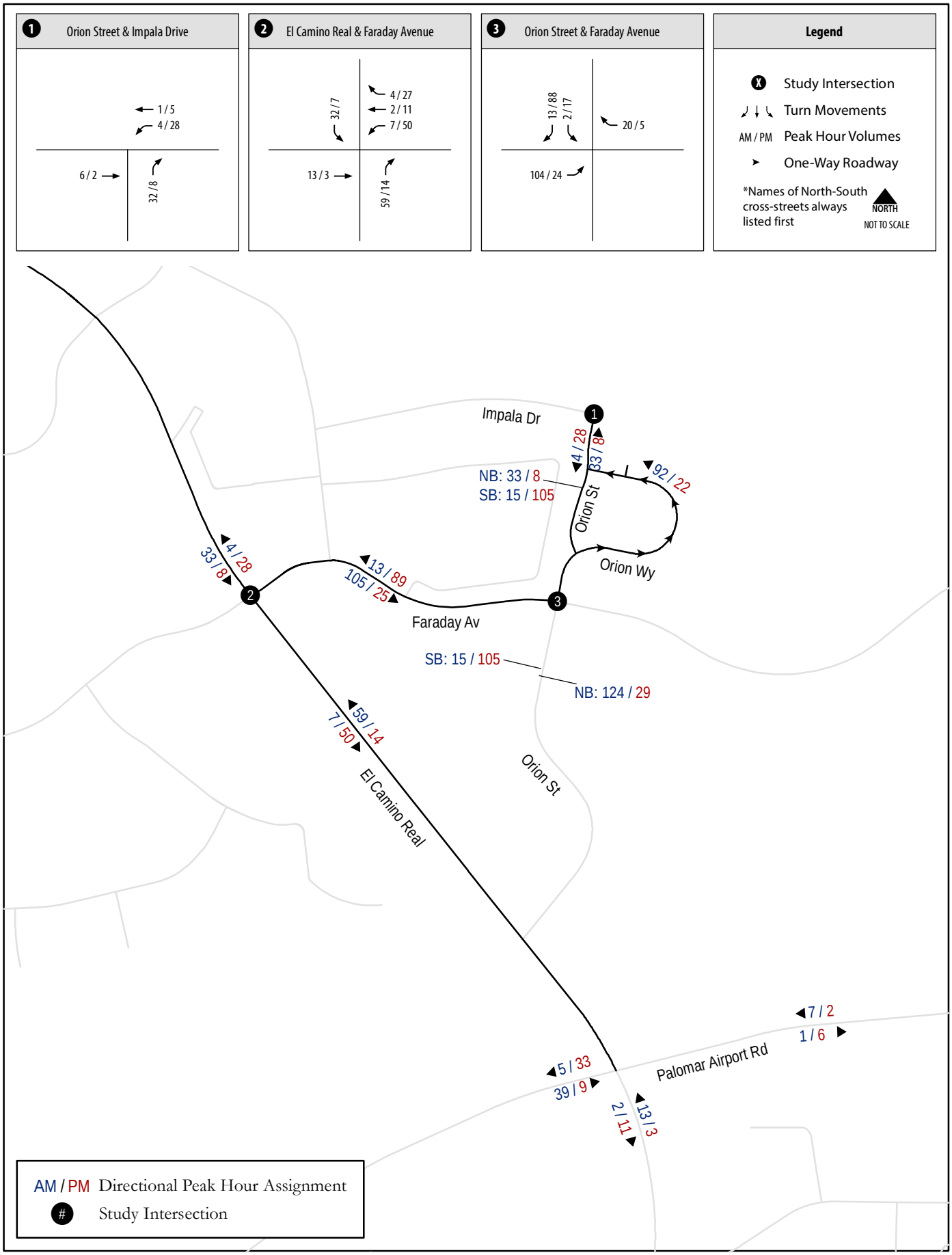
Trip Distribution

Trip distribution for the Proposed Project was based off the trip distribution utilized in the *Joint First Responders Training Facility Circulation Analysis* prepared by LSA in July 2008, as well as existing travel patterns and land uses surrounding the Proposed Project site. **Figure 3-1** displays the anticipated project's trip distribution while **Figure 3-2** displays the project's trip assignment.



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 3-1
Project Trip Distribution



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 3-2
Project Trip Assignment

4.0 Transportation Facilities Analysis

4.1 Background

The *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018,* provide direction for this review that is consistent with the General Plan Mobility Element's vision that "seeks to enhance vehicle, walking, bicycling, and public transportation systems options within Carlsbad, and improve mobility through increased connectivity and intelligent transportation management." The guidelines define the process used to review projects to reflect the Carlsbad Community Vision core values related to sustainability, neighborhood revitalization, access to recreation, active transportation, and healthy lifestyles.

The Growth Management Program (GMP), established by the City of Carlsbad in 1986, requires an evaluation of roadway facilities. The GMP ensures that "development does not occur unless adequate public facilities and services exist or will be provided concurrent with new development." The Citywide Facilities and Improvements Plan (last amended August 22, 2017) states that "when individual development projects are considered, a public facilities adequacy analysis will be provided as part of the report on the project to ensure that it is consistent with both the Citywide and Local Zone Plan." The Transportation Impact Analysis reports on the adequacy of the transportation facilities according to the following performance standards established in the current Citywide Facilities and Improvements Plan:

> *Implement a comprehensive livable streets network that serves all users of the system – vehicles, pedestrians, bicycles and public transit. Maintain LOS D or better for all modes that are subject to this multi-modal level of service (MMLOS) standard, as identified in Table 3-1 of the General Plan Mobility Element, excluding LOS exempt intersections and streets approved by the City Council.*

These concepts are codified in Section 21.90.080 of the Carlsbad Municipal Code (Growth Management) that states:

> *If at any time after preparation of the local facilities management plan the performance standards established by a plan are not met then no development permits or building permits shall be issued within the local zone until the performance standard is met or arrangements satisfactory to the City Council guaranteeing the facilities and improvement have been made.*

4.2 Existing Conditions

This section describes the study area roadway segments, signalized intersections, pedestrian facilities, bicycle facilities, transit facilities, existing daily roadway and peak hour intersection traffic volume information, as well as the LOS analysis results under Existing Conditions.

Study Area

As outlined in Section 2.1, the modes that are to be evaluated are based on the street typology for roadways connecting the project to the citywide transportation system and the location of the project. **Figure 4-1** displays the project's study area.

Roadways within the study area (street typology listed in bold):

- Orion Street, between Impala Drive / Project Driveway and Orion Way (North) – **Industrial Street**
- Orion Street, between Orion Way (North) and Orion Way (South) – **Industrial Street**
- Orion Street, between Orion Way (South) and Faraday Avenue – **Industrial Street**
- Orion Way, between Orion Street and Orion Street (loop) – **Industrial Street**
- Faraday Avenue, between El Camino Real and Faraday Avenue – **Employment/Transit Connector Street**
- El Camino Real, between Faraday Avenue and Palomar Airport Road – **Arterial Street**
- El Camino Real, between College Boulevard and Faraday Avenue– **Arterial Street**

The following roadway segments are subject to Auto Level of Service Analysis, based on Table 2.1:

Roadway segments (50 or more peak hour trips added in either direction of travel):

- Orion Street, between Impala Drive / Project Driveway and Orion Way (North)
- Orion Street, between Orion Way (North) and Orion Way (South)
- Orion Street, between Orion Way (South) and Faraday Avenue
- Orion Way, between Orion Street and Orion Street (loop)
- El Camino Real, between College Boulevard and Palomar Airport Road

Based on the *City of Carlsbad Transportation Impact Analysis Guidelines* the following intersections are subject to peak hour analysis.

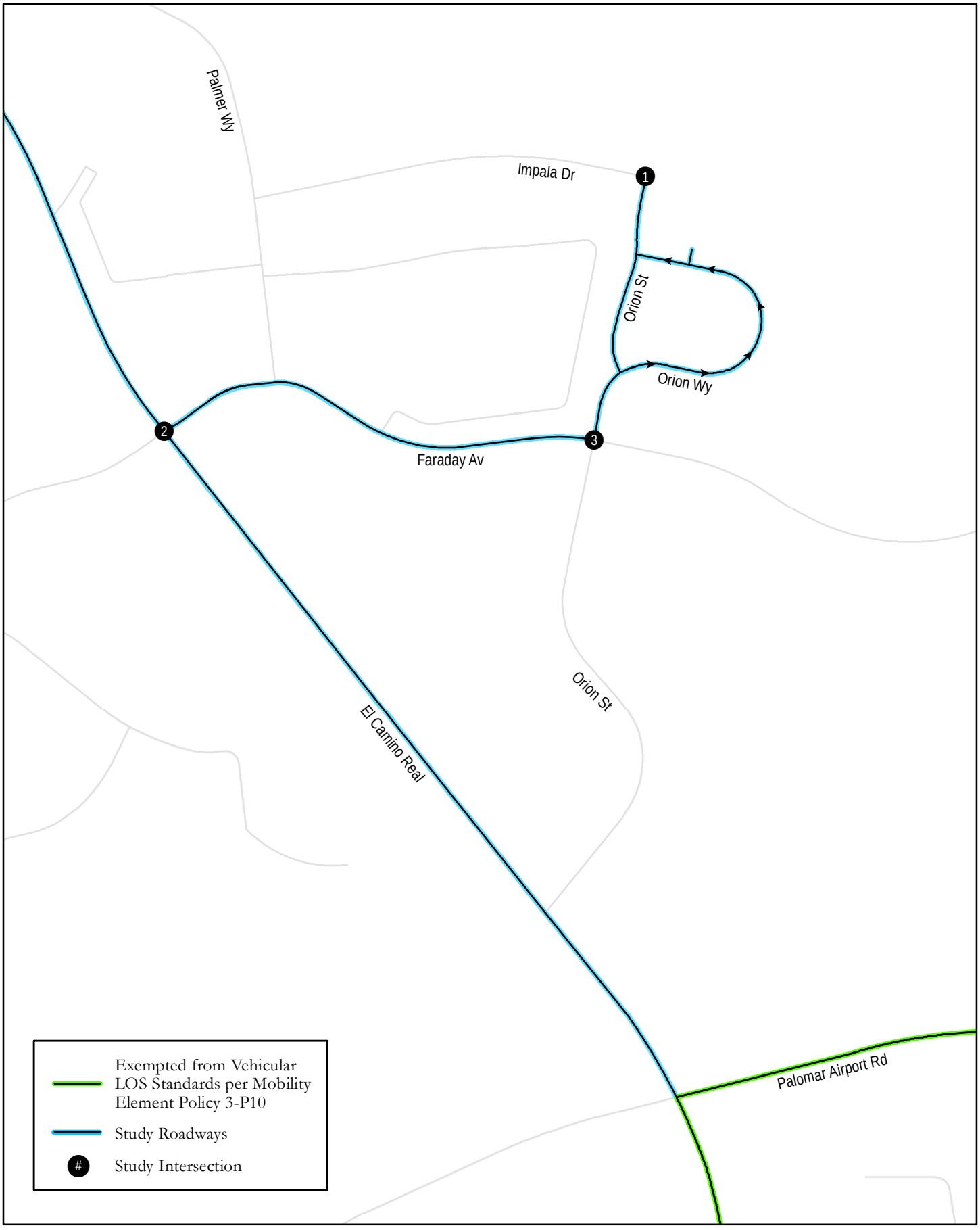
Intersections within 0.25-0. 5 miles of the project access points):

Unsignalized

1. Orion Street / Impala Drive / Project Driveway – *All-Way Stop Controlled*

Signalized

2. El Camino Real / Faraday Avenue
3. Orion Street / Faraday Avenue



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 4-1
Project Study Area

The following roadway segments are subject to Transit Level of Service Analysis (See Section 2.1 – Transit Facilities).

Transit Facilities

- Orion Street, between Impala Drive / Project Driveway and Orion Way (north)
- Orion Street, between Orion Way (north) and Orion Way (south)
- Orion Street, between Orion Way (south) and Faraday Avenue
- Orion Way, between Orion Street and Orion Street (loop)
- Faraday Avenue, between El Camino Real and Faraday Avenue
- El Camino Real, between Faraday Avenue and Palomar Airport Road

Orion Street and Orion Way are streets classified as "Industrial", which are not subject to Pedestrian nor Bicycle LOS analysis. Therefore, these analyses are not included in this report.

Figure 4-2 displays the existing roadway and intersection geometrics.

Existing street network

Each of the roadways within the study area are discussed below.

Roadway Facilities

Orion Street is a north-south undivided two-lane roadway with a posted speed limit of 25 miles (MPH) and is approximately 40 feet wide. Sidewalks are only present for approximately 200 feet on the east side of the roadway, just north of the intersection with Faraday Avenue. Class II bicycle lanes are provided on both sides of the roadway. Orion Street is identified as an Industrial Street in the *City of Carlsbad Mobility Element, June 2015.*

Orion Way is an east-west (loop) undivided one lane (one-way) roadway with no posted speed limit and is approximately 30 feet wide. Sidewalks are only present on the east/north side of the roadway (eastbound/northbound/westbound direction). Class II bicycle lanes are provided on the east/north side of the roadway (eastbound/northbound/westbound direction). Orion Way is identified as an Industrial Street in the *City of Carlsbad Mobility Element, June 2015.*

Faraday Avenue, between El Camino Real and Orion Street is an east-west roadway, intermittently divided by a two-way left-turn lane and a raised median. Faraday Avenue has a posted speed limit of 40 MPH and widths that range between approximately 63 feet and 83 feet wide. Sidewalks are provided on both sides of the roadway. Class II bicycle lanes are present on both sides of the roadway with the exception of approximately 600 feet on the south side of the roadway, just east of the intersection with El Camino Real.

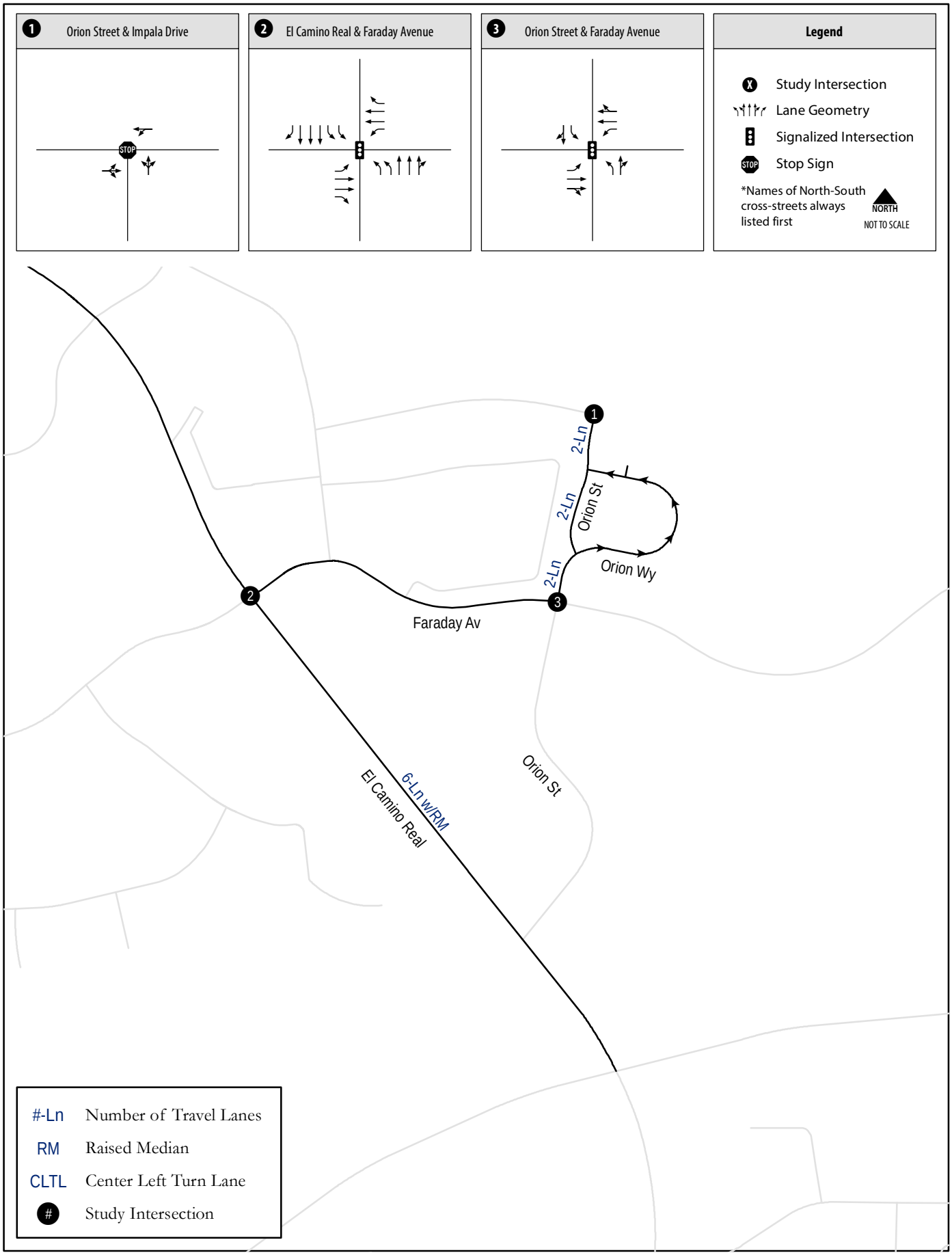
Faraday Avenue, between Orion Street and Eastern City Limits is a four-lane roadway with a striped median and a posted speed limit of 50 MPH. Sidewalks are provided on both sides of the roadway. Class II bicycle lanes are present on both sides of the roadway. Faraday Avenue is identified as an Employment/Transit Connector Street in the *City of Carlsbad Mobility Element, June 2015.*

El Camino Real is a north-south divided (raised median) six-lane roadway with a posted speed limit of 55 MPH, and widths that range between approximately 105 feet and 120 feet wide. Sidewalks and Class II

bicycle lanes are provided on both sides of the roadway. El Camino Real is identified as an Arterial Street in the *City of Carlsbad Mobility Element, June 2015.*

Traffic Volumes

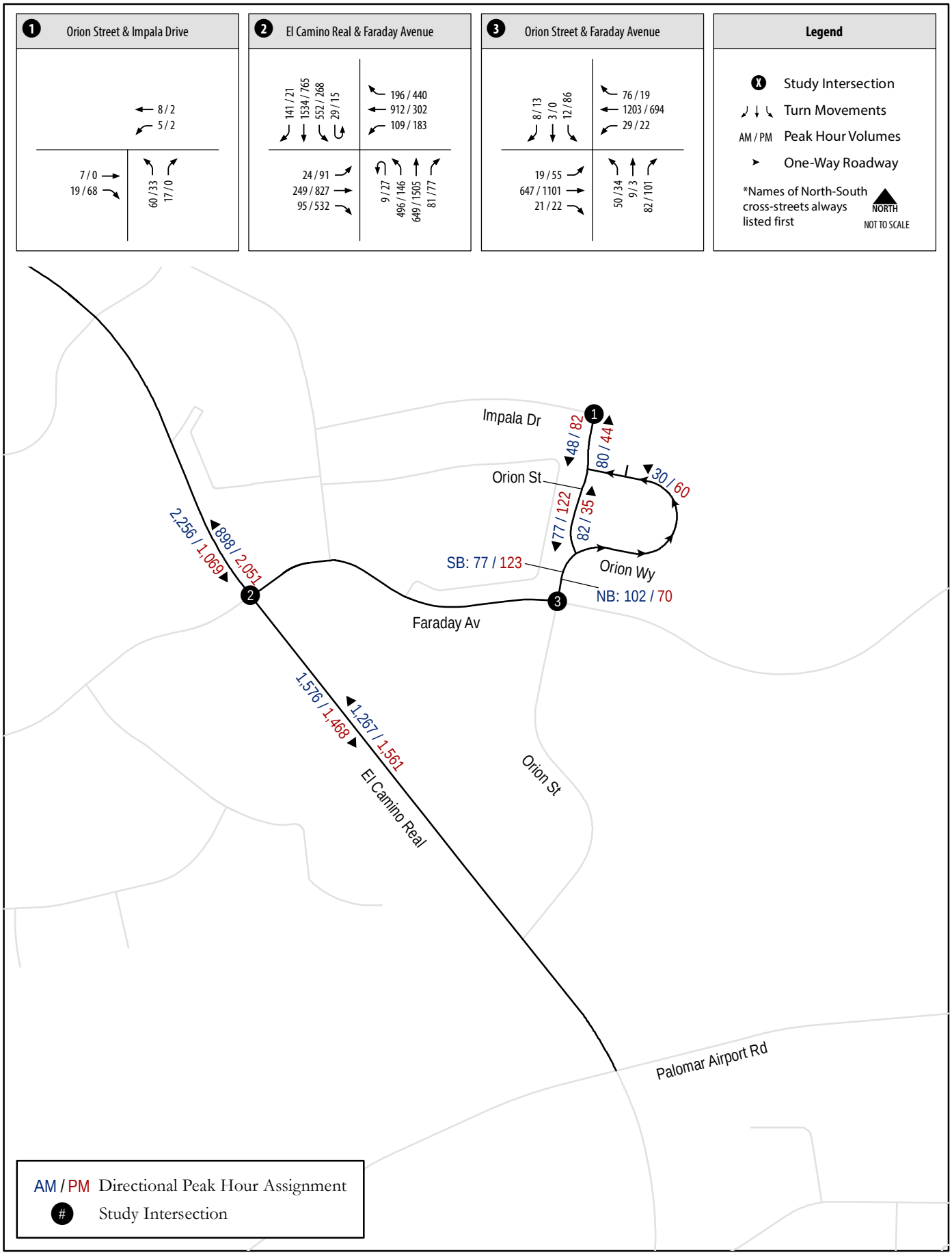
Figure 4-3 shows existing daily volumes for study area roadway segments and AM / PM peak hour traffic volumes for the study area intersections. Roadway segment and study area intersection traffic counts were conducted in February 2019 and are provided in **Appendix C**.



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

C+R

Figure 4-2
Intersection and Roadway Geometrics
- Existing Conditions



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 4-3
Traffic Volumes - Existing Conditions

Analysis of Existing Conditions

LOS analyses under Existing Conditions were conducted using the methodologies described in Section 2.1. Roadway segment LOS and intersection turning turn-lane analysis results are discussed separately below.

Roadway Segment Analysis

Table 4.1 displays the peak hour LOS analysis results for study area roadway segments under Existing Conditions.

Table 4.1 Roadway Segment LOS Capacity Analysis (Peak Hour Analysis) – Existing Conditions

Roadway	Segment	Street Typology	Cross-Section	Speed Limit	Peak Hour	Peak Direction	Segment Capacity	Peak Hour Volume	LOS
Directional Peak Hour									
Orion Street	Impala Drive to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	80	C or better
						SB	450[1]	48	C or better
					PM	NB	450[1]	44	C or better
						SB	450[1]	82	C or better
	Orion Way to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	82	C or better
						SB	450[1]	77	C or better
					PM	NB	450[1]	35	C or better
						SB	450[1]	122	D
	Orion Way to Faraday Avenue	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	102	C or better
						SB	450[1]	77	C or better
					PM	NB	450[1]	70	C or better
						SB	450[1]	123	D
Orion Way	Orion Street to Orion Street (loop)	Industrial	1-Ln Undivided	25 MPH	AM	EB/NB/WB	450[1]	30	C or better
					PM	EB/NB/WB	450[1]	60	C or better
El Camino Real	College Boulevard to Palomar Airport Road	Arterial	6-Ln Divided	55 MPH	AM	NB	2,940[2]	1,083[3]	B
						SB	2,940[2]	1,916[4]	B
					PM	NB	2,940[2]	1,806[5]	B
						SB	2,940[2]	1,269[6]	B

Source: CR Associates, December 2021.

Notes:
[1] The peak hour directional capacity for an Industrial Street was obtained from Table 2: Roadway Capacity Table Generalized Data from the City of Carlsbad Roadway Capacity Tables Report.
[2] The peak hour directional capacity for an Arterial Street was obtained from the City of Carlsbad Segment Service Volume Table for Arterial Corridors. See Appendix A.
[3] Average morning (AM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (898 + 1,267 / 2 = 1,083). See Figure 4-3.
[4] Average morning (AM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,256 + 1,576 / 2 = 1,916). See Figure 4-3.
[5] Average afternoon (PM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,051 + 1,561 / 2 = 1,806). See Figure 4-3.
[6] Average afternoon (PM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (1,069 + 1,468 / 2 = 1,269). See Figure 4-3.

As shown in the table above, all of the study area roadway segments currently operate at acceptable LOS D or better under Existing conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment

Table 4.2 identifies the pocket length, 95th percentile queue length, and excess queue (if applicable) for each left-turn movement of roadways subject to Auto MMLOS analysis within the study area. Intersection queueing analysis worksheets are provided in **Appendix D**.

Table 4.2 Peak Hour Left-turn Queue Assessment – Existing Conditions

		Left-turn pocket length (ft)		95th Percentile Queue[2] (veh/hr)		Excess queue (ft)	
#	Intersection	NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	500[1]	600[1]	398/113	355/199	0/0	0/0
3	Orion Street / Faraday Avenue	130	130	87/57	27/121	0/0	0/0

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means excess queue.
[1] Length displayed represents two left-turn lanes. Length includes taper.
[2] 95th Percentile Queuing per Synchro 10 – Traffic Analysis Software.

As shown in the table above, the left-turn storage lengths for each respective approach of the two analyzed (signalized) intersections are adequate during both the AM and PM peak hours.

Intersection Analysis – Dual Left-Turn Lane Assessment

As shown in Figure 4-3, none of the left-turn movements of roadways subject to Auto MMLOS analysis within the study area, exceed 250 vehicles per hour, with the exception of the following:

- *SB left-turn at the intersection of El Camino Real and Faraday Avenue* during the AM peak hour – **581 vehicles** while during the PM peak hour – **283 vehicles**;

However, this approach already has dual left-turn lanes. **Therefore, no additional left-turn lanes are required at any of the study area intersections.**

Intersection Analysis – Dedicated Right-Turn Lane Assessment

Table 4.3 displays the peak hour right-turn volume assessment of roadways subject to Auto MMLOS analysis within the study area under Existing Conditions. If the right-turn volume exceeds 150 vehicles per hour, a dedicated right-turn lane is recommended per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.*

Table 4.3 Peak Hour Right-turn Volume Assessment – Existing Conditions

#	Intersection	Right-turn volume (veh/hr)		Dedicated Right-Turn Lane Provided?		Dedicated Right-Turn Lane Needed?	
		NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	81/77	141/21	No	Yes	No	N/A
3	Orion Street / Faraday Avenue	82/101	8/13	No	No	No	No

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means over 150 vehicles per hour.
N/A = Not Applicable because a right-turn lane already exists.

As shown in the table above, based on the threshold for the recommendation of a dedicated right-turn lane (150 vehicles per hour) per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018,* none of the approaches exceed the right-turn lane threshold. **Therefore, no dedicated right-turn lanes are required at either of the approaches.**

4.3 Existing Plus Project Conditions

This section provides an analysis of existing traffic conditions with the addition of the Proposed Project's trips. Under this scenario, the Proposed Project's traffic volumes are added to the existing traffic volumes and roadway configuration, and impacts are assessed.

Roadway Network and Traffic Volumes

Roadway and intersection geometrics under Existing Plus Project conditions were assumed to be identical to the Existing conditions geometrics. Figure 4-2 displays roadway geometrics and intersection lane configurations under Existing Plus Project conditions.

Existing Plus Project traffic volumes were derived by combining the existing traffic volumes (displayed in Figure 4-3) and the project trip assignment volumes (displayed in Figures 3-2). Existing Plus Project daily roadway and intersection peak hour traffic volumes are displayed in **Figure 4-4**.

Analysis of Existing Plus Project Conditions

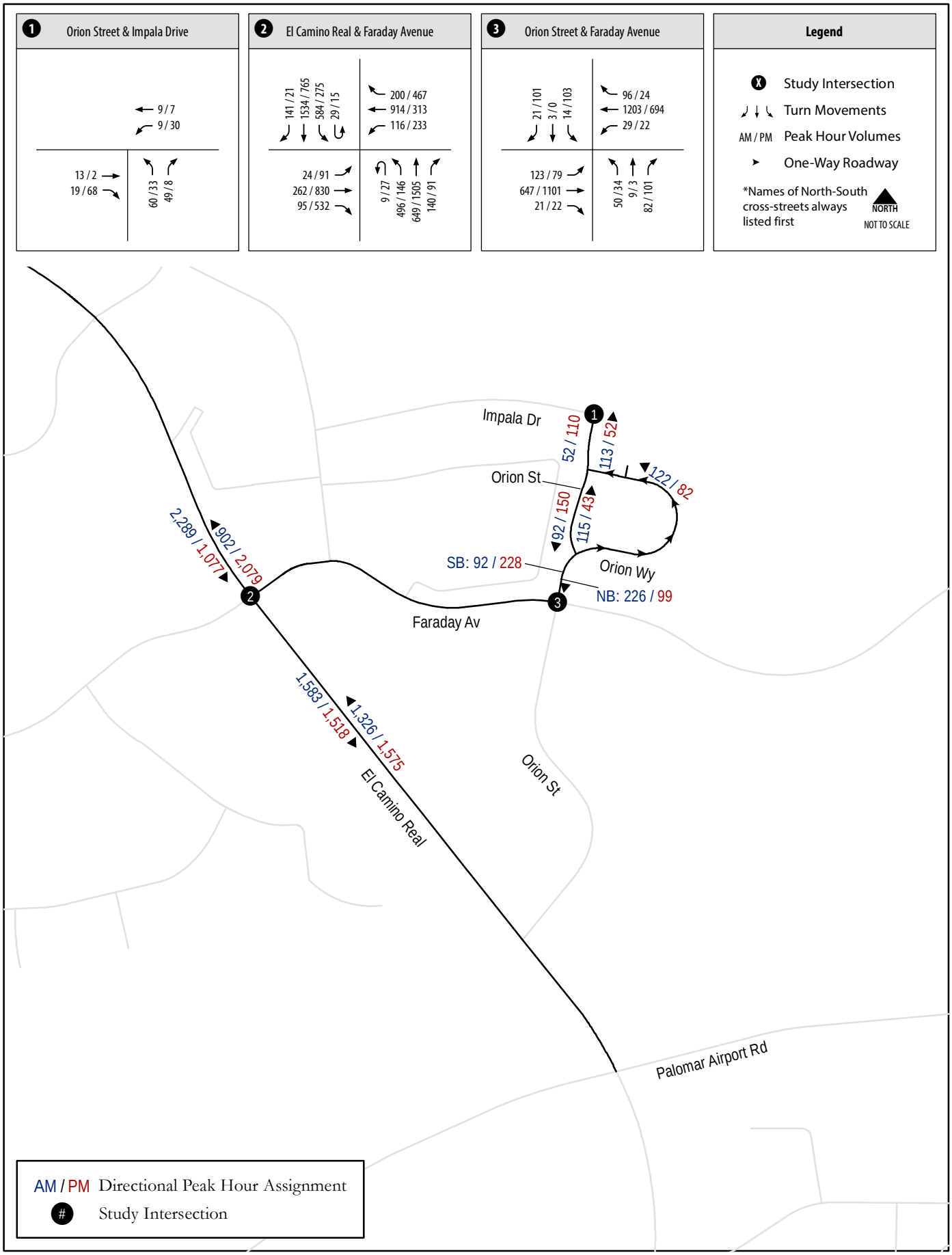
LOS analyses under Existing Plus Project Conditions were conducted using the methodologies described in Section 2.1. Roadway segment LOS and intersection turn-lane analysis results are discussed separately below.

Roadway Segment Analysis

Table 4.4 displays the peak hour LOS analysis results for study area roadway segments under Existing Plus Project Conditions.

As shown in Table 4.4, all of the study area roadway segments are anticipated to operate at acceptable LOS D or better under Existing Plus Project Conditions.

Based upon the significance criteria presented in Section 2.3, none of the roadway segments are anticipated to operate at a sub-standard level (LOS E or F) under the Existing Plus Project conditions; therefore, no additional improvements would be required.



Orion Center Operations and Maintenance Facility
Transportation Impact Analysis

Figure 4-4
Traffic Volumes - Existing Plus Project Conditions

Table 4.4 Roadway Segment LOS Capacity Analysis (Peak Hour Analysis) – Existing + Project Conditions

Roadway	Segment	Street Typology	Cross-Section	Speed Limit	Peak Hour	Peak Direction	Segment Capacity	Existing Conditions		Existing + Project		Δ in Volume
								Peak Hour Volume	LOS	Peak Hour Volume	LOS	
Directional Peak Hour												
Orion Street	Impala Drive to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	80	C or better	113	D	33
						SB	450[1]	48	C or better	52	C or better	4
					PM	NB	450[1]	44	C or better	52	C or better	8
						SB	450[1]	82	C or better	110	C or better	28
	Orion Way to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	82	C or better	115	D	33
						SB	450[1]	77	C or better	92	C or better	15
					PM	NB	450[1]	35	C or better	43	C or better	8
						SB	450[1]	122	D	227	D	28
	Orion Way to Faraday Avenue	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	102	C or better	226	D	124
						SB	450[1]	77	C or better	92	C or better	15
					PM	NB	450[1]	70	C or better	99	C or better	8
						SB	450[1]	123	D	228	D	28
Orion Way	Orion Street to Orion Street (loop)	Industrial	1-Ln Undivided	25 MPH	AM	EB/NB/WB	450[1]	30	C or better	122	D	92
					PM	EB/NB/WB	450[1]	60	C or better	82	C or better	22
El Camino Real	College Boulevard to Palomar Airport Road	Arterial	6-Ln Divided	55 MPH	AM	NB	2,940[2]	1,083	B	1,114[3]	B	31
						SB	2,940[2]	1,916	B	1,936[4]	B	20
					PM	NB	2,940[2]	1,806	B	1,827[5]	B	21
						SB	2,940[2]	1,269	B	1,297[6]	B	29

Source: Chen Ryan Associates, December 2021.

Notes:
[1] The peak hour directional capacity for an Industrial Street was obtained from Table 2: Roadway Capacity Table Generalized Data from the City of Carlsbad Roadway Capacity Tables Report.
[2] The peak hour directional capacity for an Arterial Street was obtained from the City of Carlsbad Segment Service Volume Table for Arterial Corridors. See Appendix A
[3] Average morning (AM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (902 + 1,326 / 2 = 1,114). See Figure 4-4.
[4] Average morning (AM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,289 + 1,583 / 2 = 1,936). See Figure 4-4.
[5] Average afternoon (PM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,079 + 1,575 / 2 = 1,827). See Figure 4-4.
[6] Average afternoon (PM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (1,077 + 1,518 / 2 = 1,297). See Figure 4-4.

Intersection Analysis – Left-Turn Pocket Length Assessment

Table 4.5 identifies the pocket length, 95th percentile queue length and excess queue (if applicable) for each left-turn movement of roadways subject to Auto MMLOS analysis within the study area. Intersection queueing analysis worksheets are provided in Appendix D.

Table 4.5 Peak Hour Left-turn Queue Assessment – Existing + Project Conditions

		Left-turn pocket length (ft)		95th Percentile Queue[2] (veh/hr)		Excess queue (ft)	
#	Intersection	NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	500[1]	600[1]	398/113	406/204	0/0	0/0
3	Orion Street / Faraday Avenue	130	130	87/57	29/156	0/0	0/26

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means excess queue.
[1] Length displayed represents two left-turn lanes. Length includes taper.
[2] 95th Percentile Queuing per Synchro 10 – Traffic Analysis Software.

As shown in the table above, the left-turn pocket lengths for each respective approach of the two analyzed (signalized) intersections, are adequate during both the AM and PM peak hours, with the exception of the following:

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of excess queue length is anticipated at this approach during the PM peak hour. **Therefore, the project shall extend the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment

As shown in Figure 4-3, none of the left-turn movements of roadways subject to an Auto MMLOS analysis within the study area, exceed 250 vehicles per hour, with the exception of the following:

- *SB left-turn at the intersection of El Camino Real and Faraday Avenue* during the AM peak hour – **613 vehicles** while during the PM peak hour – **290 vehicles**.

However, this approach already has dual left-turn lanes. **Therefore, no additional left-turn lanes are required at any of the study area intersections.**

Intersection Analysis – Dedicated Right-Turn Lane Assessment

Table 4.6 displays the peak hour right-turn volume assessment of roadways subject to an Auto MMLOS analysis within the study area under Existing Plus Project Conditions. If the right-turn volume exceeds 150 vehicles per hour, a dedicated right-turn lane is recommended per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.*

Table 4.6 Peak Hour Right-turn Volume Assessment – Existing + Project Conditions

ID	Intersection	Right-turn volume (veh/hr)		Dedicated Right-Turn Lane Provided?		Dedicated Right-Turn Lane Needed?	
		NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	140/91	141/121	No	Yes	No	N/A
3	Orion Street / Faraday Avenue	82/101	21/101	No	No	No	No

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means over 150 vehicles per hour.
N/A = Not Applicable because a right-turn lane already exists

As shown in the table above, based on the threshold for the recommendation of a dedicated right-turn lane (150 vehicles per hour) per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018,* none of the approaches exceed the right-turn lane threshold. **Therefore, no dedicated right-turn lanes are required at either of the approaches.**

4.4 Needed Improvements Directly Related to the Proposed Project

This section describes the improvements needed at the study area facilities under Existing Plus Project Conditions.

Roadway Segment Analysis

The roadway segment operations for within the project study area are not anticipated to degrade to a sub-standard level (LOS E or F) under Existing Plus Project conditions; therefore, additional improvements would not be required.

Intersection Analysis – Left-Turn Pocket Length Assessment

The following improvements are recommended:

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of excess queue length is anticipated at this approach during the PM peak hour. **Therefore, the project shall extend the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment

No additional left-turn lanes are required at any of the study area intersections.

Intersection Analysis – Dedicated Right-Turn Lane Assessment

No dedicated right-turn lanes are recommended at any of the study area intersections.

4.5 Cumulative Conditions

This section describes the study area roadway segments, signalized intersections, pedestrian facilities, bicycle facilities, transit facilities, existing daily roadway and peak hour intersection traffic volume information, as well as the LOS analysis results under Cumulative Conditions.

Description of Cumulative Projects

Cumulative Year analysis includes the associated traffic generated from reasonably foreseeable projects in the vicinity of the Proposed Project (cumulative projects information). The following projects, provided by the City of Carlsbad, were considered as near-term reasonably foreseeable projects:

Cumulative Projects

1. *SMAC* – Proposes to construct 27,800 square feet of Industrial Park land use at a vacant lot currently adjacent to the existing SMAC building, located at the southwest corner of the intersection of Faraday Avenue and Allen Way, in the City of Carlsbad.

2. *Viasat* – Proposes to construct 487,000 square feet of corporate headquarters land use. This project is located in Bressi Ranch on the site bounded by El Camino Real to the west, Alicante Road to the east, Gateway Road to the north and Town Garden Road to the south.

3. *Carlsbad Oaks North Specific Plan* – Proposes to develop 23 industrial lots, 3 open space lots, and 1 lot for an employee picnic area that would serve the industrial business park. Approximately 194 acres of the Specific Plan are proposed for industrial uses, including roads, and approximately 220 acres are proposed for Open Space. The project area is located east of El Camino Real, north of Palomar Airport Road, and west of Melrose Drive. It is important to note that at the time traffic counts were collected (February 2019), approximately 18.9 acres of Industrial land uses had been developed at this project site.

4. *Bressi Ranch* – Proposes to develop approximately 585.1 acres of land in the City of Carlsbad. The proposed land uses include single-family residential, multi-family residential, local shopping center, industrial, community facilities and open space.

5. *Cantarini Ranch* – Proposes to develop 105 single-family residential homes within the Sunny Creek Specific Plan Area. The Sunny Creek area is an 850-acre rural escape bounded by the Agua Hedionda Creek riparian preserve on the west, huge HMP natural open space preserves on the south and east, and College Blvd. on the north.

6. *Dos Colinas* – Proposes to develop 58 cottage style retirement homes, 166 independent living units, 20 of which will be restricted as affordable units, and an 81-room/95-bed assisted living/congregate care facility. As an alternative to the restriction of 20 on-site independent living units as affordable, the applicant may purchase 24 income-restricted units from another offsite combined inclusionary housing project. The Sunny Creek area is an 850-acre rural escape bounded by the Agua Hedionda Creek riparian preserve on the west, huge HMP natural open space preserves on the south and east, and College Blvd. on the north.

7. *Rancho Milagro* – Proposes to develop 19 single-family residential homes within the Sunny Creek Specific Plan Area. The Sunny Creek area is an 850-acre rural escape bounded by the Agua

Hedionda Creek riparian preserve on the west, huge HMP natural open space preserves on the south and east, and College Blvd. on the north.

8. *Marja Acres* – proposes the development of 248 market-rate townhomes, and 46 age-restricted (to seniors) and lower-income multi-family units, along with a maximum of 10,000 square feet (SF) of retail/commercial and restaurant redevelopment (6,000 SF of Specialty Retail use and 4,000 of "sit-down, high-turnover" restaurant) on the site. The site is currently developed with about 12,370 SF of commercial space. The Project site is located in the City of Carlsbad, on the south side of El Camino Real between Kelly Drive and West Ranch Road/ Lisa Street.

9. *Valley View* – Proposes to develop 11,404 square feet of standard commercial office. The project site is on the southeast corner of El Camino Real and Cougar Drive.

10. *Carlsbad Self Storage* – Proposes to develop 136,376 square feet of self-storage. The project site is located on the southeast quadrant of the intersection of Yarrow Drive and Palomar Airport Road.

11. La Marea Senior Carlsbad Professional Care Facility – Proposes to develop a 122-bed assisted living facility located at the northeast quadrant of the intersection of El Camino Real and Cougar Drive.

Table 4.7 displays trip generation for the cumulative projects described above. Trip distribution and trip assignment for the cumulative projects was obtained from their respective traffic impact study or assumptions based on existing traffic patterns.

Table 4.7 Cumulative Projects Trip Generation

Cumulative Project	Land Use	Daily Trips	AM Peak Hour (In / Out)	PM Peak Hour (In / Out)
1. SMAC [1]	Industrial	223	25 (23-in / 2-out)	27 (5-in / 22-out)
2. Viasat [2]	Corporate Headquarters	3,409	580 (522-in / 58-out)	545 (55-in / 490-out)
3. Carlsbad Oaks North [3]	Industrial	21,140	2,210 (1,951-in / 259-out)	2,489 (554-in / 1,935-out)
4. Bressi Ranch [4]	Residential / Industrial / Commercial	27,874	2,605 (1,760-in / 845-out)	3,195 (1,177-in / 2,018)
5. Cantarini Ranch [1]	Single Family Detached Housing	1,050	84 (25-in / 59-out)	105 (74-in / 31-out)
6. Dos Colinas [5]	Retirement Community Congregate Care Facility Multi-Family (6-20 DU/Acre)	1,291	69 (26-in / 43-out)	96 (59-in / 37-out)
7. Rancho Milagro [1]	Single Family Detached Housing	190	16 (5-in / 11-out)	19 (13-in / 6-out)
8. Marja Acres [6]	Mixed Use	901	68 (-15-in[6] / 83-out)	110 (97-in / 13-out)
9. Valley View [1]	Standard Commercial Office	229	33 (30-in / 3-out)	30 (6-in / 24-out)
10. Carlsbad Self-Storage[1]	Storage	273	16 (8-in / 8-out)	25 (13-in / 12-out)

Table 4.7 Cumulative Projects Trip Generation

Cumulative Project	Land Use	Daily Trips	AM Peak Hour (In / Out)	PM Peak Hour (In / Out)
11. La Marea Senior Care[1]	Assisted Living	305	12 (7-in / 5-out)	24 (12-in / 12-out)
Cumulative Total		56,885	5,718 (4,342-in / 1,376-out)	6,665 (2,065-in / 4,600-out)

Source: City of Carlsbad, December 2021.

Notes:
[1] Trip Generation obtained from City of Carlsbad staff and SANDAG's (Not So) Brief Guide to Vehicular Trip Generation*, April 2002.*
[2] Trip Generation obtained from ViaSat Access Study prepared by LLG Engineers, *June 17, 2016.*
[3] Trip Generation obtained from Carlsbad Oaks North Specific Plan FEIR prepared by Cotton- Bridges Associates*, August 2002.*
[4] Trip Generation obtained from Bressi Ranch Master Plan *FEIR* prepared by Cotton- Bridges Associates*, December 2001.*
[5] Trip Generation obtained from Dos Colinas *FEIR Traffic Impact Analysis* prepared by LLG Engineers*, July 26, 2011.*
[6] Trip Generation obtained from *Marja Acres Transportation Impact Analysis* prepared by LLG Engineers*, March 26, 2019. It should be noted that the AM inbound trips (15 trips) with redevelopment of the site are less than the number of trips generated by the existing land use categories.*

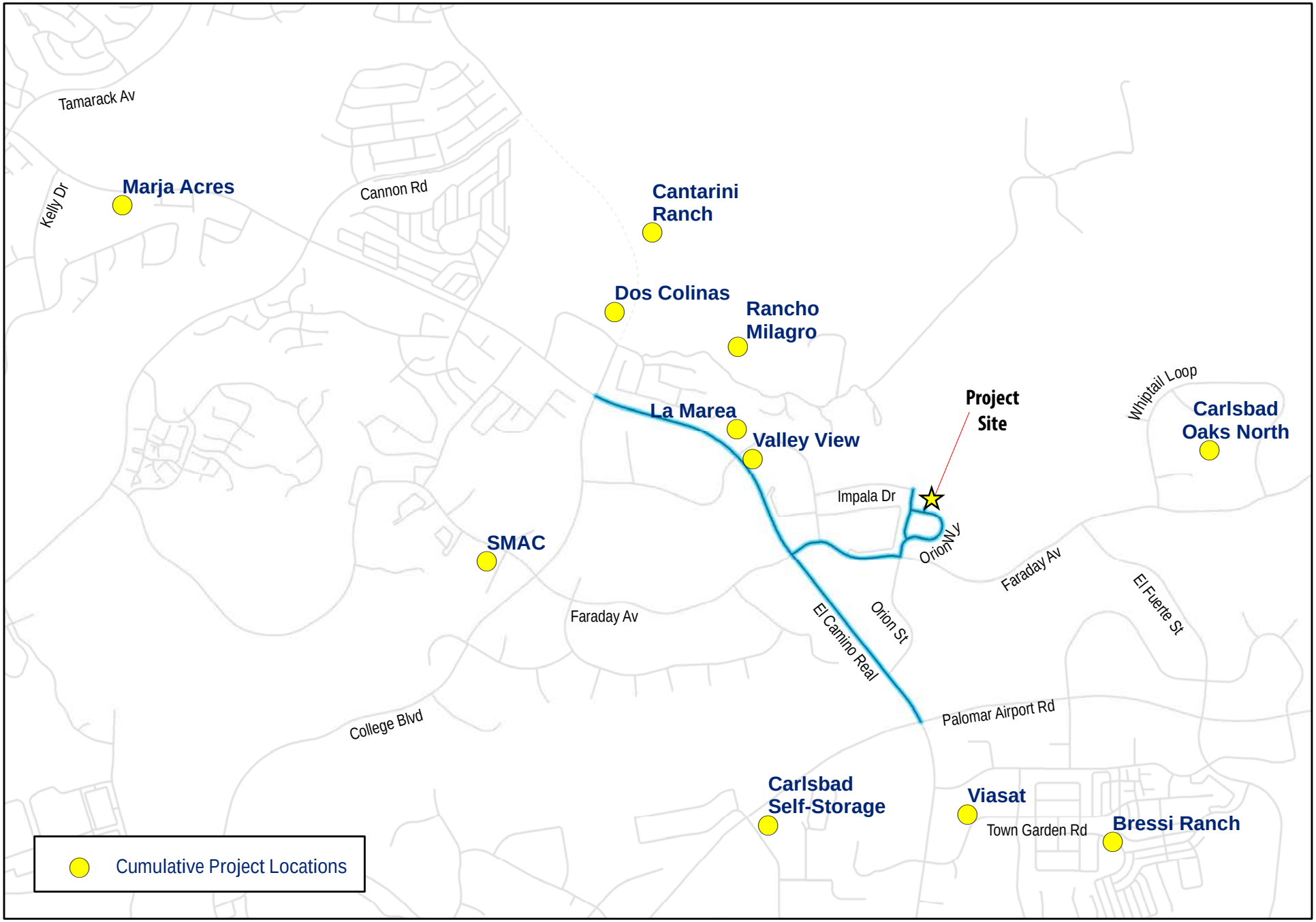
Figure 4-5 displays cumulative projects location, while **Figure 4-6** displays cumulative projects trip assignment for study area roadways and intersections. Detailed information regarding the cumulative projects is provided in **Appendix E.**

Roadway Network and Traffic Volumes

The Cumulative conditions roadway network was assumed to be largely identical to the Existing conditions network, with the exception of the College Blvd extension that will connect Cannon Road to El Camino Real. Several cumulative projects are conditioned to build this roadway connection and it is assumed to be constructed in the Cumulative Conditions scenario.

Roadway and intersection geometrics within the study area under the Cumulative conditions (Existing Plus Cumulative Projects) traffic conditions are identical to existing conditions, As shown in Figure 4-1.

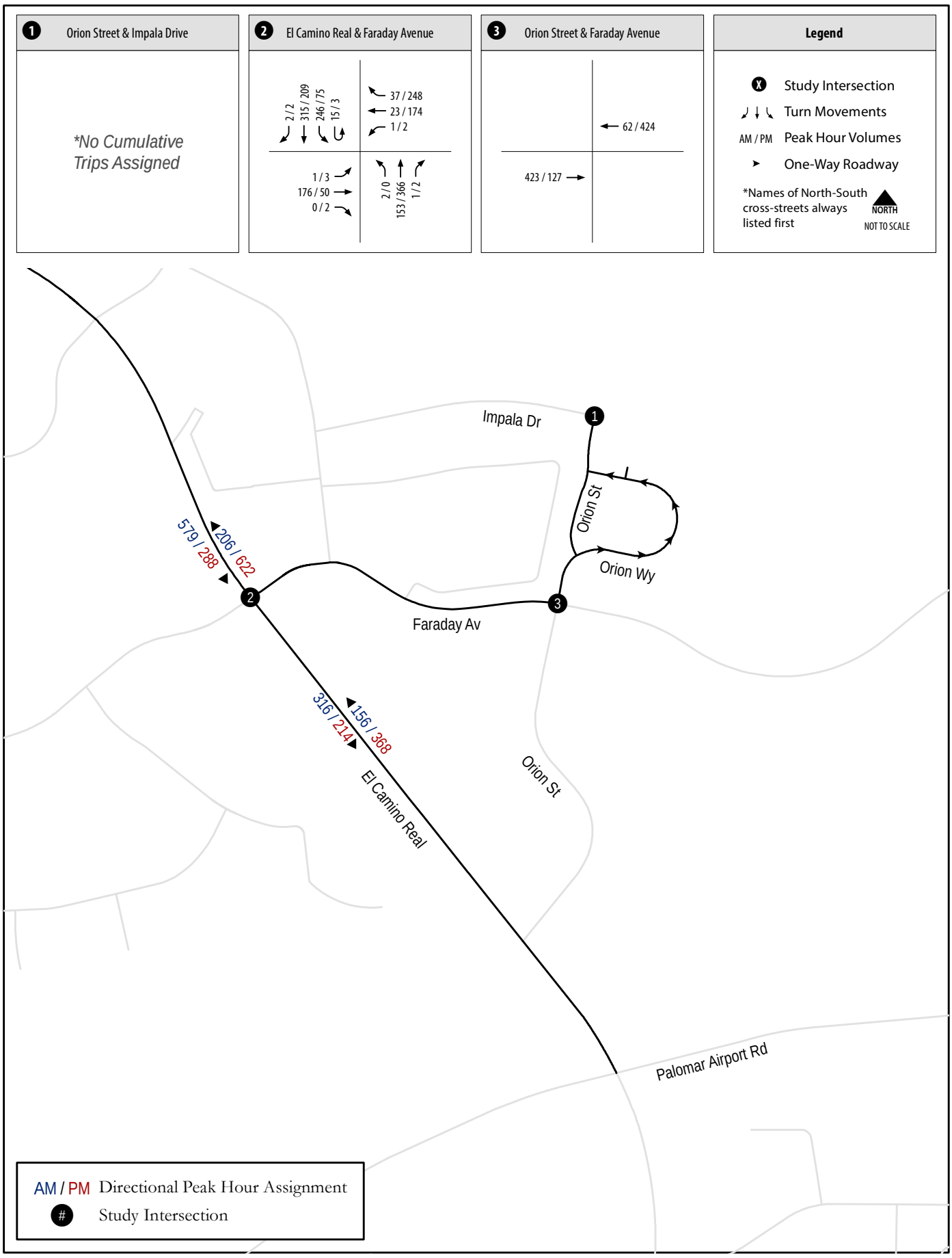
Cumulative conditions traffic volumes were derived by combining the existing traffic volumes (displayed in Figure 4-3) and the cumulative trip assignment volumes (displayed in Figures 4-5). Cumulative daily roadway and intersection peak hour traffic volumes are displayed in **Figure 4-7**.



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

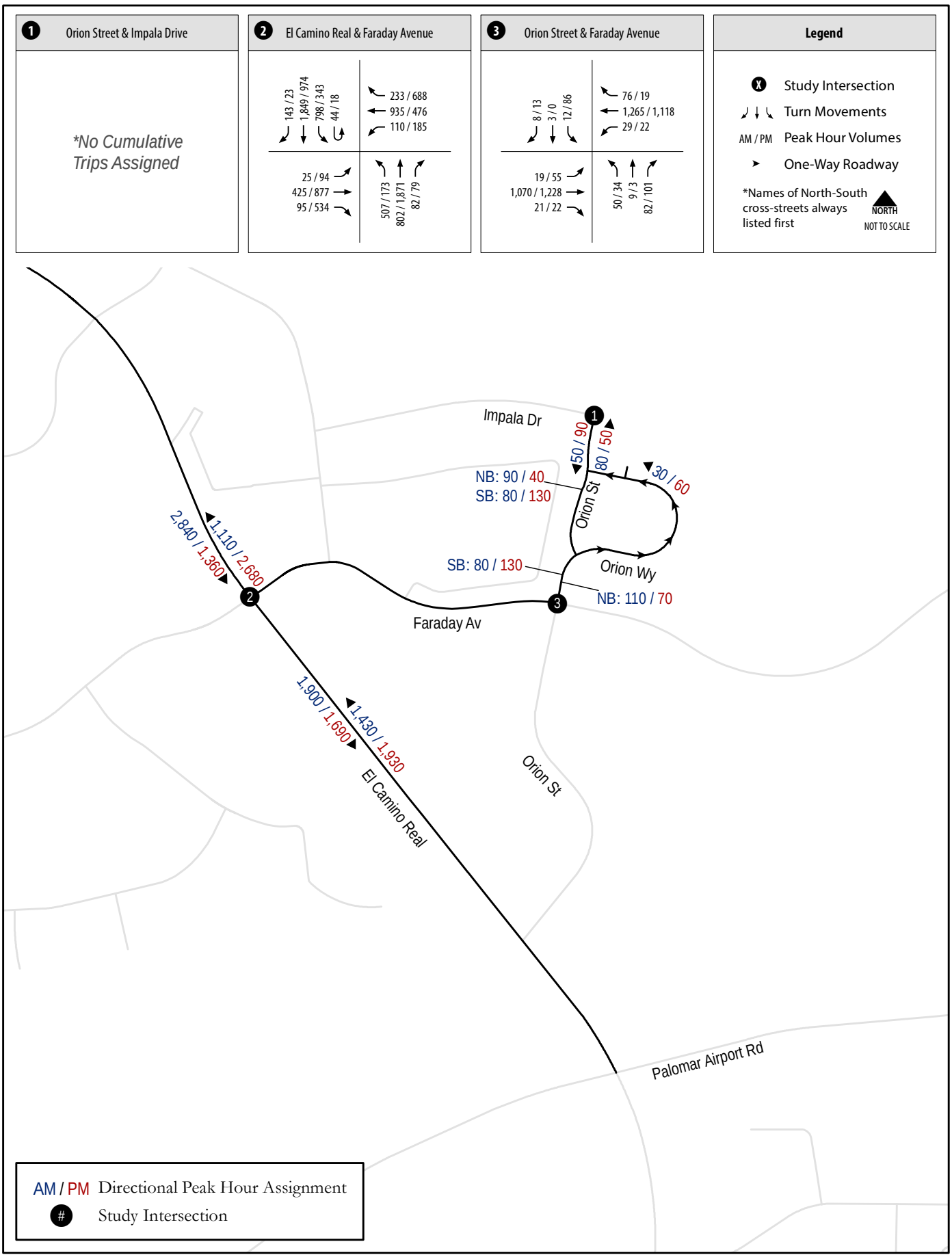
C+R

Figure 4-5
Cumulative Project Locations



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 4-6
Cumulative Projects - Trip Assignment



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 4-7
Traffic Volumes - Cumulative Traffic Conditions

Analysis of Cumulative Conditions

LOS analyses under Cumulative conditions were conducted using the methodologies described in Section 2.1. Roadway segment LOS and intersection turn-lane analysis results are discussed separately below.

Roadway Segment Analysis

Table 4.8 displays the peak hour LOS analysis results for study area roadway segments under Cumulative conditions.

Table 4.8 Roadway Segment LOS Capacity Analysis (Peak Hour Analysis) – Cumulative Conditions

Roadway	Segment	Street Typology	Cross-Section	Speed Limit	Peak Hour	Peak Direction	Segment Capacity	Peak Hour Volume	LOS
Directional Peak Hour									
Orion Street	Impala Drive to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	80	C or better
						SB	450[1]	50	C or better
					PM	NB	450[1]	50	C or better
						SB	450[1]	90	C or better
	Orion Way to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	90	C or better
						SB	450[1]	80	C or better
					PM	NB	450[1]	40	C or better
						SB	450[1]	130	D
	Orion Way to Faraday Avenue	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	110	C or better
						SB	450[1]	80	C or better
					PM	NB	450[1]	70	C or better
						SB	450[1]	130	D
Orion Way	Orion Street to Orion Street (loop)	Industrial	1-Ln Undivided	25 MPH	AM	EB/NB/WB	450[1]	30	C or better
					PM	EB/NB/WB	450[1]	60	C or better
El Camino Real	College Boulevard to Palomar Airport Road	Arterial	6-Ln Divided	55 MPH	AM	NB	2,940[2]	1,270[3]	B
						SB	2,940[2]	2,370[4]	B
					PM	NB	2,940[2]	2,305[5]	B
						SB	2,940[2]	1,525[6]	B

Source: CR Associates, December 2021.

Notes:
[1] The peak hour directional capacity for an Industrial Street was obtained from Table 2: Roadway Capacity Table Generalized Data from the City of Carlsbad Roadway Capacity Tables Report.
[2] The peak hour directional capacity for an Arterial Street was obtained from the City of Carlsbad Segment Service Volume Table for Arterial Corridors. See Appendix A.
[3] Average morning (AM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (1,110 + 1,430 / 2 = 1,270). See Figure 4-7.
[4] Average morning (AM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,840 + 1,900 / 2 = 2,370). See Figure 4-7.
[5] Average afternoon (PM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,680 + 1,930 / 2 = 2,305). See Figure 4-7.
[6] Average afternoon (PM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (1,360 + 1,690 / 2 = 1,525). See Figure 4-7.

As shown in the table above, all of the study area roadway segments are anticipated to operate at acceptable LOS D or better under Cumulative conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment

Table 4.9 identifies the pocket length, 95th percentile queue length and excess queue (if applicable) for each left-turn movement of roadways subject to Auto MMLOS analysis within the study area. Intersection queueing analysis worksheets are provided in Appendix D.

Table 4.9 Peak Hour Left-turn Queue Assessment – Cumulative Conditions

		Left-turn lane length[1] (ft)		95th Percentile Queue[2] (veh/hr)		Excess queue (ft)	
#	Intersection	NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	500[1]	600[1]	400/117	625/286	0/0	25/0
3	Orion Street / Faraday Avenue	130	130	87/57	27/121	0/0	0/0

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means excess queue.
[1] Length displayed represents two left-turn lanes. Length includes taper.
[2] 95th Percentile Queuing per Synchro 10 – Traffic Analysis Software.

As shown in the table above, the left-turn pocket lengths for each respective approach of the two analyzed (signalized) intersections, are adequate during both the AM and PM peak hours, with the exception of the following:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – A total excess of **25 feet** of queue length is calculated at this approach during the AM peak hour. However, extending the left-turn lane may not be feasible due to the existing raised median. **Therefore, it is recommended that the extension of the left-turn pocket at the SB approach is further analyzed.**

Intersection Analysis – Dual Left-Turn Lane Assessment

As shown in Figure 4-7, none of the left-turn movements of roadways subject to an Auto MMLOS analysis within the study area, exceed 250 vehicles per hour, with the exception of the following:

- *SB left-turn at the intersection of El Camino Real and Faraday Avenue* during the AM peak hour – **842 vehicles** while during the PM peak hour – **361 vehicles**;

However, this approach already has dual left-turn lanes. **Therefore, no additional left-turn lanes are required at any of the study area intersections.**

Intersection Analysis – Dedicated Right-Turn Lane Assessment

Table 4.10 displays the peak hour right-turn volume assessment of roadways subject to Auto MMLOS analysis within the study area under Cumulative Conditions. If the right-turn volume exceeds 150 vehicles per hour, a dedicated right-turn lane is recommended per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.*

Table 4.10 Peak Hour Right-turn Volume Assessment – Cumulative Conditions

#	Intersection	Right-turn volume (veh/hr)		Dedicated Right-Turn Lane Provided?		Additional Dedicated Right-Turn Lane Needed?	
		NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	82/79	143/23	No	Yes	No	N/A
3	Orion Street / Faraday Avenue	82/101	8/13	No	No	No	No

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means over 150 vehicles per hour.
N/A = Not Applicable because a right-turn lane already exists.

As shown in the table above, based on the threshold for the recommendation of a dedicated right-turn lane (150 vehicles per hour) per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018,* none of the approaches exceed the right-turn lane threshold. **Therefore, no dedicated right-turn lanes are required at either of the approaches.**

4.6 Cumulative Plus Project Conditions

This section provides an analysis of cumulative traffic conditions with the addition of the Proposed Project's trips. Under this scenario, the Proposed Project's traffic volumes are added to the cumulative traffic volumes and roadway configuration, and impacts are assessed.

Roadway Network and Traffic Volumes

Roadway and intersection geometrics under Cumulative Plus Project conditions were assumed to be identical to the Cumulative Conditions geometrics.

Cumulative Plus Project traffic volumes were derived by combining the cumulative traffic volumes (displayed in Figure 4-6) and the project trip assignment volumes (displayed in Figures 3-2). Cumulative Plus Project daily roadway and intersection peak hour traffic volumes are displayed in **Figure 4-8**.

Analysis of Cumulative Plus Project Conditions

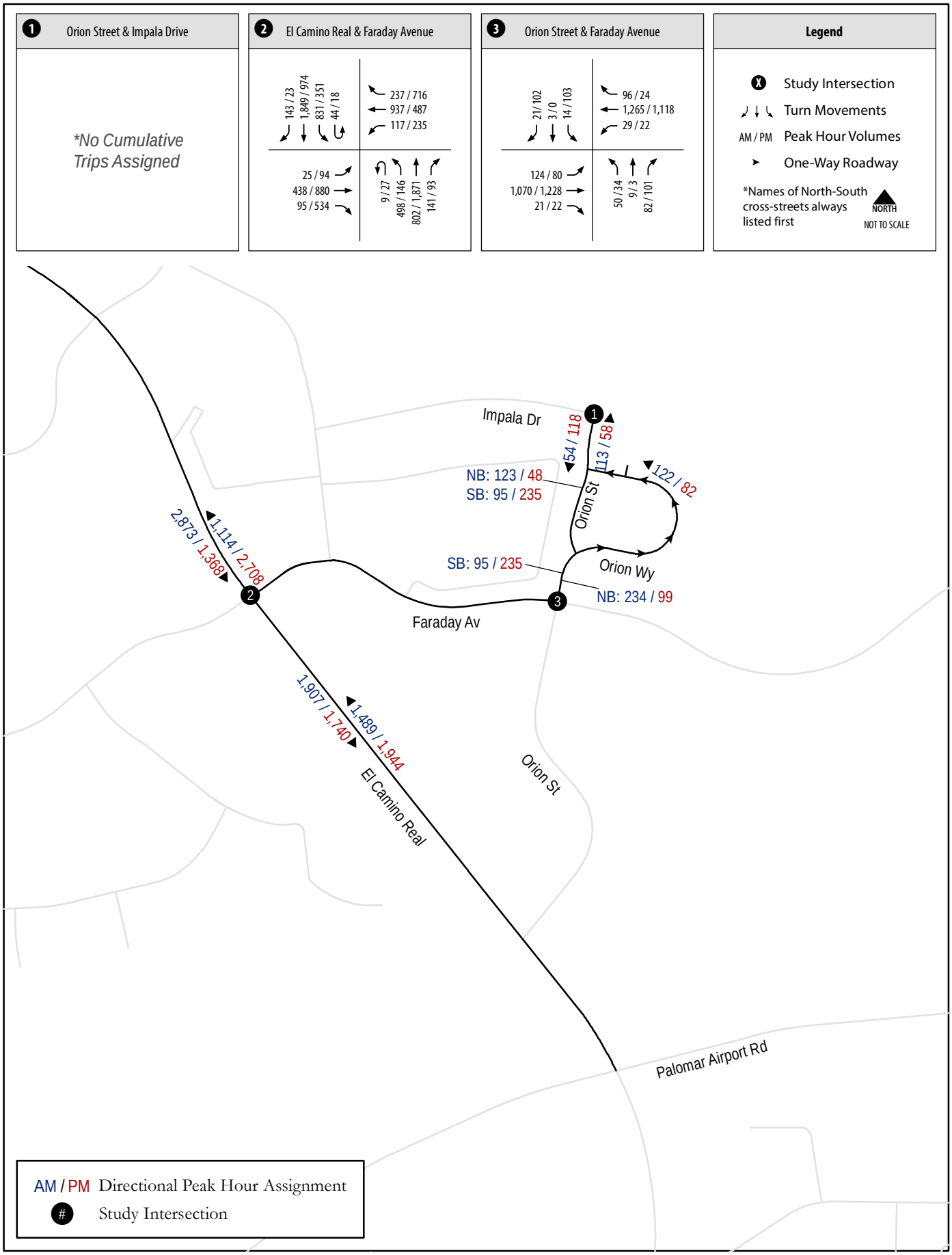
LOS analyses under Cumulative Plus Project Conditions were conducted using the methodologies described in Section 2.1. Roadway segment LOS and intersection turn-lane analysis results are discussed separately below.

Roadway Segment Analysis

Table 4.11 displays the peak hour LOS analysis results for study area roadway segments under Cumulative Plus Project Conditions.

As shown in Table 4.11, all of the study area roadway segments are anticipated to operate at acceptable LOS D or better under Cumulative Plus Project Conditions.

Based upon the significance criteria presented in Section 2.3, none of the roadway segments are anticipated to operate at a sub-standard level (LOS E or F) under Cumulative Plus Project conditions; therefore, no additional improvements would be required.



Orion Center Operations and Maintenance Facility
Local Mobility Analysis

Figure 4-8
Traffic Volumes - Cumulative Plus Project

Table 4.11 Roadway Segment LOS Capacity Analysis (Peak Hour Analysis) – Cumulative + Project Conditions

Roadway	Segment	Street Typology	Cross-Section	Speed Limit	Peak Hour	Peak Direction	Segment Capacity	Cumulative		Peak Hour Volume	LOS	Δ in Volume
								Peak Hour Volume	LOS			
Directional Peak Hour												
Orion Street	Impala Drive to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	80	C or better	113	D	33
						SB	450[1]	50	C or better	54	C or better	4
					PM	NB	450[1]	50	C or better	58	C or better	8
						SB	450[1]	90	C or better	118	D	28
	Orion Way to Orion Way	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	90	C or better	123	D	33
						SB	450[1]	80	C or better	95	C or better	15
					PM	NB	450[1]	40	C or better	48	C or better	8
						SB	450[1]	130	D	235	D	105
	Orion Way to Faraday Avenue	Industrial	2-Ln Undivided	25 MPH	AM	NB	450[1]	110	C or better	234	D	124
						SB	450[1]	80	C or better	95	C or better	15
					PM	NB	450[1]	70	C or better	99	C or better	29
						SB	450[1]	130	D	235	D	105
Orion Way	Orion Street to Orion Street (loop)	Industrial	1-Ln Undivided	25 MPH	AM	EB/NB/WB	450[1]	30	C or better	122	D	92
					PM	EB/NB/WB	450[1]	60	C or better	82	C or better	22
El Camino Real	College Boulevard to Palomar Airport Road	Arterial	6-Ln Divided	55 MPH	AM	NB	2,940[2]	1,270	B	1,301[3]	B	31
						SB	2,940[2]	2,370	B	2,390[4]	B	20
					PM	NB	2,940[2]	2,305	B	2,326[5]	B	21
						SB	2,940[2]	1,525	B	1,554[6]	B	29

Source: CR Associates, December 2021.

Notes:
[1] The peak hour directional capacity for an Industrial Street was obtained from Table 2: Roadway Capacity Table Generalized Data from the City of Carlsbad Roadway Capacity Tables Report.
[2] The peak hour directional capacity for an Arterial Street was obtained from the City of Carlsbad Segment Service Volume Table for Arterial Corridors. See Appendix A.
[3] Average morning (AM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (1,114 + 1,489 / 2 = 1,301). See Figure 4-8.
[4] Average morning (AM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,873 + 1,907 / 2 = 2,390). See Figure 4-8.
[5] Average afternoon (PM) northbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (2,708 + 1,944 / 2 = 2,326). See Figure 4-8.
[6] Average afternoon (PM) southbound traffic volume between the roadway segments of College Blvd to Faraday Avenue and Faraday Avenue to Palomar Airport Road (1,368 + 1,740 / 2 = 1,554). See Figure 4-8.

Intersection Analysis – Left-Turn Pocket Length Assessment

Table 4.12 identifies the pocket length, 95th percentile queue length and excess queue (if applicable) for each left-turn movement of roadways subject to an Auto MMLOS analysis within the study area. Intersection queueing analysis worksheets are provided in Appendix D.

Table 4.12 Peak Hour Left-turn Queue Assessment – Cumulative + Project Conditions

		Left-turn pocket length (ft)		95th Percentile Queue[2] (veh/hr)		Excess queue (ft)	
#	Intersection	NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	500[1]	600[1]	400/117	636/295	0/0	36/0
3	Orion Street / Faraday Avenue	130	130	87/57	29/156	0/0	0/26

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means excess queue.
[1] Length displayed represents two left-turn lanes. Length includes taper.
[2] 95th Percentile Queuing per Synchro 10 – Traffic Analysis Software.

As shown in the table above, the left-turn pocket lengths for each respective approach of the two analyzed (signalized) intersections, are adequate during both the AM and PM peak hours, with the exception of the following:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – A total excess of **36 feet** of queue length is calculated at this approach during the AM peak hour. **Therefore, the project shall reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach.**

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of queue length is anticipated at this approach during the PM peak hour. **Therefore, the project shall extend the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment

As shown in Figure 4-8, none of the left-turn movements, where the proposed project is anticipated to add trips, exceed 250 vehicles per hour at study area intersections, with the exception of the following:

- SB left-turn at the intersection of El Camino Real and Faraday Avenue during the AM peak hour – **875 vehicles** while during the PM peak hour – **369 vehicles**.

However, this approach already has dual left-turn lanes. **Therefore, no additional left-turn lanes are required at any of the study area intersections.**

Intersection Analysis – Dedicated Right-Turn Lane Assessment

Table 4.13 displays the peak hour right-turn volume assessment of roadways subject to Auto MMLOS analysis within the study area under Cumulative Plus Project Conditions. If the right-turn volume exceeds 150 vehicles per hour, a dedicated right-turn lane is recommended per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018.*

Table 4.13 Peak Hour Right-Turn Volume Assessment – Cumulative + Project Conditions

ID	Intersection	Right-Turn volume (veh/hr)		Dedicated Right-Turn Lane Provided?		Additional Dedicated Right-Turn Lane Needed?	
		NB	SB	NB	SB	NB	SB
2	El Camino Real / Faraday Avenue	141/93	143/23	No	Yes	No	N/A
3	Orion Street / Faraday Avenue	82/101	21/102	No	No	No	No

Source: CR Associates, December 2021.

Notes:
XX/XX = AM/PM.
Bold means over 150 vehicles per hour.
N/A = Not Applicable because a right-turn lane already exists.

As shown in the table above, based on the threshold for the recommendation of a dedicated right-turn lane (150 vehicles per hour) per the *City of Carlsbad Transportation Impact Analysis Guidelines, April 2018,* none of the approaches exceed the right-turn lane threshold. **Therefore, no dedicated right-turn lanes are required at either of the approaches.**

4.7 Needed Improvements Cumulatively Related to the Proposed Project

This section describes the improvements needed at the study area facilities under Cumulative Plus Project Conditions.

Roadway Segment Analysis

The roadway segment operations for within the project study area are not anticipated to degrade to a sub-standard level (LOS E or F) under Cumulative Plus Project conditions; therefore, additional improvements would not be required.

Intersection Analysis – Left-Turn Pocket Length Assessment

Extending the left-turn lanes is recommended at the following intersections:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – A total excess of **36 feet** of queue length is calculated at this approach during the AM peak hour. The total number of vehicle trips utilizing this left-turn lane during the AM peak hour is 875, of which 262 are cumulative and 32 (or 10.9% of the total cumulative trips) are vehicle trips associated with the Proposed Project. **Therefore, the project shall pay a fair-share contribution of 10.9% to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach.**

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of queue length is anticipated at this approach during the PM peak hour. The Proposed Project is the only project adding trips to this left-turn lane. **Therefore, the project shall pay for 100% of the costs associated with extending the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

See **Appendix F** for fair-share contribution calculations.

Intersection Analysis – Dual Left-Turn Lane Assessment

No additional left-turn lanes are required at any of the study area intersections.

Intersection Analysis – Dedicated Right-Turn Lane Assessment

No additional dedicated right-turn lanes are recommended at any of the study area intersections.

4.8 Multimodal Level of Service

This section describes the study area multimodal facilities, as well as the LOS analysis results under Existing Conditions.

Study area

As mentioned previously in this report, the modes that are to be evaluated are based on the street typology for roadways connecting the project to the citywide transportation system and the location of the project. Figure 4-1 displays the project's study area.

Existing multimodal facilities

The following multimodal facilities were selected based on the City of Carlsbad multimodal guidelines for determining the geographic area to be examined:

Subject to Transit Level of Service Analysis (See Section 2.1 – Transit Facilities):

- Orion Street, between Impala Drive / Project Driveway and Orion Way (north)
- Orion Street, between Orion Way (north) and Orion Way (south)
- Orion Street, between Orion Way (south) and Faraday Avenue
- Orion Way, between Orion Street and Orion Street (loop)
- El Camino Real, between Faraday Avenue and Palomar Airport Road

Subject to Pedestrian & Bicycle Level of Service (See Section 2.1 – Pedestrian Facilities and Bicycle Facilities)

Orion Street and Orion Way are streets classified as "Industrial", which are not subject to Pedestrian nor Bicycle LOS analysis. Therefore, these analyses are not included in this report.

Level of Service Analysis

This section analyzes the existing conditions on the identified multimodal facilities subject to MMLOS standards. Based on the roadway classification within study area, only Transit is evaluated and discussed below.

Transit LOS

Table 4.14 displays existing transit LOS at all the existing transit lines and transit stops located at a walking distance greater than ½ mile of the project site. See **Appendix G** for transit information.

Table 4.14 Transit LOS – El Camino Real Transit Stops

Criteria	El Camino Real Transit Stops
Is area governed by an adopted TDM ordinance that will promote ridesharing and/or the use of non-auto modes?	Yes
Are On Demand rideshare services available?	No
Is the study segment within FLEX service area?	No
Score / LOS	60 / D

Source: City of Carlsbad MMLOS Tool, September 2018. CR Associates, December 2021.

As shown in the table above, transit LOS operates at LOS D at the existing transit stops located at a walking distance greater than ½ mile of the project site.

4.9 Unsignalized Intersection Analysis

As mentioned in Section 2.1, unsignalized intersections located along study area roadway segments are subject to an Auto MMLOS analysis. A traffic signal warrant analysis may be required for these intersections if:

- The unsignalized intersection provides direct access to the project site, or
- The unsignalized intersection provides direct access to a cumulative project considered in the cumulative conditions section, or
- The unsignalized intersection has been identified by the City as a potential signalized intersection.

Out of the three criteria mentioned above, the intersection of Orion Street and Impala Drive / Project Driveway meets the first criteria. Therefore, traffic signal warrants were conducted for this intersection.

Analysis Methodology

The *California Manual on Uniform Traffic Control Devices* (CMUTCD) is the document that serves as a guide to determine where traffic signals should be installed. The CMUTCD defines nine (9) unique warrants relating to different traffic flow conditions which can potentially be improved by a traffic signal. It is important to note that meeting one or more warrants does not determine installation of a traffic signal, only that the location may be eligible for a signal. Each of the nine (9) unique warrants is listed below. **Appendix H** contains detailed information regarding the traffic signal warrants.

- Warrant 1, Eight (8) Hour Warrant
- Warrant 2, Four (4) Hour Warrant
- Warrant 3, Peak Hour
- Warrant 4, Pedestrian Volume
- Warrant 5, School Crossing
- Warrant 6, Coordinated Signal System
- Warrant 7, Crash Experience
- Warrant 8, Roadway Network
- Warrant 9, Intersection Near a Grade Crossing

Table 4.15 displays traffic signal warrant results under different scenarios. **Appendix H** contains traffic signal warrants conducted for all scenarios.

Table 4.15 Traffic Signal Warrant – Orion Street and Impala Drive/Project Driveway

Warrant	Existing Satisfied?	Existing + Project Satisfied?	Cumulative Satisfied?	Cumulative + Project Satisfied?	Notes
Warrant 1, Eight-Hour Vehicular Volume	No	No	No	No	Vehicular volumes on the major street and minor street do not meet the minimum requirements during the same eight hours.
Warrant 2, Four-Hour Vehicular Volume	No	No	No	No	Vehicular volumes on the major street and minor street do not meet the minimum requirements during the same four hours.
Warrant 3, Peak Hour	No	No	No	No	Vehicular volumes on the major street and minor street do not meet the minimum requirements during the same one hour (any four consecutive 15-minute periods).
Warrant 4, Pedestrian Volume	No	No	No	No	Vehicular volumes on the major street and the corresponding pedestrians per hour crossing the major street do not meet the minimum requirements during the same hour (any four consecutive 15-minute periods).
Warrant 5, School Crossing	No	No	No	No	No schools are located in the vicinity of the intersection. As such, schoolchildren are not present at this intersection.
Warrant 6, Coordinated Signal System	No	No	No	No	Within the vicinity of this intersection, there are no other signalized intersections. Therefore, platooning issues do not exist.
Warrant 7, Crash Experience	No	No	No	No	One (1) vehicular collision was identified at this intersection within a five-year period (1/1/2016 through 2/25/2021). Five or more vehicular collisions within a 12-month period are required to meet this warrant.
Warrant 8, Roadway Network	No	No	No	No	There are no traffic flow issues in the vicinity of this intersection.
Warrant 9, Intersection Near a Grade Crossing	No	No	No	No	This intersection is not located within 140 feet of a grade crossing.

Source: CR Associates, December 2021.

4.10 Transportation Systems Management (TSM)

Transportation Systems Management (TSM) integrates traffic signals in the City to a single access point, allowing city staff to monitor and update signal timings to improve safety and mobility for all users in the city. Per policy 3P.11 of the City of Carlsbad Mobility Element, projects that add vehicle traffic to street facilities that are exempt from the vehicle LOS standard are required to implement TSM strategies.

The project is subject to implementing TSM strategies as it adds 110 Average Daily Trips (ADT) or 11 peak hour trips in a single direction of travel to El Camino Real between Palomar Airport Road and La Costa Avenue, which is exempt from vehicular LOS analysis. Therefore, in order to satisfy the TSM requirements, the following improvement is recommended:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane. The proposed project shall pay a 10.9% fair-share contribution to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach. Additionally, the proposed project will pay for the installation of a traffic signal controller.

The recommendation mentioned above is consistent with those discussed in Section 4.6 of this report. This recommendation increases capacity at the intersection, which increases the efficiency of traffic signals.

4.11 Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is the concept of using policies, strategies, and programmatic measures to encourage a shift away from single-occupancy vehicle (SOV) trips toward alternative travel options, such as walking, biking, transit, and ridesharing to reduce excess demand for congested roadways and parking. In other words, TDM efforts try to get people to drive alone less, and instead, walk, bike, ride transit or carpool more. Less driving alone can benefit the individual in many ways by reducing stress, increasing physical activity, and saving money. Cumulatively, it also can allow for a much more efficient use of road space, thereby reducing congestion, overall vehicle miles traveled (VMT), and greenhouse gas (GHG) emissions. The Tier 3 TDM plan for the proposed project meets two distinct requirements: 1) Complying with the Mobility Element requirement and 2) Complying with the City of Carlsbad TDM ordinance.

4.12 TDM Program Application and Thresholds for Compliance

The City of Carlsbad TDM Program applies to all non-residential developers, property managers, and employers doing business in the City of Carlsbad, both existing and new. There are mandatory requirements for new non-residential developments that meet certain thresholds and a voluntary business program for all businesses that would like to participate.

Proposed non-residential development projects with trip generation estimates of 110 daily employee trips or more are subject to the TDM ordinance and are required to complete and implement a Developer TDM Plan.

Table 4.16 displays the TDM plan applicability in terms of ADT generation.

Table 4.16 TDM Plan Applicability

ADT	New Development	Tenant Improvement
<110	Exempt	
110 – 220	Tier 1	Tier 1
221 – 275	Tier 2	Tier 2
>275	Tier 3	Tier 2

Source: City of Carlsbad TDM Handbook, August 2019.

Table 4.17 displays the expected total employee average daily employee trips based on the employee ADT estimations.

Table 4.17 Employee ADT Estimation for Various Commercial Uses

Use	Employee ADT for first 1,000 square feet	Employee ADT / 1,000 square feet thereafter[1]
Office-all uses[2]	13	13
Restaurant	11	11
Retail	8	4.5
Industrial	4	3.5
Manufacturing	4	3
Warehousing	4	1

Source: City of Carlsbad TDM Handbook, August 2019.

Notes:
[1] Unless otherwise noted, rates estimated from ITE Trip Generation Manual, 10th Edition
[2] For all office categories. Calibrated based on typical number of employees/square foot for office uses.
[3] Retail uses include shopping center, variety store, supermarket, gyms, pharmacy, etc.

Based on the trip generation rates displayed in Table 4.17, the proposed Orion Center Project is anticipated to generate a total of 675 average daily employee trips. The calculations were performed as follows:

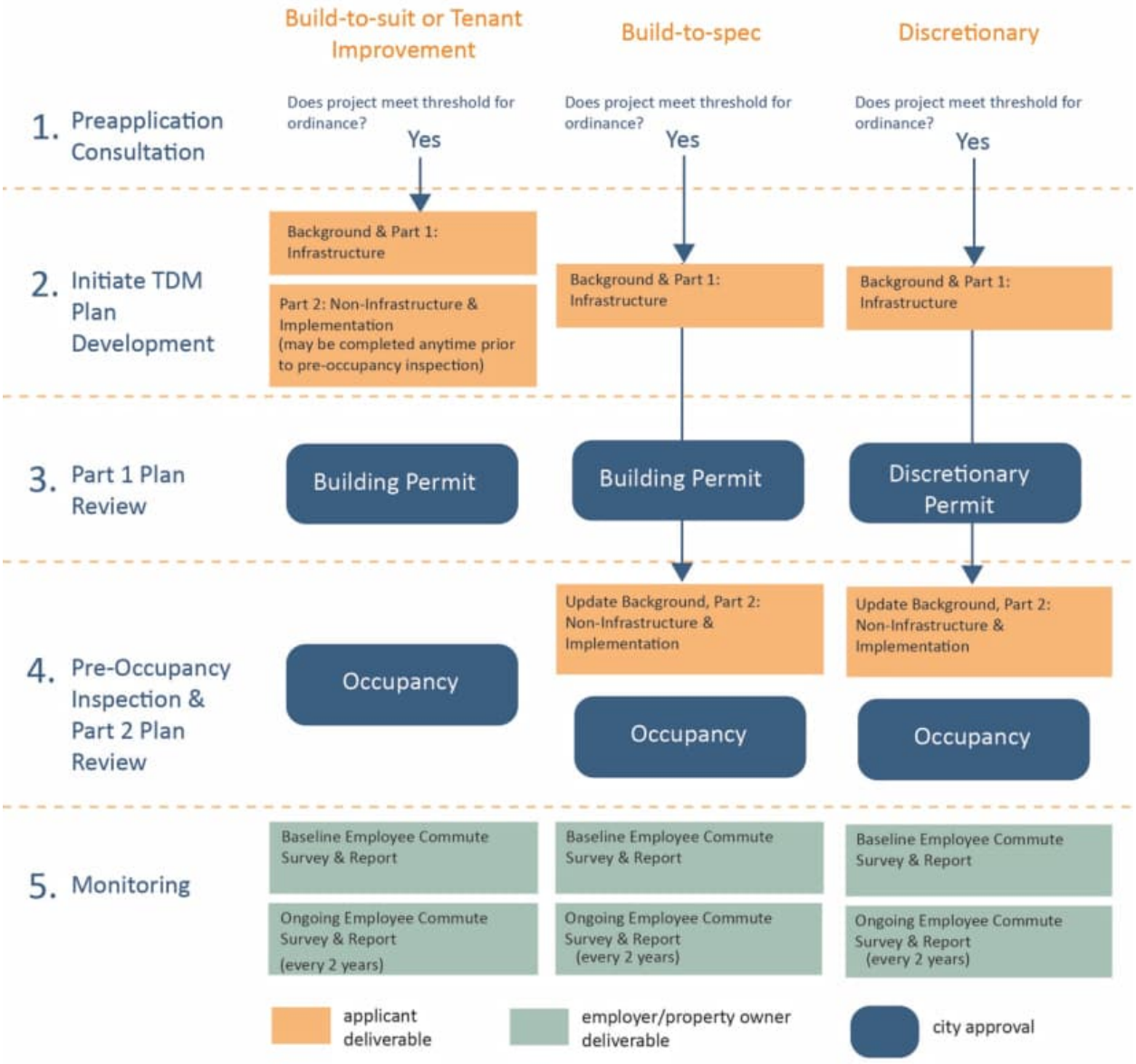
- Office (41,900 square feet) – **13 trips** for the first 1,000 sq.ft. and **532 trips** for the next 40,900 sq.ft. (40,900/1,000 * 13) = **545 trips**;
- Industrial (26,330 square feet) – **4 trips** for the first 1,000 sq.ft. and **89 trips** for the next 25,330 sq.ft. (25,330/1,000 * 3.5) = **93 trips**; and
- Storage (35,280 square feet) – 4 trips for the first 1,000 sq.ft. and 35 trips for the next 34,280 sq.ft. (34,280/1,000 * 1) = **39 trips**.

The proposed Orion Center Project is anticipated to generate 677 average daily employee trips; therefore, a Tier 3 Plan **is required**.

4.13 TDM Plan Requirements

A Tier 3 TDM plan is organized into two separate parts:

1. All developments subject to the ordinance must submit Part I: Project Background, Existing Conditions and Infrastructure TDM Strategies of the TDM plan prior to building permit issuance.
2. Part II of the TDM Plan consists of non-infrastructure strategies and must be submitted and approved prior to occupancy. Build-to-suit projects and tenant improvements may submit Part II along with Part I prior to building permit issuance.



Source: City of Carlsbad TDM Handbook, August 2019.

The proposed Orion Center Project falls under the category of a Discretionary permit and its Tier 2/3 TDM plan requires the selection of TDM infrastructure strategies to satisfy Part I in addition to the three required ones non-infrastructure strategies to satisfy Part II.

It is important to note that the City of Carlsbad is currently developing a TDM program that will be available to all city employees, including employees of the Orion Center Operations and Maintenance Facility.

A Tier 3 development must achieve a minimum of six (6) points through infrastructure strategies (Part I), the following five infrastructure TDM strategies will be provided for the achievement of the minimum six (6) points needed by the proposed Orion Center Project towards the total of 18 points needed for a Tier 3 development:

Secure Bike Parking – 1 point
Provide a secure, weather-protected bike cage or bike room for employees.

Public Bike Racks – 1 point
Provide public bike racks near the building entrances for all cyclists, including visitors.

Passenger Loading Zone – 1 point
Provide signed passenger pick-up and loading curb space for ride-share.

End of Trip Facilities – 1 point
Provide shower and changing rooms for employees who use active transportation to get to work.

Preferential Carpool Parking – 2 points
Provide preferential car/vanpool parking spaces. Up to 9 preferential car/vanpool parking spaces. Up to 4 can be combined with preferential Electric Vehicle/clean air spaces and marked as such as long as the 5 spaces solely dedicated to car/vanpools are closer to building entrances. All preferential spaces must be enforced.

Based on the TDM strategies described above, the proposed Orion Center Project would meet the minimum of six (6) points required from infrastructure TDM strategies. Additionally, the proposed Orion Center Project will provide the following non-infrastructure TDM Strategies:

Transportation Coordinator – 1 point
Provide an on-site transportation coordinator responsible for ensuring that infrastructure is maintained, policies and programs are implemented, and amenities and partnerships are maintained as described in the approved TDM plan and otherwise ensuring compliance with City of Carlsbad TDM Plan requirements.

Distribute New Hire Transportation Information – 1 point
Provide information to new employees during the hiring and orientation process about the transportation options available.

Citywide TDM Program – 2 points
The Transportation Coordinator is required to meet with the citywide TDM programs outreach staff on a regular basis (at least annually) and participate in at least one event held by the citywide TDM program (if available).

Real-Time Travel Information – 1 point
Provide Wi-Fi hotspots in both the city staff locations and locations accessible by the public to display real-time transit information as well as promote all modes of travel information, education, and benefits.

Mobile **On-site Amenities – 1 point**
Invite mobile food and coffee trucks, cleaners, and mail services to stop by the proposed project. As more mobile amenities are available, they will be incorporated into the on-site amenities schedule.

Guaranteed Ride Home (GRH) Services – 1 point
Promote the iCommute Guaranteed Ride Home services via staff communication.

Marketing and Outreach – 1 point
The City has a formal TDM program called CarlsbadCommuter.com. There will be a minimum o four events per year. The first event is associated with the new year and promotes balanced work and new habits; telework, shift schedules, walking, biking, carpooling, vanpooling, and transit. The second event in May complements the regional efforts and focuses on biking and bike safety via bike to school day and bike-to- work day. The third event complements the regional car-free day and focuses on site specific business health fair promotion of TDM during the health care open enrollment period. The fourth event is about recognition, awards, and sharing best practices.

Flexible/Alternative Work Schedules – 1 point
Provide a wide variety of schedules based on job responsibilities. The City will continue to monitor employee schedules and promote a flexible/alternative work schedule as appropriate. It is anticipated that a minimum of 30 percent of the staff will be on alternative work schedule.

Commuter Tax Benefits – 1 point
Provide a pre-tax commuter benefit to employees allowing them to pay for qualifying commuter expenses with pre-tax funds. This is marketed with all employee benefits which are showcased during the open enrollment period in the Fall.

Customized Travel Plans – 1 point
Provide a customized travel plan, via the Transportation Coordinator, for every employee that requests the assistance with their travel plans.

Innovation – 1 point
Provide alternative transportation sources via the RideAmigos App to incentivize, track, reward, and match potential shared mobility options to employees. The CarlsbadCommuter.com website has an innovative chat option with a TDM specialist to help both employees and employers to find the resources and services they need to stay connected, engaged, and active in TDM opportunities.

4.14 Findings and Conclusions

This section provides a summary of the key findings and conclusions, including the recommended improvements associated with the various analysis scenarios.

Existing Conditions

Roadway
All roadway segments were identified to operate at LOS D or better under Existing conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment
No physical improvements are recommended at any of the intersection approaches.

Intersection Analysis – Dual Left-Turn Lane Assessment
No additional left-turn lanes are required at any of the left-turn approaches within the study area.

Intersection Analysis – Dedicated Right-Turn Lane Assessment
No additional dedicated right-turn lanes are recommended within the study area.

MMLOS Analysis
All transit facilities located within the project study area operate at LOS D under Existing conditions.

Existing Plus Project Conditions

Roadway
All of the study area roadway segments are anticipated to operate at acceptable LOS D or better under Existing Plus Project Conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment
The following improvements are recommended:

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of excess queue length is anticipated at this approach during the PM peak hour. **Therefore, the project shall extend the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment
No additional left-turn lanes are required at any of the study area intersections.

Intersection Analysis – Dedicated Right-Turn Lane Assessment
No additional dedicated right-turn lanes are recommended at either of the approaches.

Cumulative Conditions

Roadways
All roadway segments were identified to operate at LOS D or better under Cumulative conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment
No physical improvements are recommended at any of the intersection approaches.

Intersection Analysis – Dual Left-Turn Lane Assessment
No additional left-turn lanes are required at any of the left-turn approaches within the study area.

Intersection Analysis – Dedicated Right-Turn Lane Assessment
No additional dedicated right-turn lanes are recommended within the study area.

Cumulative Plus Project Conditions

Roadways
All of the study area roadway segments are anticipated to operate at acceptable LOS D or better under Cumulative Plus Project Conditions.

Intersection Analysis – Left-Turn Pocket Length Assessment
Extending the left-turn lanes is recommended at the following intersections:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – A total excess of **36 feet** of queue length is calculated at this approach during the AM peak hour. The total number of vehicle trips utilizing this left-turn lane during the AM peak hour is 875, of which 262 are cumulative and 32 (or 10.9% of the total cumulative trips) are vehicle trips associated with the Proposed Project. **Therefore, the project shall pay a fair-share contribution of 10.9% to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach.**

- *SB left-turn approach at Orion Street / Faraday Avenue* – A total excess of **26 feet** of queue length is anticipated at this approach during the PM peak hour. The Proposed Project is the only project adding trips to this left-turn lane. **Therefore, the project shall pay for 100% of the costs associated with extending the left-turn lane at this approach. The extension of this left-turn lane can be accomplished by restriping.**

Intersection Analysis – Dual Left-Turn Lane Assessment
No additional left-turn lanes are required at any of the study area intersections.

Intersection Analysis – Dedicated Right-Turn Lane Assessment
No additional dedicated right-turn lanes are recommended at either of the approaches.

Transportation Systems Management (TSM)

The project is anticipated to add more than 11 peak hour trips in a single direction of travel to El Camino Real between Palomar Airport Road and La Costa Avenue, which is exempt for vehicular LOS analysis; therefore, extending the left-turn lanes is recommended at the following intersection:

- *SB left-turn approach at El Camino Real / Faraday Avenue* – **The project shall coordinate with the City of Carlsbad's Traffic Division to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach.** The proposed project shall pay a 10.9% fair-share contribution to reconstruct the median at El Camino Real to accommodate the extension of the left-turn lane at this approach. Additionally, the proposed project will pay for the installation of a traffic signal controller.

This recommendation increases capacity at the intersection, which increases the efficiency of traffic signals.

Transportation Demand Management (TDM)

A Tier 3 development must achieve a minimum of 6 points through infrastructure strategies (Part I), the following seven infrastructure TDM strategies will be provided for the achievement of the minimum six (6) points needed by the proposed Orion Center Project towards the total of 18 points needed for a Tier 3 development:

Secure Bike Parking – 1 point

Provide a secure, weather-protected bike cage or bike room for employees.

Public Bike Racks – 1 point

Provide public bike racks near the building entrances for all cyclists, including visitors.

Passenger Loading Zone – 1 point

Provide signed passenger pick-up and loading curb space for ride-share.

End of Trip Facilities – 1 point

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Preferential Carpool Parking – 2 points

Provide preferential car/vanpool parking spaces. Up to 9 preferential car/vanpool parking spaces. Up to 4 can be combined with preferential Electric Vehicle/clean air spaces and marked as such as long as the 5 spaces solely dedicated to car/vanpools are closer to building entrances. All preferential spaces must be enforced.

Based on the TDM strategies described above, the proposed Orion Center Project would meet the minimum of 6 points required from infrastructure TDM strategies. Additionally, the proposed Orion Center Project will provide the following non-infrastructure TDM Strategies:

Transportation Coordinator – 1 point

Provide an on-site transportation coordinator responsible for ensuring that infrastructure is maintained, policies and programs are implemented, and amenities and partnerships are

maintained as described in the approved TDM plan and otherwise ensuring compliance with City of Carlsbad TDM Plan requirements.

Distribute New Hire Transportation Information – 1 point
Provide information to new employees during the hiring and orientation process about the transportation options available.

Citywide TDM Program – 2 points
The Transportation Coordinator is required to meet with the citywide TDM programs outreach staff on a regular basis (at least annually) and participate in at least one event held by the citywide TDM program (if available).

Real-Time Travel Information – 1 point
Provide Wi-Fi hotspots in both the city staff locations and locations accessible by the public to display real-time transit information as well as promote all modes of travel information, education, and benefits.

Mobile On-site Amenities – 1 point
Invite mobile food and coffee trucks, cleaners, and mail services to stop by the proposed project. As more mobile amenities are available, they will be incorporated into the on-site amenities schedule.

Guaranteed Ride Home (GRH) Services – 1 point
Promote the iCommute Guaranteed Ride Home services via staff communication.

Marketing and Outreach – 1 point
The City has a formal TDM program called CarlsbadCommuter.com. There will be a minimum o four events per year. The first event is associated with the new year and promotes balanced work and new habits; telework, shift schedules, walking, biking, carpooling, vanpooling, and transit. The second event in May complements the regional efforts and focuses on biking and bike safety via bike to school day and bike-to- work day. The third event complements the regional car-free day and focuses on site specific business health fair promotion of TDM during the health care open enrollment period. The fourth event is about recognition, awards, and sharing best practices.

Flexible/Alternative Work Schedules – 1 point
Provide a wide variety of schedules based on job responsibilities. The City will continue to monitor employee schedules and promote a flexible/alternative work schedule as appropriate. It is anticipated that a minimum of 30 percent of the staff will be on alternative work schedule.

Commuter Tax Benefits – 1 point
Provide a pre-tax commuter benefit to employees allowing them to pay for qualifying commuter expenses with pre-tax funds. This is marketed with all employee benefits which are showcased during the open enrollment period in the Fall.

Customized Travel Plans – 1 point
Provide a customized travel plan, via the Transportation Coordinator, for every employee that requests the assistance with their travel plans.

Innovation – 1 point

Provide alternative transportation sources via the RideAmigos App to incentivize, track, reward, and match potential shared mobility options to employees. The CarlsbadCommuter.com website has an innovative chat option with a TDM specialist to help both employees and employers to find the resources and services they need to stay connected, engaged, and active in TDM opportunities.

APPENDIX A – City of Carlsbad Roadway Capacity Tables

City of Carlsbad Segment LOS Capacity Threshold

Segment Capacity Threshold for Arterial Streets

Hourly Volume in Peak Direction

Lanes	Speed Limit	Median	B	C	D	E
1	35	Undivided	**	180	590	740
	35	Divided	**	190	630	780
2	35	Divided	**	520	1390	1540
	45	Divided	**	600	1560	1760
	50	Divided	**	850	1690	1820
	55	Divided	**	1050	1800	1890
3	35	Divided	**	680	2230	2540
	45	Divided	**	2040	2660	2700
	50	Divided	**	2360	2760	2800
	55	Divided	390	2600	2870	2900
4	45	Divided	**	2780	3560	3620

Hourly Volume in Both Direction

Lanes	Speed Limit	Median	B	C	D	E
2	35	Undivided	**	340	1100	1380
	35	Divided	**	360	1170	1450
4	35	Divided	**	970	2580	2860
	45	Divided	**	1120	2890	3260
	50	Divided	**	1580	3130	3380
	55	Divided	**	1950	3340	3500
5	55	Divided	**	3395	4343	4455
6	35	Divided	**	1260	4130	4720
	50	Divided	**	4380	5120	5180
	55	Divided	730	4820	5320	5360
7	45	Divided	**	4483	5785	5878

Annual Average Daily Traffic

Lanes	Speed Limit	Median	B	C	D	E
2	35	Undivided	**	4200	13700	17200
	35	Divided	**	4400	14600	18100
4	35	Divided	**	12100	32200	35800
	45	Divided	**	13900	36200	40800
	50	Divided	**	19700	39200	42200
	55	Divided	**	24400	41700	43800
6	35	Divided	**	15800	51700	59000
	50	Divided	**	54700	63900	64800
	55	Divided	9100	60200	66500	67000

Segment Capacity Threshold for Industrial Streets

Hourly Volume in Peak Direction

Lanes	Speed Limit	Median	B	C	D	E
1	25	Undivided	**	110	450	560
	25	Divided	**	140	610	720
	35	Undivided	**	180	590	740
	35	Divided	**	190	630	780
	40	Undivided	**	216	708	888
	40	Divided	**	228	756	936

Hourly Volume in Both Direction

Lanes	Speed Limit	Median	B	C	D	E
2	25	Undivided	**	200	800	990
	25	Divided	**	250	1080	1270
	35	Undivided	**	340	1100	1380
	35	Divided	**	360	1170	1450
	40	Undivided	**	408	1320	1656
	40	Divided	**	432	1404	1740

Annual Average Daily Traffic

Lanes	Speed Limit	Median	B	C	D	E
2	25	Undivided	**	2200	8900	11000
	25	Divided	**	2800	12000	14100
	35	Undivided	**	4200	13700	17200
	35	Divided	**	4400	14600	18100
	40	Undivided	**	5040	16440	20640
	40	Divided	**	5280	17520	21720

Facility Level of Service Analysis

Facility Service Volume Table

ARTERIAL STREETS

N/S Streets	Limits	Roadway Classification	TSM Improvement	Peak Direction LOS Thresholds					Thresholds	
				A	B	C	D	E	LOS Standard	Capacity
El Camino Real	City Limits to Marron Road	6/35/D	Without	**	**	**	**	1400	1	1400
	Marron Road to Carlsbad Village Drive	6/35/D	Without	**	140	2070	2520	##	2520	2520
	Carlsbad Village Drive to Tamarack Avenue	6/55/D	Without	1930	2850	2900	##	##	2900	2900
	Tamarack Avenue to Cannon Road [1]	6/55/D	Without	**	**	2400	2800	##	2800	2800
	Cannon Road to College Boulevard	2/55/D - NB	Without	**	1060	1860	##	##	1860	1860
		3/55/D - SB	Without	**	2150	2900	##	##	2900	2900
	College Boulevard to Palomar Airport Road [1]	6/55/D	Without	270	2750	2940	##	##	2940	2940
	Palomar Airport Road to Camino Vida Roble	6/55/D	Without	**	**	1330	2510	2580	2510	2580
	Camino Vida Roble to Poinsettia Lane	2/55/D - NB	Without	**	970	2020	2100	##	2100	2100
		3/55/D - SB	Without	**	1470	2820	2900	##	2900	2900
	Poinsettia Lane to Aviara Parkway-Alga Road	6/55/D	Without	**	**	2100	2820	2900	2820	2900
	Aviara Parkway-Alga Road to La Costa Avenue	3/55/D - NB	Without	**	1390	2580	##	##	2580	2580
		2/55/D - SB	Without	**	800	1920	##	##	1920	1920
	La Costa Avenue to Leucadia Boulevard	6/55/D	Without	**	**	1880	2820	2880	2820	2880
College Boulevard	City Limits to Carlsbad Village Drive	4/45/D	Without	**	**	930	1680	1770	1680	1770
	Carlsbad Village Drive to Cannon Road	4/45/D	Without	**	**	1040	1760	1800	1760	1800
	El Camino Real to Aston Avenue	4/50/D	Without	**	**	390	1440	1810	1440	1810
	Aston Avenue to Palomar Airport Road	2/50/D - NB	Without	880	1680	##	##	##	1680	1680
		2/50/D - SB	Without	80	970	1040	##	##	1040	1040
Aviara Parkway	Palomar Aiport Road to Poinsettia Lane [1]	4/45/D	Without	**	**	**	1130	1630	1130	1630
			With	**	**	800	1620	1740	1620	1740
Melrose Drive	City Limits to Palomar Airport Road	4/55/D - NB	Without	**	**	1710	2740	2830	2740	2830
		3/55/D - SB	Without	**	**	**	930	1630	930	1630
	Palomar Airport Road to Poinsettia Lane	6/55/D	Without	**	490	2720	2880	##	2880	2880
	Poinsettia Lane to Rancho Santa Fe Road	6/55/D	Without	**	**	1400	2100	##	2100	2100
Rancho Santa Fe Road	City Limits to Camino Junipero	6/55/D	Without	**	2520	3160	##	##	3160	3160
	Camino Junipero to La Costa Avenue	6/55/D	Without	**	1400	2660	2700	##	2700	2700
	La Costa Avenue to Calle Barcelona	6/50/D	Without	**	460	2410	2480	##	2480	2480
	Calle Barcelona to Olivenhain Road	6/50/D	Without	**	540	2810	3040	##	3040	3040

E/W Streets	Limits	Roadway Classification		Peak Direction LOS Thresholds					Thresholds	
				A	B	C	D	E	LOS Standard	Capacity
Cannon Road	Avenida Encinas to Paseo del Norte [1]	4/35/D	Without	**	**	**	730	1320	730	1320
	Paseo del Norte to Car Country	4/50/D	Without	**	390	1630	1770	1800	1770	1800
	Car Country to Legoland Drive	4/50/D	Without	**	1170	1660	1700	##	1700	1700
	Legoland Drive to Faraday Avenue	4/50/D	Without	**	270	1280	1320	##	1320	1320
	Faraday Avenue to El Camino Real	4/50/D	Without	**	**	1280	1620	##	1620	1620
	El Camino Real to College Boulevard	4/50/D	Without	**	**	280	1310	1690	1310	1690
Faraday Avenue	Van Allen Way to El Camino Real	4/40/D	Without	**	**	220	1400	1680	1400	1680
	El Camino Real to Melrose Drive	4/50/D	Without	**	**	1370	1640	##	1640	1640
Palomar Airport Road	Carlsbad Boulevard to Avenida Encinas	2/35/U	Without	**	520	760	##	##	760	760
	Avenida Encinas to Paseo del Norte	3/35/D - EB	Without	**	**	**	**	250	1	250
		2/35/D - WB	Without	**	**	**	**	650	1	650
	Paseo del Norte to Armada	3/45/D - EB	Without	**	**	1640	2660	2740	2660	2740
		4/45/D - WB	Without	**	**	2250	3570	3680	3570	3680
	Armada to Aviara Parkway	6/55/D	Without	**	650	2760	2940	##	2940	2940
	Aviara Parkway to Camino Vida Roble [1]	6/55/D	Without	440	2720	2900	##	##	2900	2900
	Camino Vida Roble to El Camino Real [1]	6/55/D	Without	**	890	2780	2900	##	2900	2900
	El Camino Real to El Fuerte	6/55/D	Without	**	1290	2830	2900	##	2900	2900
	El Fuerte to Melrose Drive	6/55/D	Without	**	1230	2860	2940	##	2940	2940
	Melrose Drive to City Limits	6/55/D	Without	**	340	2590	2900	##	2900	2900
Poinsettia Lane	Avenida Encinas to Paseo del Norte	4/35/D	Without	**	**	**	180	1190	180	1190
	Paseo del Norte to Aviara Parkway	4/50/D	Without	**	**	1330	1770	1840	1770	1840
La Costa Avenue	Piraeus Street to El Camino Real	4/55/D	Without	**	1450	1700	##	##	1700	1700

** Indicates LOS cannot be achieved during peak hour.(e.g., signal spacing is too close to achieve smooth traffic flows even at low volumes).

Indicates the capacity jumps to LOS F because intersection capacities have been reached. (i.e., travel speeds quickly degrade to LOS F).

[1] - Service volumes for individual segments are provided in Segment Service Volume Table

TSM - Transportation System Management

Segment Level of Service Analysis

Segment Capacity Table

ARTERIAL STREETS				
N/S Streets	Limits	Roadway Classification	Capacity *	
			Without TSM	With TSM **
El Camino Real	Tamarack Avenue to Kelly Drive	6/55/D	2950	2950
	Kelly Drive to Lisa St-West Ranch	6/55/D	2900	2900
	Lisa St-West Ranch - Cannon Road	6/55/D	2800	2800
	College Boulevard to Faraday Road	6/55/D	3100	3100
	Faraday Road to Palomar Aiport Road	6/55/D	2940	2940
Aviara Parkway	Palomar Aiport Road to Laurel Tree Lane	4/45/D	1410	1820
	Laurel Tree Ln to Mariposa Rd-Cobblestone Rd	4/45/D	1450	1720
	Mariposa Rd-Cobblestone Rd to Plum Tree Rd	4/45/D	1690	1760
	Plum Tree Rd to Camino De Las Ondas	4/45/D	1720	1780
	Camino De Las Ondas to Poinsettia Lane	4/45/D	1690	1760
W/W Streets	Limits	Roadway Classification	Capacity *	
			Without TSM	With TSM **
Cannon Road	Avenida Encinas to I-5 SB Ramp	4/35/D	200	200
	I-5 SB Ramp to I-5 NB Ramp	4/35/D	1790	1790
	I-5 NB Ramp to Paseo del Norte	4/35/D	1390	1390
Palomar Airport Road	Aviara Parkway to Palomar Oaks Way	6/55/D	2900	2900
	Palomar Oaks Way to Camino Vida Roble	6/55/D	2900	2900
	Camino Vida Roble to Yarrow Drive	6/55/D	2900	2900
	Yarrow Drive to Lowes	6/55/D	2880	2880
	Lowes to El Camino Real	6/55/D	2910	2910

Notes:

* The rodaway capacities reported in this table were developed in accordance with the Highway Capacity Manual. Capacity is determined by many factors including the arrival type.

** Transportation Systems Management (TSM) include projects indented to improve traffic flow. A TSM project may include upgrades to traffic signal equipment to enable adaptive signal operations. City staff determined that adaptive signal operations are expected to improve the arrival type in the AM/PM peak hours (i.e., increase capacity) if the signals operated in the free mode (i.e., uncooridnated) prior to the project. City staff determined that adaptive operations do not significantly improve arrival type (i.e., do not increase capacity) on corridors already operating in coordinated mode prior to adaptive operations.

APPENDIX B – Relevant Excerpts from ITE Trip Generation Manual

Industrial Park
(130)

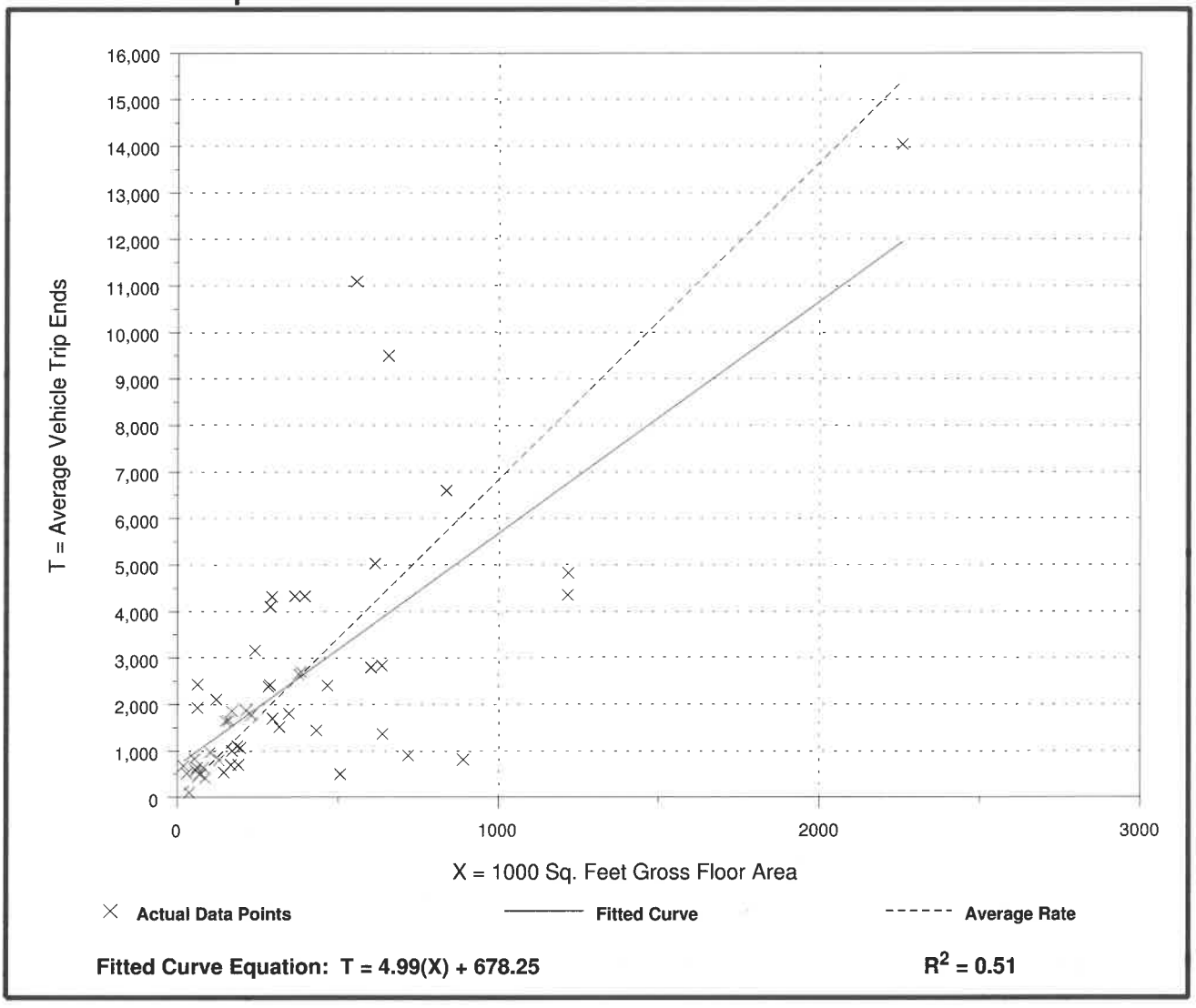
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday

Number of Studies: 52
Average 1000 Sq. Feet GFA: 369
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
6.83	0.91 - 36.97	5.57

Data Plot and Equation



Fitted Curve Equation: T = 4.99(X) + 678.25

R^2 = 0.51

Appendix C – Traffic Data

Prepared by NDS/ATD

VOLUME

Orion St Bet. Impala Dr & Orion Way (Exit Only)

Day: Thursday
Date: 3/7/2019

City: Carlsbad
Project #: CA19_4114_001

DAILY TOTALS	NB	SB	EB	WB	Total
	605	488	0	0	1,093

AM Period	NB		SB		EB		WB		TOTAL	
00:00	0		0						0	
00:15	0		0						0	
00:30	0		0						0	
00:45	0		0						0	
01:00	0		0						0	
01:15	0		0						0	
01:30	0		0						0	
01:45	0		0						0	
02:00	0		0						0	
02:15	0		0						0	
02:30	0		0						0	
02:45	0		0						0	
03:00	0		0						0	
03:15	1		1						2	
03:30	0		1						1	
03:45	0	1	0	2					0	3
04:00	0		0						0	
04:15	1		0						1	
04:30	0		0						0	
04:45	2	3	1	1					3	4
05:00	1		0						1	
05:15	2		0						2	
05:30	1		0						1	
05:45	7	11	3	3					10	14
06:00	9		2						11	
06:15	11		1						12	
06:30	26		1						27	
06:45	27	73	4	8					31	81
07:00	16		2						18	
07:15	11		6						17	
07:30	25		5						30	
07:45	19	71	1	14					20	85
08:00	19		2						21	
08:15	15		6						21	
08:30	13		8						21	
08:45	23	70	6	22					29	92
09:00	19		8						27	
09:15	10		4						14	
09:30	12		1						13	
09:45	7	48	7	20					14	68
10:00	10		4						14	
10:15	11		5						16	
10:30	9		8						17	
10:45	9	39	4	21					13	60
11:00	10		5						15	
11:15	7		13						20	
11:30	5		17						22	
11:45	9	31	13	48					22	79
TOTALS		347		139						486
SPLIT %		71.4%		28.6%						44.5%

PM Period	NB		SB		EB		WB		TOTAL	
12:00	11		9						20	
12:15	13		11						24	
12:30	12		13						25	
12:45	6	42	4	37					10	79
13:00	12		8						20	
13:15	5		5						10	
13:30	10		6						16	
13:45	10	37	5	24					15	61
14:00	10		12						22	
14:15	14		9						23	
14:30	10		10						20	
14:45	10	44	14	45					24	89
15:00	5		11						16	
15:15	10		9						19	
15:30	7		35						42	
15:45	13	35	22	77					35	112
16:00	12		11						23	
16:15	11		14						25	
16:30	5		14						19	
16:45	7	35	14	53					21	88
17:00	12		28						40	
17:15	4		13						17	
17:30	5		16						21	
17:45	5	26	7	64					12	90
18:00	5		11						16	
18:15	2		3						5	
18:30	4		3						7	
18:45	2	13	6	23					8	36
19:00	2		2						4	
19:15	6		1						7	
19:30	0		5						5	
19:45	1	9	2	10					3	19
20:00	1		1						2	
20:15	1		3						4	
20:30	1		1						2	
20:45	2	5	1	6					3	11
21:00	2		0						2	
21:15	1		0						1	
21:30	0		1						1	
21:45	0	3	0	1					0	4
22:00	2		1						3	
22:15	1		0						1	
22:30	2		3						5	
22:45	2	7	0	4					2	11
23:00	1		5						6	
23:15	0		0						0	
23:30	0		0						0	
23:45	1	2	0	5					1	7
TOTALS		258		349						607
SPLIT %		42.5%		57.5%						55.5%

AM	80	NB			
	48	SB			
PM	44	NB			
	82	SB			

DAILY TOTALS	NB	SB	EB	WB	Total
	605	488	0	0	1,093

AM Peak Hour	06:15	11:15			08:15	PM Peak Hour	13:30	15:30			15:30
AM Pk Volume	80	52			98	PM Pk Volume	44	82			125
Pk Hr Factor	0.741	0.765			0.845	Pk Hr Factor	0.786	0.586			0.744
7 - 9 Volume	141	36	0	0	177	4 - 6 Volume	61	117	0	0	178
7 - 9 Peak Hour	07:30	08:00			07:30	4 - 6 Peak Hour	16:00	16:45			16:15
7 - 9 Pk Volume	78	22	0	0	92	4 - 6 Pk Volume	35	71	0	0	105
Pk Hr Factor	0.780	0.688	0.000	0.000	0.767	Pk Hr Factor	0.729	0.634	0.000	0.000	0.656

Prepared by NDS/ATD

VOLUME

Orion St Bet. Orion Way (Exit Only) & Orion Way (Entrance)

Day: Thursday
Date: 3/7/2019

City: Carlsbad
Project #: CA19_4114_002

DAILY TOTALS	NB	SB	EB	WB	Total
	533	838	0	0	1,371

AM Period	NB		SB		EB		WB		TOTAL	
00:00	0		0						0	
00:15	0		2						2	
00:30	0		0						0	
00:45	0		0	2					0	2
01:00	0		1						1	
01:15	0		0						0	
01:30	0		0						0	
01:45	0		1	2					1	2
02:00	0		1						1	
02:15	0		0						0	
02:30	0		0						0	
02:45	0		0	1					0	1
03:00	0		0						0	
03:15	0		3						3	
03:30	0		1						1	
03:45	0		0	4					0	4
04:00	0		6						6	
04:15	1		2						3	
04:30	0		0						0	
04:45	2	3	3	11					5	14
05:00	1		1						2	
05:15	2		5						7	
05:30	1		1						2	
05:45	6	10	5	12					11	22
06:00	10		3						13	
06:15	11		3						14	
06:30	25		3						28	
06:45	32	78	5	14					37	92
07:00	15		4						19	
07:15	9		9						18	
07:30	23		8						31	
07:45	21	68	1	22					22	90
08:00	22		6						28	
08:15	16		6						22	
08:30	11		9						20	
08:45	27	76	8	29					35	105
09:00	20		9						29	
09:15	10		8						18	
09:30	12		5						17	
09:45	8	50	12	34					20	84
10:00	8		10						18	
10:15	9		9						18	
10:30	10		12						22	
10:45	7	34	16	47					23	81
11:00	7		16						23	
11:15	5		22						27	
11:30	4		19						23	
11:45	8	24	20	77					28	101
TOTALS		343		255						598
SPLIT %		57.4%		42.6%						43.6%

PM Period	NB		SB		EB		WB		TOTAL	
12:00	11		14						25	
12:15	13		17						30	
12:30	7		23						30	
12:45	4	35	10	64					14	99
13:00	7		13						20	
13:15	6		14						20	
13:30	12		10						22	
13:45	8	33	10	47					18	80
14:00	9		20						29	
14:15	11		14						25	
14:30	5		16						21	
14:45	7	32	20	70					27	102
15:00	4		17						21	
15:15	9		14						23	
15:30	5		38						43	
15:45	6	24	39	108					45	132
16:00	6		26						32	
16:15	9		19						28	
16:30	2		23						25	
16:45	5	22	22	90					27	112
17:00	4		37						41	
17:15	3		18						21	
17:30	4		21						25	
17:45	5	16	10	86					15	102
18:00	3		21						24	
18:15	4		8						12	
18:30	2		11						13	
18:45	1	10	10	50					11	60
19:00	2		5						7	
19:15	3		3						6	
19:30	0		7						7	
19:45	1	6	2	17					3	23
20:00	1		3						4	
20:15	2		8						10	
20:30	1		2						3	
20:45	1	5	1	14					2	19
21:00	1		6						7	
21:15	1		2						3	
21:30	0		1						1	
21:45	0	2	2	11					2	13
22:00	2		5						7	
22:15	1		2						3	
22:30	1		6						7	
22:45	1	5	1	14					2	19
23:00	0		8						8	
23:15	0		1						1	
23:30	0		2						2	
23:45	0		1	12					1	12
TOTALS		190		583						773
SPLIT %		24.6%		75.4%						56.4%

	AM			PM	
	82	NB		35	NB
	77	SB		122	SB

DAILY TOTALS	NB	SB	EB	WB	Total
	533	838	0	0	1,371

AM Peak Hour	06:15	11:00			11:45
AM Pk Volume	83	77			113
Pk Hr Factor	0.648	0.875			0.942
7 - 9 Volume	144	51	0	0	195
7 - 9 Peak Hour	07:30	08:00			08:00
7 - 9 Pk Volume	82	29	0	0	105
Pk Hr Factor	0.891	0.806	0.000	0.000	0.750

PM Peak Hour	13:30	15:30			15:30
PM Pk Volume	40	122			148
Pk Hr Factor	0.833	0.782			0.822
4 - 6 Volume	38	176	0	0	214
4 - 6 Peak Hour	16:00	16:15			16:15
4 - 6 Pk Volume	22	101	0	0	121
Pk Hr Factor	0.611	0.682	0.000	0.000	0.738

Prepared by NDS/ATD

VOLUME

Orion St Bet. Orion Way (Entrance Only) & Faraday Ave

Day: Thursday
Date: 3/7/2019

City: Carlsbad
Project #: CA19_4114_003

DAILY TOTALS	NB	SB	EB	WB	Total
	932	866	0	0	1,798

AM Period	NB		SB		EB		WB		TOTAL	
00:00	2		1						3	
00:15	1		3						4	
00:30	2		0						2	
00:45	0	5	0	4					0	9
01:00	1		1						2	
01:15	1		0						1	
01:30	0		0						0	
01:45	1	3	1	2					2	5
02:00	1		1						2	
02:15	1		1						2	
02:30	0		0						0	
02:45	1	3	0	2					1	5
03:00	2		0						2	
03:15	2		4						6	
03:30	6		1						7	
03:45	2	12	0	5					2	17
04:00	3		6						9	
04:15	1		2						3	
04:30	2		0						2	
04:45	4	10	3	11					7	21
05:00	4		1						5	
05:15	7		3						10	
05:30	8		2						10	
05:45	13	32	4	10					17	42
06:00	23		4						27	
06:15	14		3						17	
06:30	28		2						30	
06:45	33	98	4	13					37	111
07:00	22		3						25	
07:15	16		8						24	
07:30	31		10						41	
07:45	25	94	4	25					29	119
08:00	26		8						34	
08:15	18		6						24	
08:30	12		9						21	
08:45	34	90	11	34					45	124
09:00	26		9						35	
09:15	17		8						25	
09:30	20		5						25	
09:45	9	72	13	35					22	107
10:00	11		11						22	
10:15	11		9						20	
10:30	17		11						28	
10:45	9	48	16	47					25	95
11:00	11		17						28	
11:15	12		22						34	
11:30	7		19						26	
11:45	18	48	19	77					37	125
TOTALS		515		265						780
SPLIT %		66.0%		34.0%						43.4%

PM Period	NB		SB		EB		WB		TOTAL	
12:00	22		14						36	
12:15	21		16						37	
12:30	12		22						34	
12:45	15	70	11	63					26	133
13:00	11		15						26	
13:15	13		14						27	
13:30	22		17						39	
13:45	10	56	12	58					22	114
14:00	14		18						32	
14:15	19		14						33	
14:30	17		19						36	
14:45	15	65	20	71					35	136
15:00	13		16						29	
15:15	20		12						32	
15:30	19		38						57	
15:45	12	64	38	104					50	168
16:00	13		25						38	
16:15	16		22						38	
16:30	8		23						31	
16:45	11	48	22	92					33	140
17:00	9		42						51	
17:15	6		19						25	
17:30	9		21						30	
17:45	9	33	10	92					19	125
18:00	6		21						27	
18:15	7		8						15	
18:30	4		11						15	
18:45	3	20	10	50					13	70
19:00	2		6						8	
19:15	6		3						9	
19:30	1		7						8	
19:45	3	12	1	17					4	29
20:00	4		2						6	
20:15	7		9						16	
20:30	2		2						4	
20:45	6	19	1	14					7	33
21:00	6		5						11	
21:15	3		6						9	
21:30	6		1						7	
21:45	1	16	2	14					3	30
22:00	3		5						8	
22:15	4		2						6	
22:30	1		6						7	
22:45	4	12	1	14					5	26
23:00	2		8						10	
23:15	0		1						1	
23:30	0		2						2	
23:45	0	2	1	12					1	14
TOTALS		417		601						1018
SPLIT %		41.0%		59.0%						56.6%

	AM		PM	
	102	NB	70	NB
	77	SB	123	SB

DAILY TOTALS	NB	SB	EB	WB	Total
	932	866	0	0	1,798

AM Peak Hour	06:45	11:00			11:45
AM Pk Volume	102	77			144
Pk Hr Factor	0.773	0.875			0.973
7 - 9 Volume	184	59	0	0	243
7 - 9 Peak Hour	07:30	08:00			07:15
7 - 9 Pk Volume	100	34	0	0	128
Pk Hr Factor	0.806	0.773	0.000	0.000	0.780

PM Peak Hour	12:00	15:30			15:30
PM Pk Volume	70	123			183
Pk Hr Factor	0.795	0.809			0.803
4 - 6 Volume	81	184	0	0	265
4 - 6 Peak Hour	16:00	16:15			16:15
4 - 6 Pk Volume	48	109	0	0	153
Pk Hr Factor	0.750	0.649	0.000	0.000	0.750

Prepared by NDS/ATD

VOLUME

Orion Way (Exit Only) E/O Orion St

Day: Thursday
Date: 3/7/2019

City: Carlsbad
Project #: CA19_4114_006

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	0	436	436

AM Period	NB	SB	EB	WB		TOTAL		PM Period	NB	SB	EB	WB		TOTAL	
00:00			0	1		1		12:00			0	5		5	
00:15			0	2		2		12:15			0	9		9	
00:30			0	0		0		12:30			0	11		11	
00:45			0	0	3	0	3	12:45			0	7	32	7	32
01:00			0	1		1		13:00			0	9		9	
01:15			0	0		0		13:15			0	8		8	
01:30			0	0		0		13:30			0	4		4	
01:45			0	2	3	2	3	13:45			0	7	28	7	28
02:00			0	1		1		14:00			0	11		11	
02:15			0	0		0		14:15			0	7		7	
02:30			0	0		0		14:30			0	10		10	
02:45			0	0	1	0	1	14:45			0	6	34	6	34
03:00			0	0		0		15:00			0	7		7	
03:15			0	3		3		15:15			0	7		7	
03:30			0	0		0		15:30			0	9		9	
03:45			0	0	3	0	3	15:45			0	20	43	20	43
04:00			0	6		6		16:00			0	21		21	
04:15			0	2		2		16:15			0	7		7	
04:30			0	0		0		16:30			0	12		12	
04:45			0	2	10	2	10	16:45			0	11	51	11	51
05:00			0	1		1		17:00			0	17		17	
05:15			0	4		4		17:15			0	8		8	
05:30			0	2		2		17:30			0	4		4	
05:45			0	2	9	2	9	17:45			0	4	33	4	33
06:00			0	1		1		18:00			0	12		12	
06:15			0	3		3		18:15			0	8		8	
06:30			0	5		5		18:30			0	7		7	
06:45			0	4	13	4	13	18:45			0	3	30	3	30
07:00			0	3		3		19:00			0	3		3	
07:15			0	3		3		19:15			0	5		5	
07:30			0	6		6		19:30			0	1		1	
07:45			0	0	12	0	12	19:45			0	1	10	1	10
08:00			0	4		4		20:00			0	2		2	
08:15			0	1		1		20:15			0	4		4	
08:30			0	3		3		20:30			0	1		1	
08:45			0	4	12	4	12	20:45			0	1	8	1	8
09:00			0	2		2		21:00			0	7		7	
09:15			0	2		2		21:15			0	3		3	
09:30			0	6		6		21:30			0	0		0	
09:45			0	6	16	6	16	21:45			0	2	12	2	12
10:00			0	8		8		22:00			0	4		4	
10:15			0	5		5		22:15			0	2		2	
10:30			0	5		5		22:30			0	4		4	
10:45			0	8	26	8	26	22:45			0	2	12	2	12
11:00			0	10		10		23:00			0	4		4	
11:15			0	7		7		23:15			0	1		1	
11:30			0	2		2		23:30			0	2		2	
11:45			0	7	26	7	26	23:45			0	2	9	2	9
TOTALS					134		134	TOTALS					302		302
SPLIT %					100.0%		30.7%	SPLIT %					100.0%		69.3%

AM	30 NB
PM	60 NB

DAILY TOTALS	NB	SB	EB	WB	Total
	0	0	0	436	436

AM Peak Hour					11:45		11:45	PM Peak Hour					15:45		15:45
AM Pk Volume					32		32	PM Pk Volume					60		60
Pk Hr Factor					0.727		0.727	Pk Hr Factor					0.714		0.714
7 - 9 Volume	0	0	0		24		24	4 - 6 Volume	0	0	0		84		84
7 - 9 Peak Hour					07:15		07:15	4 - 6 Peak Hour					16:00		16:00
7 - 9 Pk Volume	0	0	0		13		13	4 - 6 Pk	0	0	0		51		51
Pk Hr Factor	0.000	0.000	0.000		0.542		0.542	Pk Hr Factor	0.000	0.000	0.000		0.607		0.607

Prepared by NDS/ATD

VOLUME

El Camino Real Bet. Faraday Ave & Orion Rd

Day: Thursday
Date: 3/7/2019

City: Carlsbad
Project #: CA19_4114_005

DAILY TOTALS	NB	SB	EB	WB	Total
	16,478	17,309	0	0	33,787

AM Period	NB		SB		EB		WB		TOTAL	
00:00	19		13						32	
00:15	9		8						17	
00:30	10		11						21	
00:45	5	43	4	36					9	79
01:00	9		11						20	
01:15	11		2						13	
01:30	7		9						16	
01:45	6	33	3	25					9	58
02:00	5		7						12	
02:15	4		5						9	
02:30	4		13						17	
02:45	4	17	7	32					11	49
03:00	2		7						9	
03:15	5		6						11	
03:30	5		17						22	
03:45	10	22	21	51					31	73
04:00	10		12						22	
04:15	15		26						41	
04:30	26		38						64	
04:45	42	93	45	121					87	214
05:00	36		44						80	
05:15	38		74						112	
05:30	72		87						159	
05:45	116	262	138	343					254	605
06:00	82		129						211	
06:15	102		160						262	
06:30	135		195						330	
06:45	196	515	301	785					497	1300
07:00	243		374						617	
07:15	270		401						671	
07:30	305		417						722	
07:45	364	1182	349	1541					713	2723
08:00	313		409						722	
08:15	280		390						670	
08:30	310		279						589	
08:45	286	1189	313	1391					599	2580
09:00	211		313						524	
09:15	224		267						491	
09:30	222		250						472	
09:45	209	866	246	1076					455	1942
10:00	229		221						450	
10:15	186		225						411	
10:30	220		257						477	
10:45	219	854	221	924					440	1778
11:00	232		221						453	
11:15	237		276						513	
11:30	245		297						542	
11:45	255	969	356	1150					611	2119
TOTALS		6045		7475						13520
SPLIT %		44.7%		55.3%						40.0%

PM Period	NB		SB		EB		WB		TOTAL	
12:00	305		355						660	
12:15	291		303						594	
12:30	289		296						585	
12:45	310	1195	285	1239					595	2434
13:00	329		298						627	
13:15	326		250						576	
13:30	299		272						571	
13:45	293	1247	295	1115					588	2362
14:00	288		245						533	
14:15	326		257						583	
14:30	371		347						718	
14:45	340	1325	409	1258					749	2583
15:00	317		388						705	
15:15	299		342						641	
15:30	347		342						689	
15:45	333	1296	306	1378					639	2674
16:00	379		354						733	
16:15	384		349						733	
16:30	358		359						717	
16:45	405	1526	370	1432					775	2958
17:00	414		390						804	
17:15	375		404						779	
17:30	347		314						661	
17:45	322	1458	267	1375					589	2833
18:00	308		290						598	
18:15	273		201						474	
18:30	216		217						433	
18:45	159	956	189	897					348	1853
19:00	166		134						300	
19:15	113		112						225	
19:30	103		91						194	
19:45	111	493	99	436					210	929
20:00	121		81						202	
20:15	100		77						177	
20:30	99		57						156	
20:45	89	409	62	277					151	686
21:00	103		71						174	
21:15	67		53						120	
21:30	58		48						106	
21:45	50	278	43	215					93	493
22:00	48		36						84	
22:15	36		25						61	
22:30	45		50						95	
22:45	29	158	22	133					51	291
23:00	33		32						65	
23:15	24		24						48	
23:30	20		8						28	
23:45	15	92	15	79					30	171
TOTALS		10433		9834						20267
SPLIT %		51.5%		48.5%						60.0%

AM	1267	NB
	1576	SB
PM	1561	NB
	1468	SB

DAILY TOTALS	NB	SB	EB	WB	Total
	16,478	17,309	0	0	33,787

AM Peak Hour	07:45	07:15			07:15
AM Pk Volume	1267	1576			2828
Pk Hr Factor	0.870	0.945			0.979
7 - 9 Volume	2371	2932	0	0	5303
7 - 9 Peak Hour	07:45	07:15			07:15
7 - 9 Pk Volume	1267	1576	0	0	2828
Pk Hr Factor	0.870	0.945	0.000	0.000	0.979

PM Peak Hour	16:15	16:30			16:30
PM Pk Volume	1561	1523			3075
Pk Hr Factor	0.943	0.942			0.956
4 - 6 Volume	2984	2807	0	0	5791
4 - 6 Peak Hour	16:15	16:30			16:30
4 - 6 Pk Volume	1561	1523	0	0	3075
Pk Hr Factor	0.943	0.942	0.000	0.000	0.956

Prepared by National Data & Surveying Services

El Camino Real & Faraday Ave

Peak Hour Turning Movement Count

ID: 19-04113-005
City: Carlsbad

Day: Thursday
Date: 03/07/2019

PEAK HOURS

AM: 07:15 AM - 08:15 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

El Camino Real — SOUTHBOUND

AM	141	1534	552	29	898	AM
NOON	0	0	0	0	0	NOON
PM	21	765	268	15	2051	PM
	1	3	2	0		

Faraday Ave — EASTBOUND

AM	NOON	PM	
1549	0	469	
0	0	0	0
24	0	91	1
249	0	827	2
95	0	532	1
AM	NOON	PM	

CONTROL

Signalized

TEV	5076	0	5199
	AM	NOON	PM
PHF	0.94		0.92

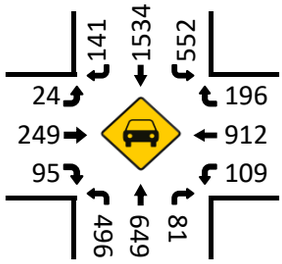
WESTBOUND — Faraday Ave

PM	NOON	AM	
440	0	196	1
302	0	912	2
183	0	109	1
0	0	0	0
1172	0	882	
PM	NOON	AM	

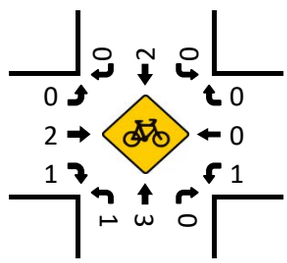
El Camino Real — NORTHBOUND

	0	2	3	0		
PM	1507	27	146	1505	77	PM
NOON	0	0	0	0	0	NOON
AM	1747	9	496	649	81	AM

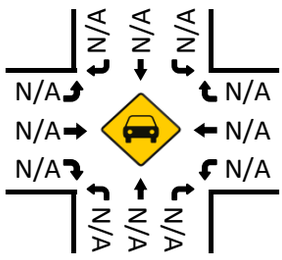
Total Vehicles (AM)



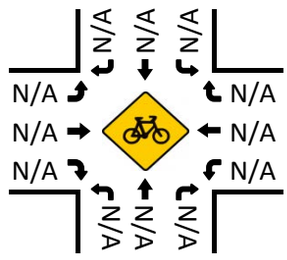
Bikes (AM)



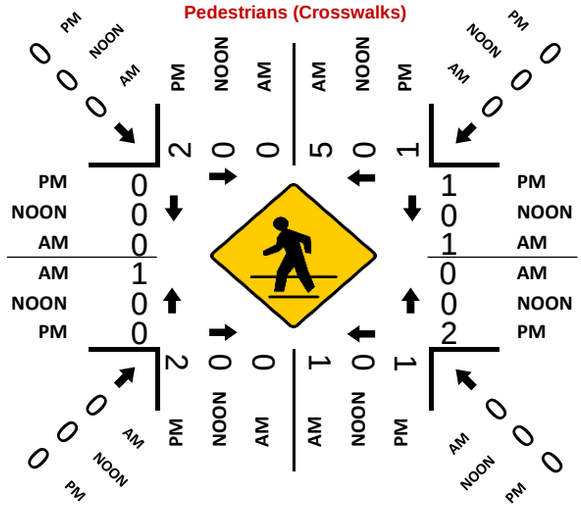
Total Vehicles (Noon)



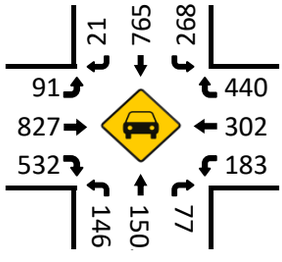
Bikes (NOON)



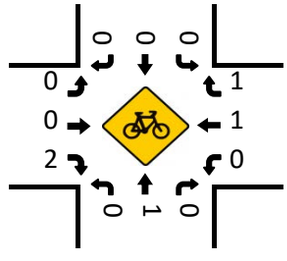
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



Prepared by National Data & Surveying Services

Orion St & Impala Dr & Orion Center Dwy

Peak Hour Turning Movement Count

ID: 19-04113-001
City: Carlsbad

Day: Thursday
Date: 03/07/2019

PEAK HOURS

AM: 08:00 AM - 09:00 AM
NOON: NONE
PM: 04:15 PM - 05:15 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

Orion St

SOUTHBOUND

AM	0	0	0	0	0	AM
NOON	0	0	0	0	0	NOON
PM	0	0	0	0	0	PM

EASTBOUND — Impala Dr & Orion Center Dwy

AM	NOON	PM		
68	0	35	⇦	
0	0	0	↰	0
0	0	0	↑	0
7	0	0	→	1
19	0	68	↱	0
AM	NOON	PM		

WESTBOUND — Impala Dr & Orion Center Dwy

PM	NOON	AM		
0	0	0	↱	0
2	0	8	←	1
2	0	5	↰	0
0	0	0	↑	0
0	0	24	⇨	
PM	NOON	AM		

CONTROL

3-Way Stop (NB/EB/WB)

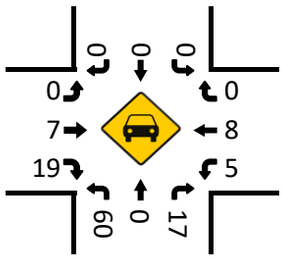
	AM	NOON	PM
TEV	116	0	105
PHF	0.78		0.73

	0	0	1	0	
	↰	↑	↑	↱	
PM	70	0	33	0	0	PM
NOON	0	0	0	0	0	NOON
AM	24	0	60	0	17	AM

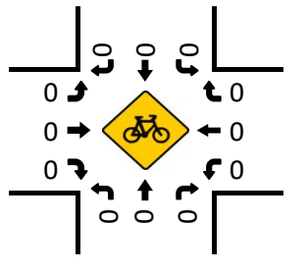
NORTHBOUND

Orion St

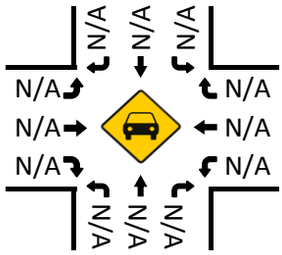
Total Vehicles (AM)



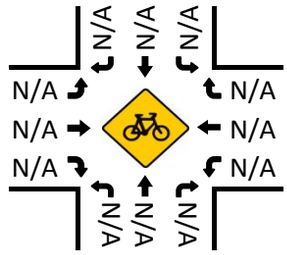
Bikes (AM)



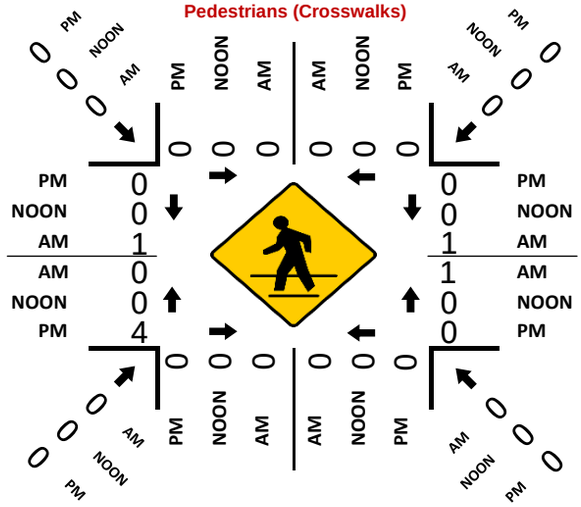
Total Vehicles (Noon)



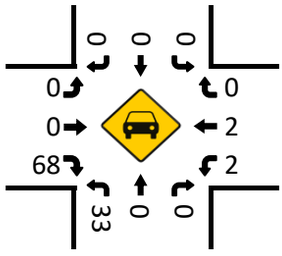
Bikes (NOON)



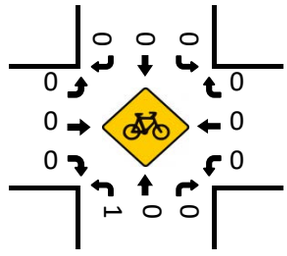
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



Prepared by National Data & Surveying Services

Orion Rd & Faraday Ave

Peak Hour Turning Movement Count

ID: 19-04113-004
City: Carlsbad

Day: Thursday
Date: 03/07/2019

	PEAK HOURS	COUNT PERIODS
AM	07:30 AM - 08:30 AM	07:00 AM - 09:00 AM
NOON	NONE	NONE
PM	04:30 PM - 05:30 PM	04:00 PM - 06:00 PM

Orion Rd — SOUTHBOUND

	Right	Through	Left	U-Turn	Departing
AM	8	3	12	0	102
NOON	0	0	0	0	0
PM	13	0	86	0	33
Lanes	0	1	1	0	

Faraday Ave — EASTBOUND

	AM	NOON	PM	Lanes
Departing	1263	0	785	
U-Turn	2	0	44	0
Left	17	0	11	1
Through	647	0	1101	2
Right	21	0	22	0

Faraday Ave — WESTBOUND

	Lanes	PM	NOON	AM
Right	0	19	0	76
Through	2	694	0	1203
Left	1	22	0	28
U-Turn	0	0	0	1
Departing		1288	0	742

Orion Rd — NORTHBOUND

	Departing	U-Turn	Left	Through	Right
Lanes		0	1	1	0
PM	44	0	34	3	101
NOON	0	0	0	0	0
AM	52	0	50	9	82

CONTROL

Signalized

	AM	NOON	PM
TEV	2159	0	2150
PHF	0.86		0.89

Total Vehicles (AM)

Approach	Left	Through	Right
Southbound	12	3	8
Eastbound	17	647	21
Westbound	28	1203	76
Northbound	50	9	82

Total Vehicles (Noon)

Approach	Left	Through	Right
Southbound	N/A	N/A	N/A
Eastbound	N/A	N/A	N/A
Westbound	N/A	N/A	N/A
Northbound	N/A	N/A	N/A

Total Vehicles (PM)

Approach	Left	Through	Right
Southbound	86	0	13
Eastbound	11	1101	22
Westbound	22	694	19
Northbound	34	3	101

Bikes (AM)

Approach	Left	Through	Right
Southbound	0	0	0
Eastbound	0	1	0
Westbound	0	1	0
Northbound	0	0	0

Bikes (NOON)

Approach	Left	Through	Right
Southbound	N/A	N/A	N/A
Eastbound	N/A	N/A	N/A
Westbound	N/A	N/A	N/A
Northbound	N/A	N/A	N/A

Bikes (PM)

Approach	Left	Through	Right
Southbound	0	0	0
Eastbound	0	4	1
Westbound	0	1	0
Northbound	0	1	0

Pedestrians (Crosswalks)

Crosswalk	Direction	AM	NOON	PM
North	Eastbound	0	0	0
North	Westbound	0	0	0
West	Southbound	1	0	3
West	Northbound	0	0	3
East	Southbound	1	0	2
East	Northbound	1	0	0
South	Eastbound	3	0	0
South	Westbound	0	0	2
NW diagonal		0	0	0
NE diagonal		0	0	0
SW diagonal		0	0	0
SE diagonal		0	0	0

Prepared by National Data & Surveying Services

El Camino Real & Faraday Ave

Peak Hour Turning Movement Count

ID: 19-04113-005
City: Carlsbad

Day: Thursday
Date: 03/07/2019

El Camino Real

SOUTHBOUND

PEAK HOURS									COUNT PERIODS
07:15 AM - 08:15 AM	AM	141	1534	552	29	898	AM	07:00 AM - 09:00 AM
NONE	NOON	0	0	0	0	0	NOON	NONE
04:30 PM - 05:30 PM	PM	21	765	268	15	2051	PM	04:00 PM - 06:00 PM

	AM	NOON	PM
	1	3	2	0

EASTBOUND

	AM	NOON	PM	
	1549	0	469	⇦
0	0	0	0	↶ 0
1	24	0	91	↱ 1
2	249	0	827	→ 2
1	95	0	532	↴ 1
	AM	NOON	PM	

WESTBOUND

	PM	NOON	AM	
1	440	0	196	↰ 1
2	302	0	912	← 2
1	183	0	109	↰ 1
0	0	0	0	↶ 0
	1172	0	882	⇨
	PM	NOON	AM	

	PM	NOON	AM
	0	2	3	0

CONTROL
Signalized

TEV	5076 AM	0 NOON	5199 PM
PHF	0.94		0.92

NORTHBOUND

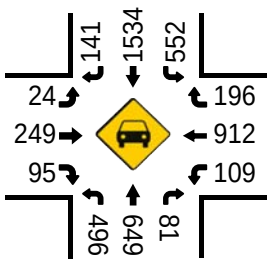
PM	1507	27	146	1505	77	PM
NOON	0	0	0	0	0	NOON
AM	1747	9	496	649	81	AM

El Camino Real

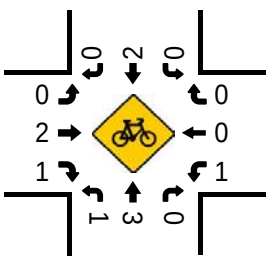
Faraday Ave (EASTBOUND)
Faraday Ave (WESTBOUND)

AM	898	NB
AM	2256	SB
PM	2051	NB
PM	1069	SB

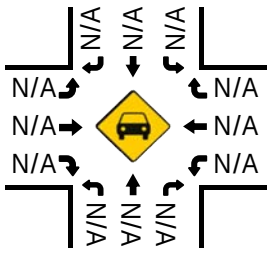
Total Vehicles (AM)



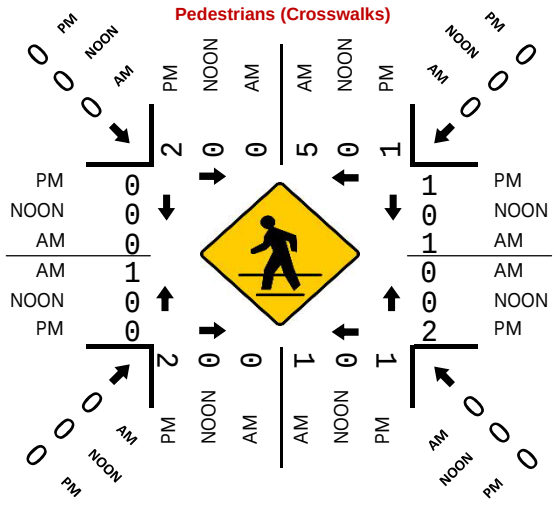
Bikes (AM)



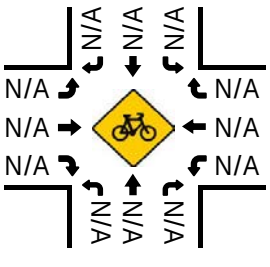
Total Vehicles (Noon)



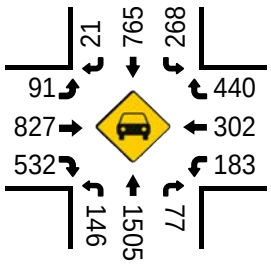
Pedestrians (Crosswalks)



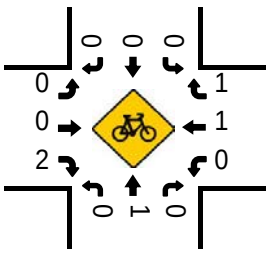
Bikes (NOON)



Total Vehicles (PM)



Bikes (PM)



Prepared by NDS/ATD

VOLUME

El Camino Real Bet. Faraday Ave & Orion Rd

Day: Thursday
Date: 3/7/2019

City: Carlsbad
Project #: CA19_4114_005

DAILY TOTALS	NB	SB	EB	WB	Total
	16,478	17,309	0	0	33,787

AM Period	NB		SB		EB	WB	TOTAL		PM Period	NB		SB		EB	WB	TOTAL	
00:00	19		13				32		12:00	305		355				660	
00:15	9		8				17		12:15	291		303				594	
00:30	10		11				21		12:30	289		296				585	
00:45	5	43	4	36			9	79	12:45	310	1195	285	1239			595	2434
01:00	9		11				20		13:00	329		298				627	
01:15	11		2				13		13:15	326		250				576	
01:30	7		9				16		13:30	299		272				571	
01:45	6	33	3	25			9	58	13:45	293	1247	295	1115			588	2362
02:00	5		7				12		14:00	288		245				533	
02:15	4		5				9		14:15	326		257				583	
02:30	4		13				17		14:30	371		347				718	
02:45	4	17	7	32			11	49	14:45	340	1325	409	1258			749	2583
03:00	2		7				9		15:00	317		388				705	
03:15	5		6				11		15:15	299		342				641	
03:30	5		17				22		15:30	347		342				689	
03:45	10	22	21	51			31	73	15:45	333	1296	306	1378			639	2674
04:00	10		12				22		16:00	379		354				733	
04:15	15		26				41		16:15	384		349				733	
04:30	26		38				64		16:30	358		359				717	
04:45	42	93	45	121			87	214	16:45	405	1526	370	1432			775	2958
05:00	36		44				80		17:00	414		390				804	
05:15	38		74				112		17:15	375		404				779	
05:30	72		87				159		17:30	347		314				661	
05:45	116	262	138	343			254	605	17:45	322	1458	267	1375			589	2833
06:00	82		129				211		18:00	308		290				598	
06:15	102		160				262		18:15	273		201				474	
06:30	135		195				330		18:30	216		217				433	
06:45	196	515	301	785			497	1300	18:45	159	956	189	897			348	1853
07:00	243		374				617		19:00	166		134				300	
07:15	270		401				671		19:15	113		112				225	
07:30	305		417				722		19:30	103		91				194	
07:45	364	1182	349	1541			713	2723	19:45	111	493	99	436			210	929
08:00	313		409				722		20:00	121		81				202	
08:15	280		390				670		20:15	100		77				177	
08:30	310		279				589		20:30	99		57				156	
08:45	286	1189	313	1391			599	2580	20:45	89	409	62	277			151	686
09:00	211		313				524		21:00	103		71				174	
09:15	224		267				491		21:15	67		53				120	
09:30	222		250				472		21:30	58		48				106	
09:45	209	866	246	1076			455	1942	21:45	50	278	43	215			93	493
10:00	229		221				450		22:00	48		36				84	
10:15	186		225				411		22:15	36		25				61	
10:30	220		257				477		22:30	45		50				95	
10:45	219	854	221	924			440	1778	22:45	29	158	22	133			51	291
11:00	232		221				453		23:00	33		32				65	
11:15	237		276				513		23:15	24		24				48	
11:30	245		297				542		23:30	20		8				28	
11:45	255	969	356	1150			611	2119	23:45	15	92	15	79			30	171
TOTALS		6045		7475				13520	TOTALS		10433		9834				20267
SPLIT %		44.7%		55.3%				40.0%	SPLIT %		51.5%		48.5%				60.0%

AM	1267	NB	
	1576	SB	
PM	1561	NB	
	1468	SB	

DAILY TOTALS	NB	SB	EB	WB	Total
	16,478	17,309	0	0	33,787

AM Peak Hour	07:45	07:15			07:15	PM Peak Hour	16:15	16:30			16:30
AM Pk Volume	1267	1576			2828	PM Pk Volume	1561	1523			3075
Pk Hr Factor	0.870	0.945			0.979	Pk Hr Factor	0.943	0.942			0.956
7 - 9 Volume	2371	2932	0	0	5303	4 - 6 Volume	2984	2807	0	0	5791
7 - 9 Peak Hour	07:45	07:15			07:15	4 - 6 Peak Hour	16:15	16:30			16:30
7 - 9 Pk Volume	1267	1576	0	0	2828	4 - 6 Pk Volume	1561	1523	0	0	3075
Pk Hr Factor	0.870	0.945	0.000	0.000	0.979	Pk Hr Factor	0.943	0.942	0.000	0.000	0.956

Roadway	Segment	Average DPHV	Peak Hour	Peak Direction
El Camino Real	College Blvd to Palomar Airport Road	1083	AM	NB
		1916	AM	SB
		1806	PM	NB
		1269	PM	SB

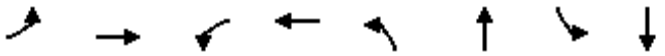
Appendix D – Queueing Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	26	274	104	115	960	206	549	793	632	1667	153
v/c Ratio	0.51	0.35	0.22	0.91	0.92	0.35	0.95	0.53	0.86	0.95	0.23
Control Delay	100.6	46.0	1.0	120.8	61.1	9.3	84.5	43.4	64.9	57.6	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.6	46.0	1.0	120.8	61.1	9.3	84.5	43.4	64.9	57.6	3.3
Queue Length 50th (ft)	25	109	0	110	457	17	~274	235	298	~588	0
Queue Length 95th (ft)	#72	152	0	#240	#574	82	#398	297	355	#700	32
Internal Link Dist (ft)		547			1569			1357		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	51	982	559	127	1134	620	576	1496	905	1749	655
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.28	0.19	0.91	0.85	0.33	0.95	0.53	0.70	0.95	0.23

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	23	795	34	1487	56	101	17	15
v/c Ratio	0.15	0.35	0.22	0.65	0.36	0.28	0.11	0.05
Control Delay	45.1	14.0	45.3	19.4	48.0	9.5	44.9	16.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.1	14.0	45.3	19.4	48.0	9.5	44.9	16.1
Queue Length 50th (ft)	7	36	11	92	18	3	5	1
Queue Length 95th (ft)	39	248	52	#657	#87	43	27	12
Internal Link Dist (ft)		1569		490		564		219
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	150	2292	159	2291	159	763	150	738
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.35	0.21	0.65	0.35	0.13	0.11	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

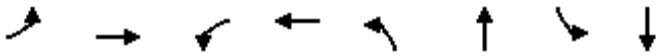
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	115	1047	673	223	368	537	188	1720	298	805	22
v/c Ratio	0.71	2.20	1.37	0.68	0.46	0.90	0.20	0.87	0.79	0.68	0.05
Control Delay	88.5	575.7	200.0	67.1	52.2	43.0	33.4	38.0	81.0	56.2	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.5	575.7	200.0	67.1	52.2	43.0	33.4	38.0	81.0	56.2	0.2
Queue Length 50th (ft)	111	~888	~586	197	160	236	91	627	147	275	0
Queue Length 95th (ft)	153	#873	#636	257	197	#343	m113	m#693	199	311	0
Internal Link Dist (ft)		547			1569			1245		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	214	476	493	391	818	599	922	1978	418	1806	643
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	2.20	1.37	0.57	0.45	0.90	0.20	0.87	0.71	0.45	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	65	1337	24	766	43	130	128	19
v/c Ratio	0.39	0.78	0.17	0.54	0.20	0.34	0.64	0.03
Control Delay	46.7	25.3	45.9	22.7	41.6	8.1	55.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.7	25.3	45.9	22.7	41.6	8.1	55.8	0.1
Queue Length 50th (ft)	23	177	9	120	11	1	46	0
Queue Length 95th (ft)	80	#550	43	286	57	32	#121	0
Internal Link Dist (ft)		1569		490		564		224
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	218	1865	139	1742	229	734	200	826
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.72	0.17	0.44	0.19	0.18	0.64	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

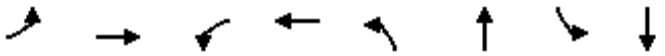
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	115	1051	673	284	382	570	188	1735	305	805	22
v/c Ratio	0.71	2.31	1.47	0.80	0.45	0.94	0.20	0.91	0.81	0.73	0.05
Control Delay	88.5	622.4	244.7	73.2	50.9	48.7	33.7	42.2	81.7	58.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.5	622.4	244.7	73.2	50.9	48.7	33.7	42.2	81.7	58.9	0.2
Queue Length 50th (ft)	111	~892	~643	260	166	283	90	634	151	276	0
Queue Length 95th (ft)	153	#876	#692	329	205	#421	m113	m#702	204	311	0
Internal Link Dist (ft)		547			1569			1245		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	214	455	459	391	846	609	931	1910	418	1806	643
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	2.31	1.47	0.73	0.45	0.94	0.20	0.91	0.73	0.45	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	94	1337	24	772	43	130	154	151
v/c Ratio	0.51	0.80	0.17	0.57	0.29	0.34	0.74	0.25
Control Delay	49.8	26.2	45.7	23.6	46.6	8.1	62.5	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.8	26.2	45.7	23.6	46.6	8.1	62.5	1.0
Queue Length 50th (ft)	34	177	9	125	16	1	56	0
Queue Length 95th (ft)	107	#550	43	288	57	32	#156	0
Internal Link Dist (ft)		1569		490		564		224
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	226	1927	144	1762	163	757	207	848
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.69	0.17	0.44	0.26	0.17	0.74	0.18

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	26	288	104	122	962	211	549	857	666	1667	153
v/c Ratio	0.51	0.38	0.22	0.90	0.91	0.36	0.95	0.58	0.90	0.96	0.24
Control Delay	100.2	46.4	1.1	117.3	60.0	9.7	83.8	43.6	69.3	59.3	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.2	46.4	1.1	117.3	60.0	9.7	83.8	43.6	69.3	59.3	3.4
Queue Length 50th (ft)	25	115	0	117	456	21	~274	259	314	~610	0
Queue Length 95th (ft)	#72	158	0	#251	#553	86	#398	309	#406	#708	32
Internal Link Dist (ft)		547			1569			1357		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	51	984	560	136	1153	627	578	1472	822	1731	651
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.29	0.19	0.90	0.83	0.34	0.95	0.58	0.81	0.96	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
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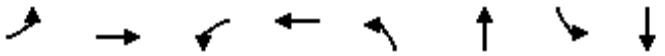
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	146	795	34	1511	56	101	19	33
v/c Ratio	1.15	0.36	0.26	0.78	0.43	0.26	0.15	0.11
Control Delay	165.1	15.5	49.0	24.7	54.2	9.1	47.4	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	165.1	15.5	49.0	24.7	54.2	9.1	47.4	12.1
Queue Length 50th (ft)	~82	114	16	295	27	4	9	2
Queue Length 95th (ft)	#238	248	52	#675	#87	43	29	16
Internal Link Dist (ft)		1569		490		564		219
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	127	2187	136	1928	134	663	127	622
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.15	0.36	0.25	0.78	0.42	0.15	0.15	0.05

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

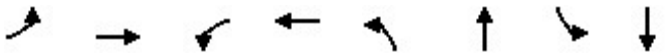
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	27	467	104	116	984	245	551	961	915	2010	155
v/c Ratio	0.53	0.59	0.21	0.91	0.93	0.40	0.96	0.77	1.02	1.16	0.24
Control Delay	103.4	50.7	1.0	124.1	62.2	10.8	86.7	53.8	84.8	118.4	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	103.4	50.7	1.0	124.1	62.2	10.8	86.7	53.8	84.8	118.4	3.6
Queue Length 50th (ft)	26	198	0	111	473	31	~276	313	~492	~849	0
Queue Length 95th (ft)	#76	255	0	#242	#599	104	#400	369	#625	#942	33
Internal Link Dist (ft)		547			1569			1357		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	51	975	557	127	1127	631	573	1244	899	1738	652
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.48	0.19	0.91	0.87	0.39	0.96	0.77	1.02	1.16	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	23	1299	34	1559	56	101	17	15
v/c Ratio	0.17	0.61	0.24	0.70	0.40	0.26	0.12	0.05
Control Delay	46.6	20.1	47.4	21.1	51.5	9.0	46.2	16.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.6	20.1	47.4	21.1	51.5	9.0	46.2	16.5
Queue Length 50th (ft)	10	228	14	207	24	3	7	2
Queue Length 95th (ft)	39	472	52	#709	#87	43	27	12
Internal Link Dist (ft)		1569		490		564		219
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	137	2217	146	2237	144	708	137	678
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.59	0.23	0.70	0.39	0.14	0.12	0.02

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

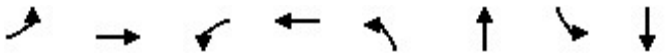
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	119	1110	676	226	580	839	188	2120	380	1025	24
v/c Ratio	0.72	2.59	1.46	0.58	0.66	1.36	0.24	1.17	0.92	0.80	0.05
Control Delay	89.3	745.2	243.1	58.9	55.4	198.3	46.5	121.9	93.2	57.5	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	89.3	745.2	243.1	58.9	55.4	198.3	46.5	121.9	93.2	57.5	0.2
Queue Length 50th (ft)	115	~955	~623	199	271	~843	91	~906	192	347	0
Queue Length 95th (ft)	158	#933	#673	262	313	#950	m117	m#973	#286	376	0
Internal Link Dist (ft)		547			1569			1245		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	214	429	462	391	881	618	773	1807	418	1806	643
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	2.59	1.46	0.58	0.66	1.36	0.24	1.17	0.91	0.57	0.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	65	1488	24	1222	43	130	128	19
v/c Ratio	0.42	0.80	0.19	0.76	0.33	0.35	0.72	0.04
Control Delay	50.3	25.8	47.9	27.7	50.2	8.3	65.6	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.3	25.8	47.9	27.7	50.2	8.3	65.6	0.2
Queue Length 50th (ft)	30	212	11	232	20	2	59	0
Queue Length 95th (ft)	80	#657	43	#581	57	32	#121	0
Internal Link Dist (ft)		1569		490		564		224
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	194	1861	124	1640	140	668	178	739
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.80	0.19	0.75	0.31	0.19	0.72	0.03

Intersection Summary

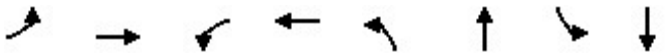
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	27	481	104	123	986	249	551	1025	951	2010	155
v/c Ratio	0.53	0.61	0.21	0.98	0.93	0.41	0.96	0.88	1.00	1.16	0.24
Control Delay	103.5	51.2	1.0	137.1	62.3	10.8	86.9	60.9	78.5	118.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	103.5	51.2	1.0	137.1	62.3	10.8	86.9	60.9	78.5	118.7	3.6
Queue Length 50th (ft)	26	205	0	~123	475	31	~276	344	~502	~849	0
Queue Length 95th (ft)	#76	264	0	#260	#601	105	#400	#428	#636	#942	33
Internal Link Dist (ft)		547			1569			1357		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	51	975	557	126	1126	633	572	1161	953	1737	652
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.49	0.19	0.98	0.88	0.39	0.96	0.88	1.00	1.16	0.24

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	148	1299	34	1583	56	101	19	33
v/c Ratio	1.17	0.59	0.26	0.82	0.43	0.26	0.15	0.11
Control Delay	170.0	19.6	49.0	26.1	54.2	9.1	47.4	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	170.0	19.6	49.0	26.1	54.2	9.1	47.4	12.1
Queue Length 50th (ft)	~84	228	16	321	27	4	9	2
Queue Length 95th (ft)	#242	472	52	#727	#87	43	29	16
Internal Link Dist (ft)		1569		490		564		219
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	127	2192	136	1928	134	663	127	622
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.17	0.59	0.25	0.82	0.42	0.15	0.15	0.05

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

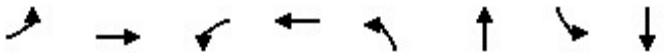
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	119	1114	676	287	594	873	188	2135	388	1025	24
v/c Ratio	0.72	2.60	1.55	0.73	0.67	1.41	0.24	1.19	0.93	0.80	0.05
Control Delay	89.3	749.3	282.3	66.6	56.0	221.7	46.6	127.1	95.0	57.5	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	89.3	749.3	282.3	66.6	56.0	221.7	46.6	127.1	95.0	57.5	0.2
Queue Length 50th (ft)	115	~960	~678	264	278	~913	91	~918	196	347	0
Queue Length 95th (ft)	158	#937	#728	333	321	#1016	m117	m#982	#295	376	0
Internal Link Dist (ft)		547			1569			1245		567	
Turn Bay Length (ft)	137		422	149		272	204		248		182
Base Capacity (vph)	214	429	436	391	881	618	773	1800	418	1806	643
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	2.60	1.55	0.73	0.67	1.41	0.24	1.19	0.93	0.57	0.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	95	1488	24	1228	43	130	154	152
v/c Ratio	0.57	0.81	0.19	0.78	0.32	0.35	0.85	0.28
Control Delay	55.5	26.2	48.0	28.8	50.2	8.3	80.5	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.5	26.2	48.0	28.8	50.2	8.3	80.5	2.7
Queue Length 50th (ft)	44	212	11	244	20	2	75	0
Queue Length 95th (ft)	#109	#657	43	#585	57	32	#156	0
Internal Link Dist (ft)		1569		490		564		224
Turn Bay Length (ft)	264		254		106		100	
Base Capacity (vph)	198	1837	126	1581	143	679	181	749
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.81	0.19	0.78	0.30	0.19	0.85	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

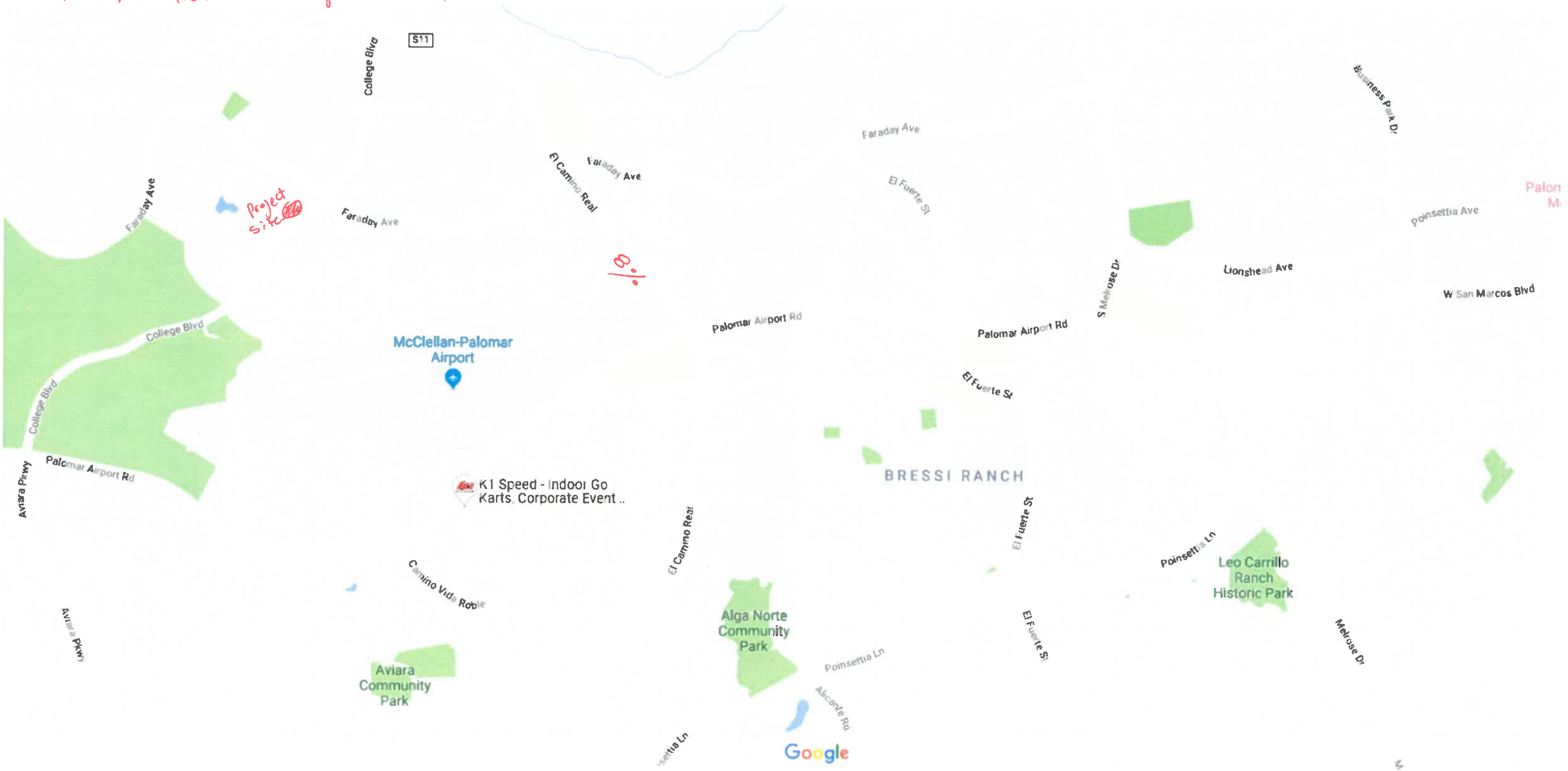
Appendix E – Cumulative Projects Info

(1) SMAC

Total ADT = 223 trips — In out

AM Peak Hour = 25 trips — 23/2

PM Peak Hour = 27 trips — 5/22



(2) VIASAT

TOTAL ADT = 3,409 TRIPS

AM PEAK HOUR = 580 TRIPS

PM PEAK HOUR = 545 TRIPS

IN	OUT
522	58
55	490

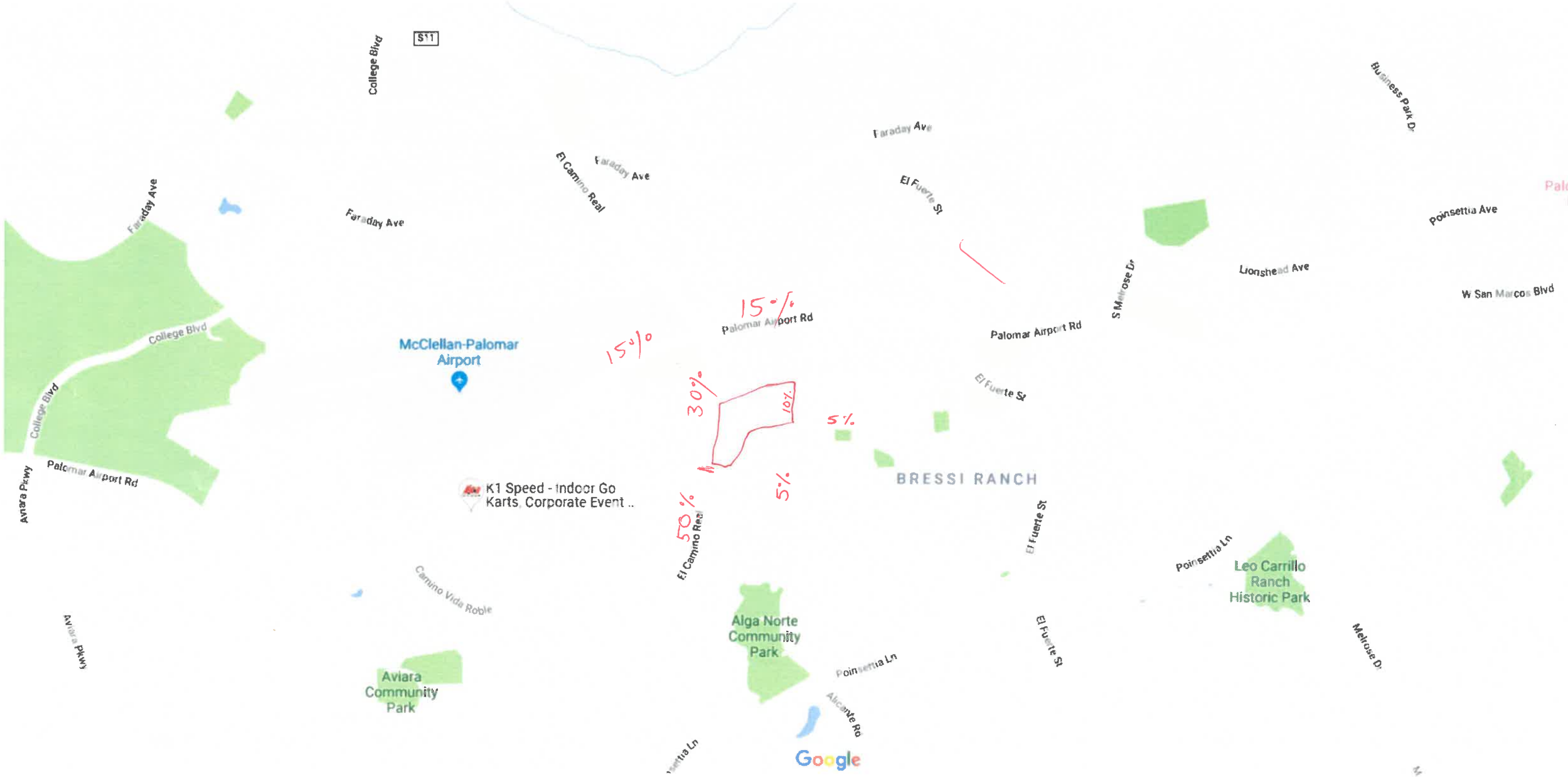


TABLE A
PROJECT TRIP GENERATION

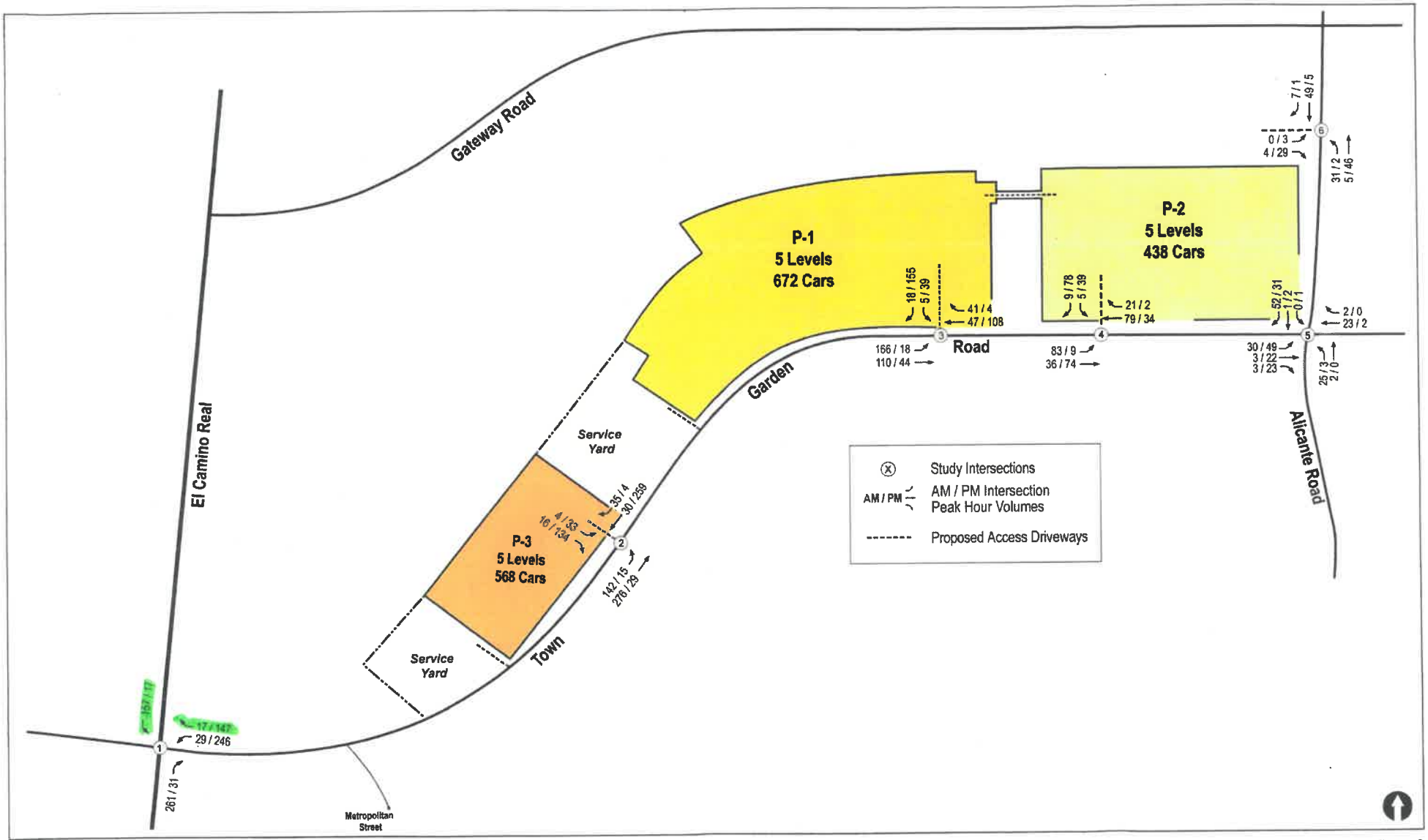
Land Use (Lot)	Size	Daily Trip Ends (ADTs)		AM Peak Hour				PM Peak Hour			
		Rate [a]	Volume	% of ADT [b]	In:Out Split	Volume In	Volume Out	% of ADT	In:Out Split	Volume In	Volume Out
Office: Corporate Headquarters	487 KSF [c]	7/ KSF	3,409	17%	90:10	522	58	16%	10:90	55	490
Total		–	**3,409**	–	–	**522**	**58**	–	–	**55**	**490**

Footnotes:

a. Rate is based on *SANDAG's (Not So) Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region, April 2002.*

b. ADT = Average Daily Traffic

c. KSF = 1,000 Square Feet



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Date: 06/16/16

LINSCOTT LAW & GREENSPAN engineers

Figure C

Project Traffic Volumes

VIASAT Access

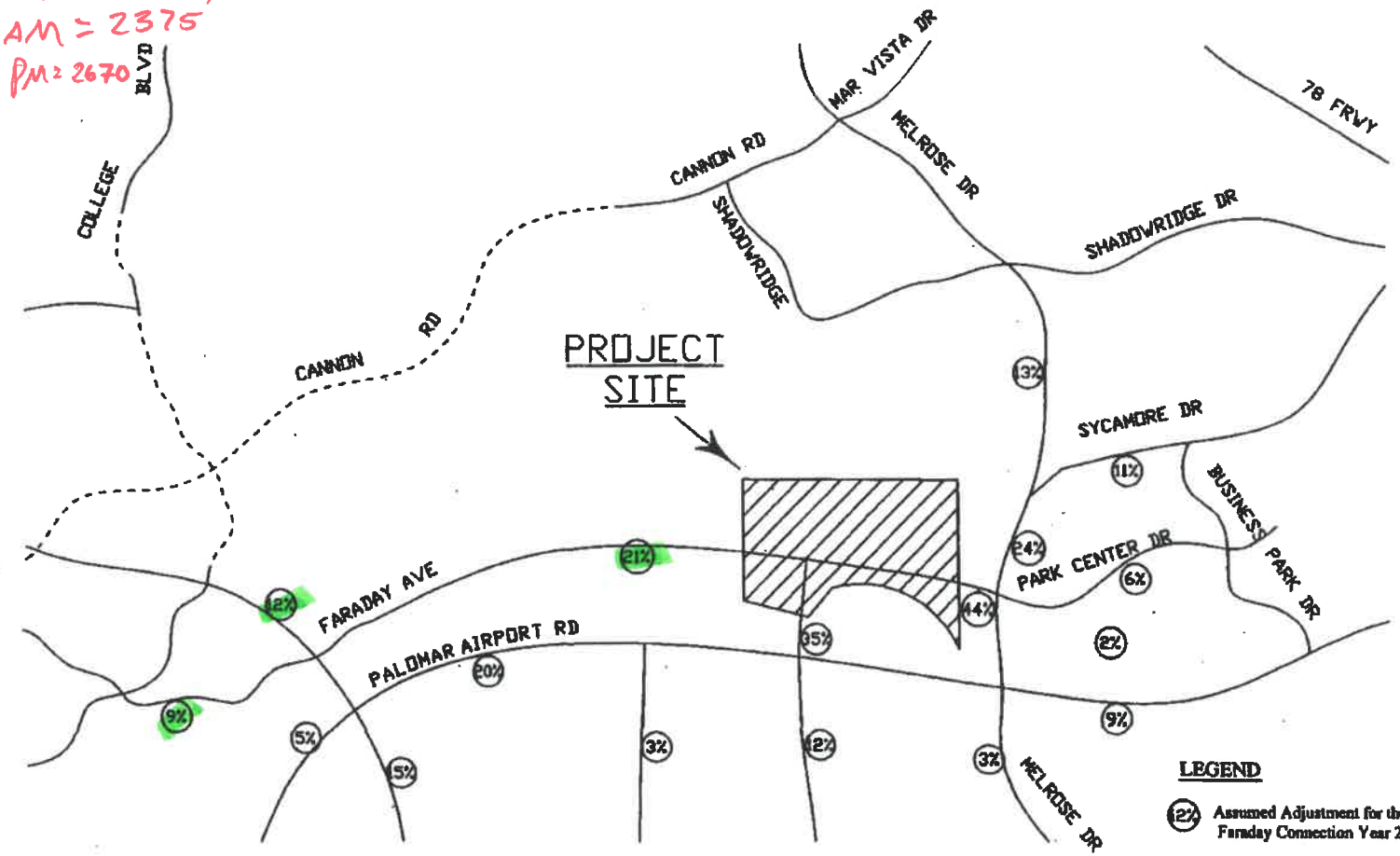
(3) Oaks North

Total ADT = 22,650 In Out

AM Peak Hour = 2,375 – 2100/275

PM Peak Hour = 3670 – 590/2,080

Total ADT = 22,650
AM = 2375
PM = 2670



CARLSBAD OAKS NORTH

WPA TRAFFIC ENGINEERING, INC.

PROJECT YEAR 2005 "WITH FARADAY CONNECTION"
ADJUSTMENTS DISTRIBUTION

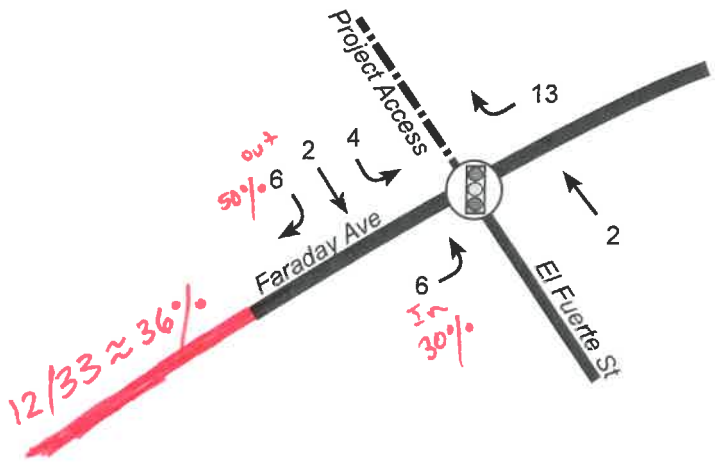
Figure 5.2-4

Not To Scale

NORTH

In out split
21 12 60:40

33 Peak hour Trips (AM)



AM Peak Hour Project Increment
(7:30-8:30)

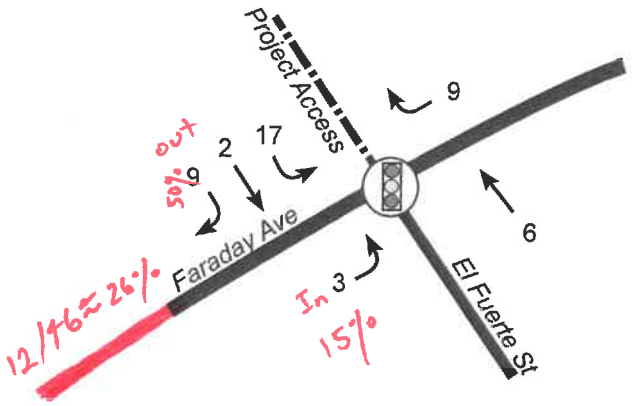
= Signal

15% on ECR

Avg = 36% + 26% = 31% on Faraday, 455 Total Trips

In out split
18 28 40:60

46 Peak hour Trips (PM)



PM Peak Hour Project Increment
(4:45-5:45)

CRANE TRANSPORTATION GROUP

Figure 6
AM and PM Peak Hour
Existing and 2035 Project Increment

Old Trip Generation

					AM				PM		
Land Use	Quantity (AC)	Trip Rate	ADT	% Peak	In	Out	Total	% Peak	In	Out	Total
Planned Industrial	216.9	79.99	17350	11%	1715	190	1905	12%	415	1665	2080
Light Industrial	8.7	201.14	1750	12%	165	40	205	12%	40	165	205
Low Rise Office	4.9	295.91	1450	14%	185	20	205	13%	40	155	195
Other Commercial	5.2	403.84	2100	3%	35	25	60	9%	95	95	190
			22650		2100	275	2375		590	2080	2670

New Trip Generation

					AM				PM		
Land Use	Quantity (AC)	Trip Rate	Daily Trips	% Peak	In	Out	Total	% Peak	In	Out	Total
Planned Industrial	198.0	79.99	15840	11%	1566	174	1740	12%	379	1520	1899
Light Industrial	8.7	201.14	1750	12%	165	40	205	12%	40	165	205
Low Rise Office	4.9	295.91	1450	14%	185	20	205	13%	40	155	195
Other Commercial	5.2	403.84	2100	3%	35	25	60	9%	95	95	190
			21140		1951	259	2210		554	1935	2489

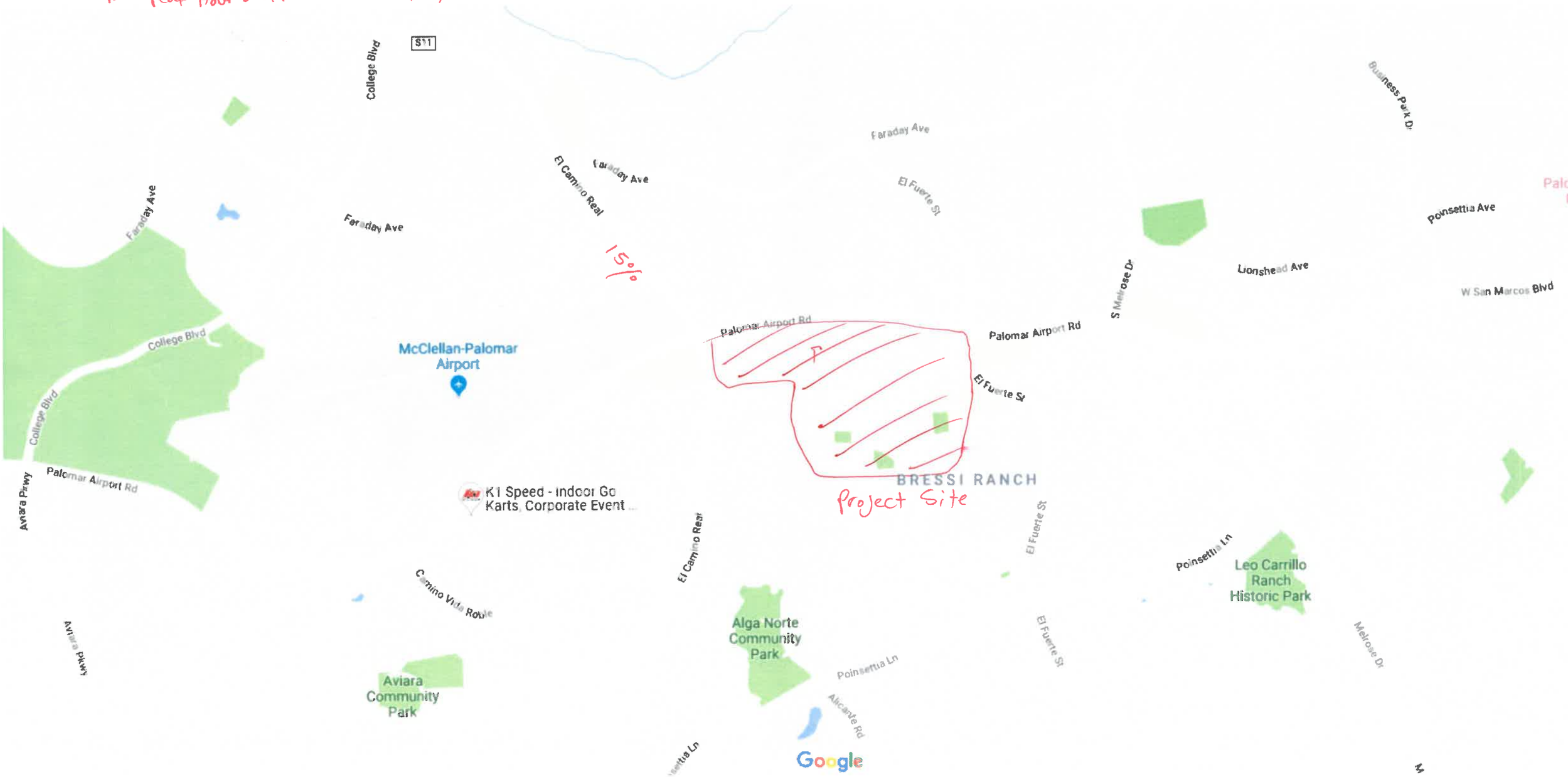
Square footage from developed parcels by the year 2019 was converted to acreage and subtracted from the "Planned Industrial". The acreage was subtracted from said category as a conservative approach since this category has the lowest trip rate.

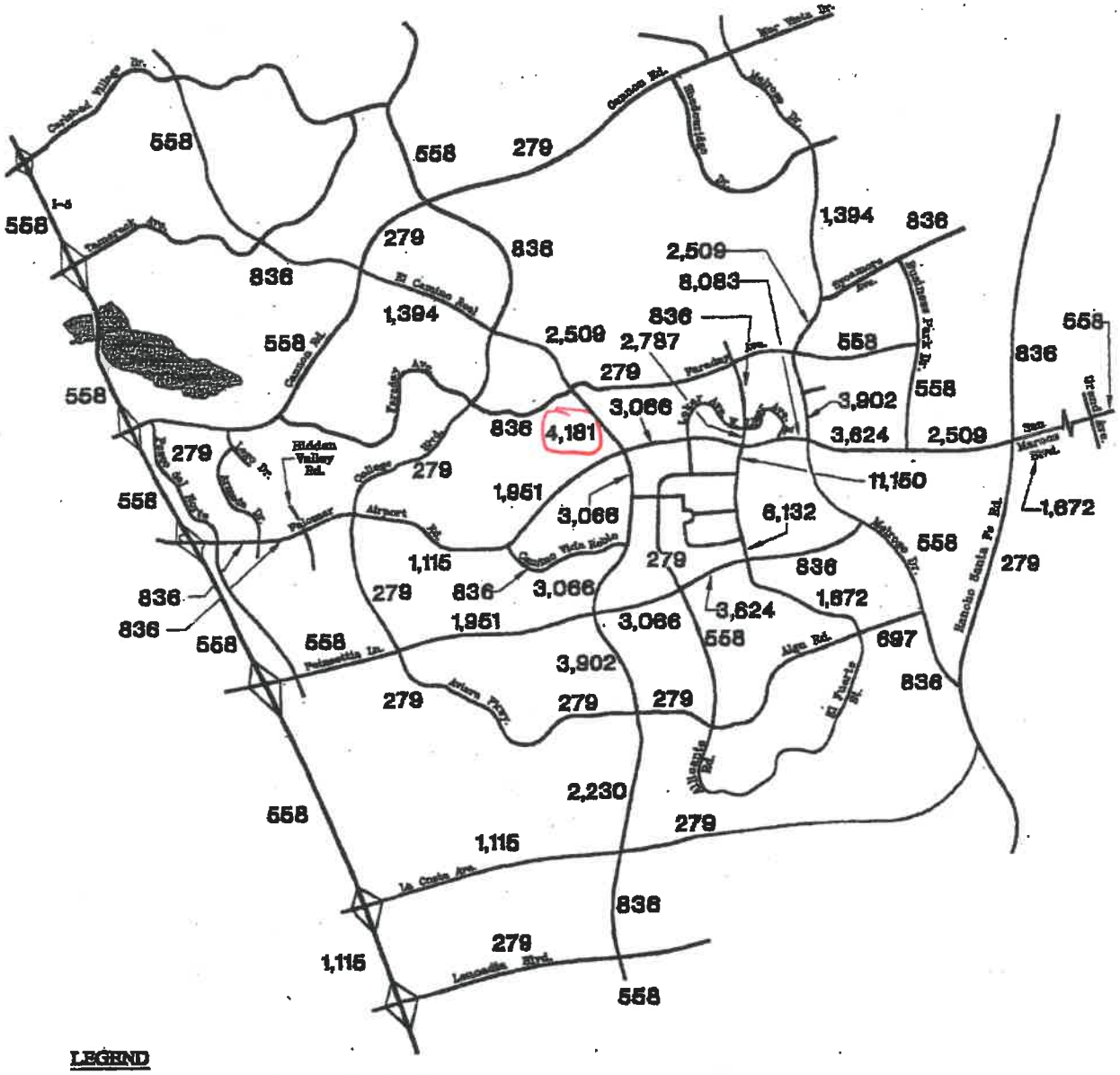
<<------ A total of 822,373 square feet were removed (18.88 acres)

(5) Bressi Ranch

Total ADT = 27,874

	In	Out
AM Peak Hour = 2605	1760	845
PM Peak Hour = 3195	1177	2,018



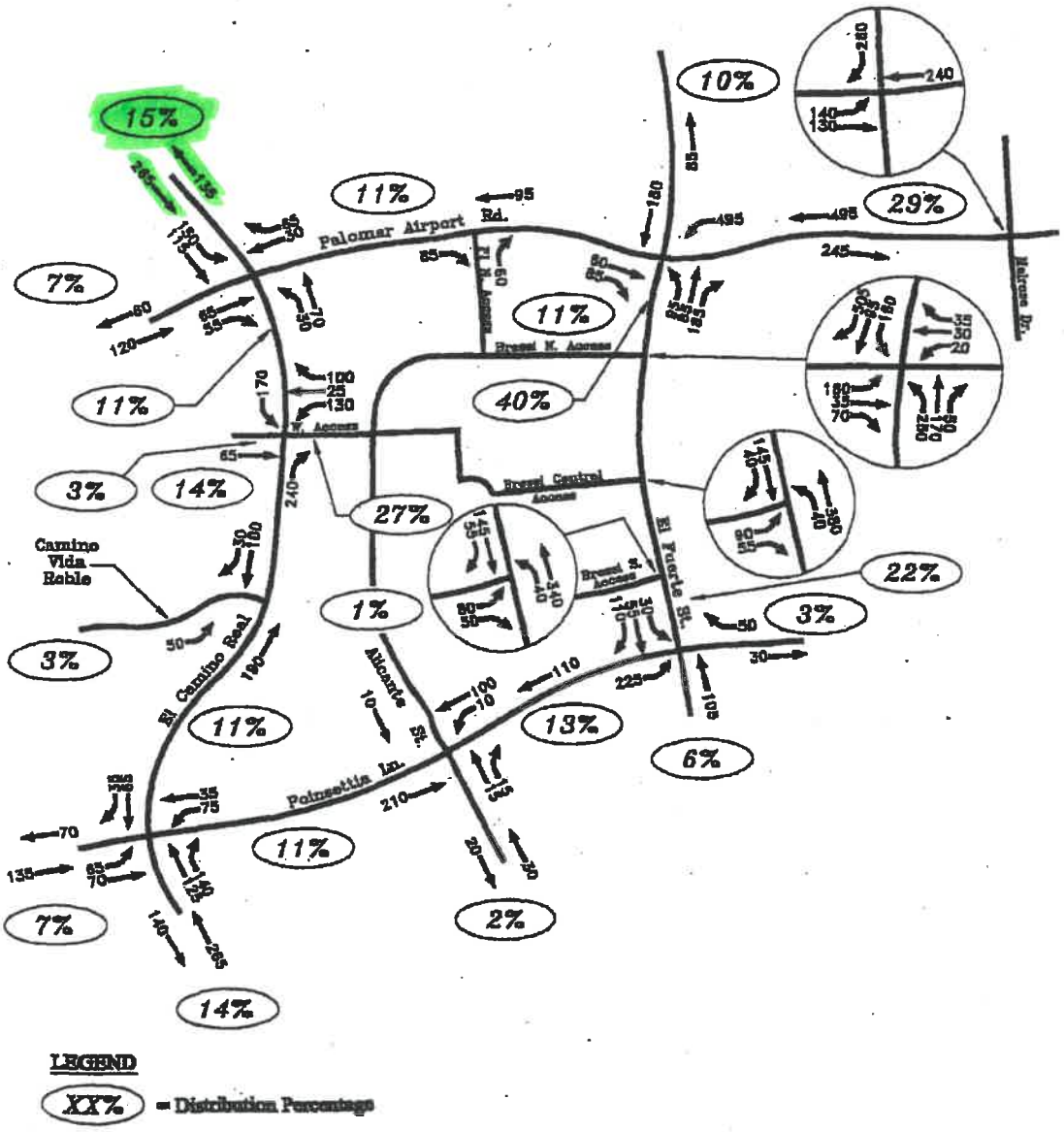


SOURCE: Urban Systems Associates, Inc.

North No Scale

Figure 5.2-5
Project Only Average Daily Traffic Volumes

Bressi Ranch



SOURCE: Urban Systems Associates, Inc.

North No Scale

Figure 5.2-6
Year 2020 Project Only AM Peak Hour Trips

4.0 PROPOSED PROJECT

4.1 Trip Generation

The Project proposes the construction of 294 residential dwelling units and 10,000 SF of commercial space. The residential units will be composed of 248 market rate townhomes, and 46 affordable age-restricted multi-family units. The townhomes are analyzed under the "Condominium" trip generation rate found in the SANDAG "Brief Guide", based on an approximate residential density of 17 DU/acre for these units. The senior apartments are analyzed using the "Senior Adult Housing – Attached" rate from the national ITE Trip Generation Manual, as SANDAG does not provide a rate for that unique land use. Instead, SANDAG provides a rate for "retirement community" which is typically a larger, stand-alone age-restricted single-family home community as opposed to reduced-rate senior apartments as proposed. ***Appendix E*** contains the ITE trip generation rates. The commercial space is currently proposed as 6,000 SF of specialty retail uses, and 4,000 SF of sit-down/high-turnover restaurant use.

Trip generation estimates for the Project were based on the SANDAG's *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region* (April 2002) and the ITE Trip Generation Manual.

The site is currently developed with approximately 12,370 sf of commercial space consisting of a restaurant, convenience/liquor store, bicycle shop, and guitar repair shop. Trip generation rates for the existing site were also obtained from SANDAG.

Table 4–1 tabulates the net Project traffic generation. Net of reductions for the existing on-site land uses, the Project is calculated to generate 901 ADT with (15) inbound / 83 outbound trips during the AM peak hour and 97 inbound / 13 outbound trips during the PM peak hour.

It should be noted that the AM inbound trips with redevelopment of the site are less than the number of trips generated by the existing land use categories.

TABLE 4–1
PROJECT TRIP GENERATION SUMMARY

Land Use	Quantity	Daily Driveway Trips (ADT)		AM Peak Hour					PM Peak Hour				
		Rate	Volume	Rate	In:Out Split	Volume In	Volume Out	Volume Total	Rate	In:Out Split	Volume In	Volume Out	Volume Total
Proposed Project													
Townhomes (Condominium) [a]	248 DU	8/DU	1,984	8%	2:8	32	127	159	10%	7:3	139	59	198
Apartment [b]	46 DU	3.7/DU	170	0.20/DU	35:65	3	6	9	0.26/DU	55:45	7	5	12
Specialty Retail [c]	6,000 SF	40/ksf	240	3%	6:4	4	3	7	9%	5:5	11	11	22
Restaurant (Sit-down, high turnover)	4,000 SF	160/ksf	640	8%	5:5	26	25	51	8%	6:4	31	20	51
Subtotal Proposed Project:	—	—	*3,034*	—	—	*65*	*161*	*226*	—	—	*188*	*95*	*283*
Existing Site													
Convenience Market	2,700 SF	500/ksf	1,350	8%	5:5	54	54	108	8%	5:5	54	54	108
Specialty Retail	6,370 SF	40/ksf	255	3%	6:4	5	3	8	9%	5:5	12	11	23
Restaurant (sit-down, high turnover)	3,300 SF	160/ksf	528	8%	5:5	21	21	42	8%	6:4	25	17	42
Subtotal Existing	—	—	*(2,133)*	—	—	*(80)*	*(78)*	*(158)*	—	—	*(91)*	*(82)*	*(173)*
Net New Traffic	—	—	***901***	—	—	***(15)***	***83***	***68***	—	—	***97***	***13***	***110***

Source: SANDAG (Not So) Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region (April 2002).

Footnotes:

a. Condominium rate applies to "any multi-family 6-20 DU/acre".

b. Senior Adult Housing – Attached (Land Use 252). ITE Trip Generation Manual, 10th Edition (See *Appendix E*).

c. Specialty retail rate applies to proposed "bike shop" and unspecified retail

General Notes:

- ksf = Thousand Square Feet
- ADT = Average Daily Trips

4.2 Trip Distribution

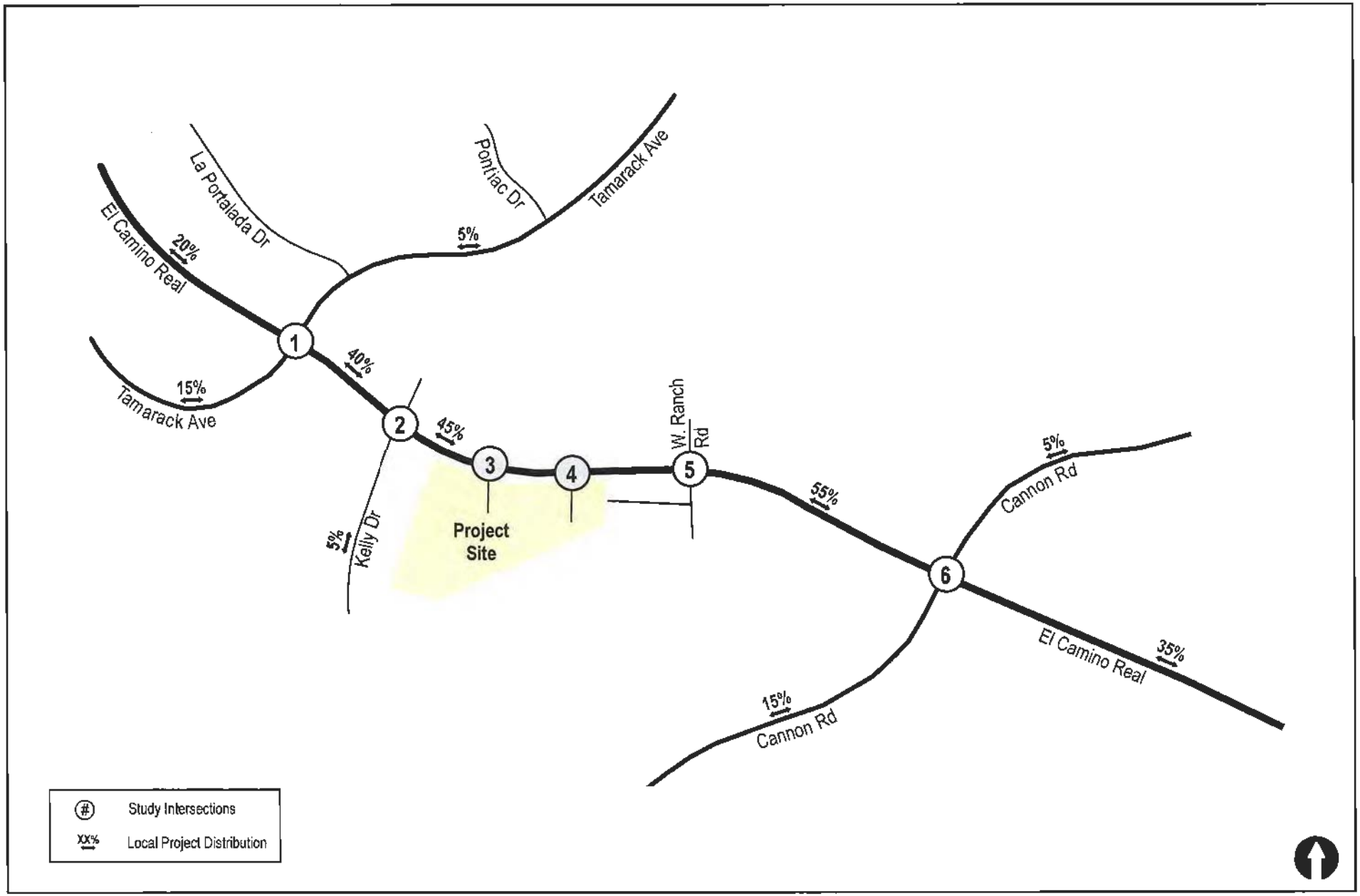
The Project's distribution was developed using engineering judgment informed by the Project land uses (residential, age-restricted residential, retail and restaurant), as well as existing traffic patterns at the study area intersections. The Project's residential components are intended to provide both infill (townhomes) and senior housing, both of which are anticipated to generate both regional trips to the Interstate 5 corridor and locally-oriented trips along the El Camino Real corridor.

Some Project traffic has been distributed to/from the Kelly Elementary school located south of El Camino Real on Kelly Drive through the El Camino Real/ Kelly Drive signalized intersection to reflect potential school and/or cut through trips to Tamarack Drive. The intersection is evaluated, but Kelly Drive is classified as a School Street per the City of Carlsbad Mobility Element; therefore, it is not subject to level of service standards for vehicles.

It should also be noted that the raised median on El Camino Real restricts left turns to and from the Project site. The adjacent signalized intersections at West Ranch Road/Lisa Street to the east and Kelly Drive to the west will serve the resulting U-turn movements.

4.3 Trip Assignment

The Project traffic generation in *Table 4–1* was assigned to the street system based on the trip distribution presented in ***Figure 4–1***. The resulting assignment of AM/PM peak hour Project volumes is shown on ***Figure 4–2***. Existing + Project traffic volumes are presented on ***Figure 4–3***.



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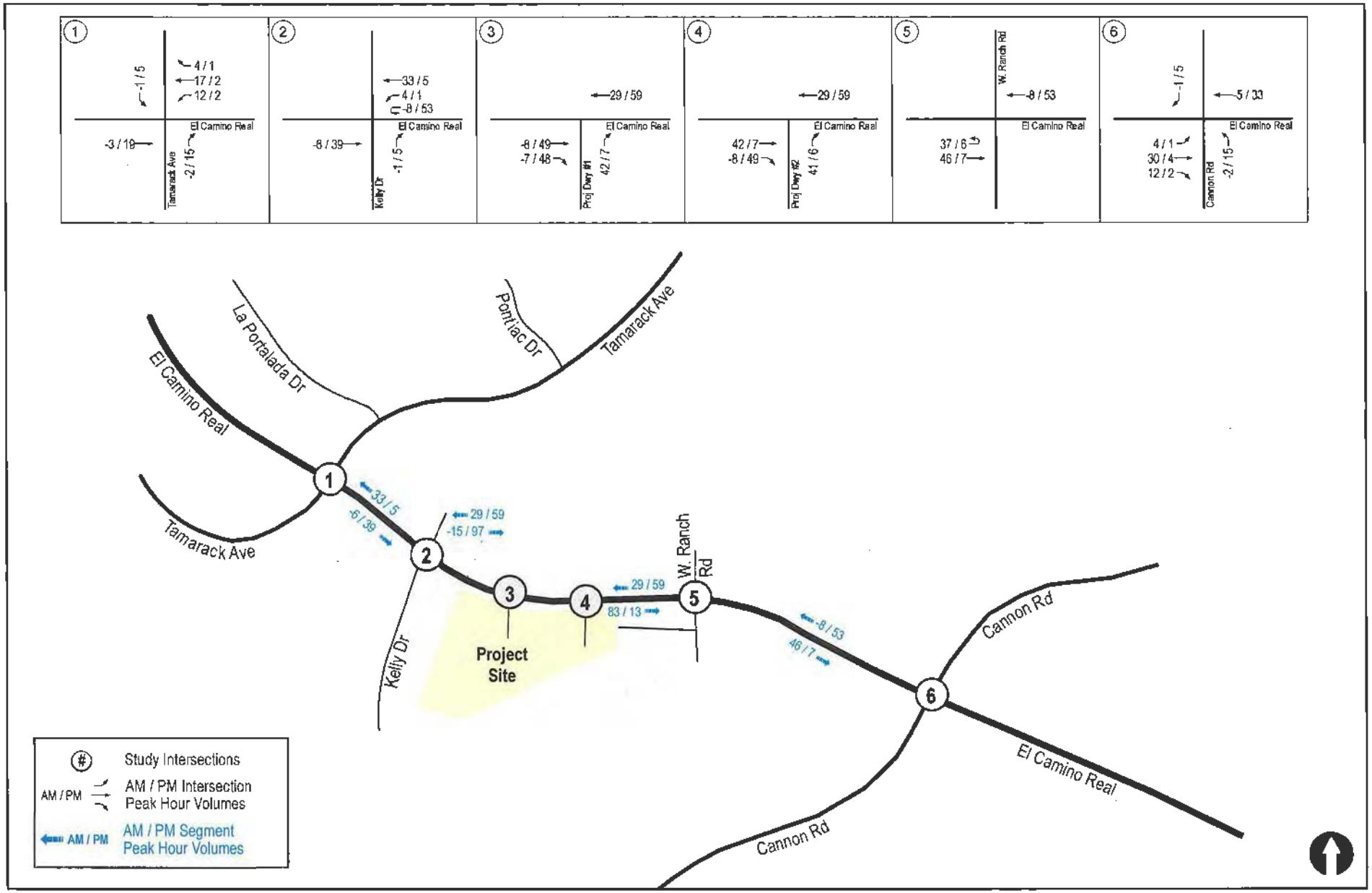
Date: 01/09/19

Figure 4-1

Project Trip Distribution

MARJA ACRES



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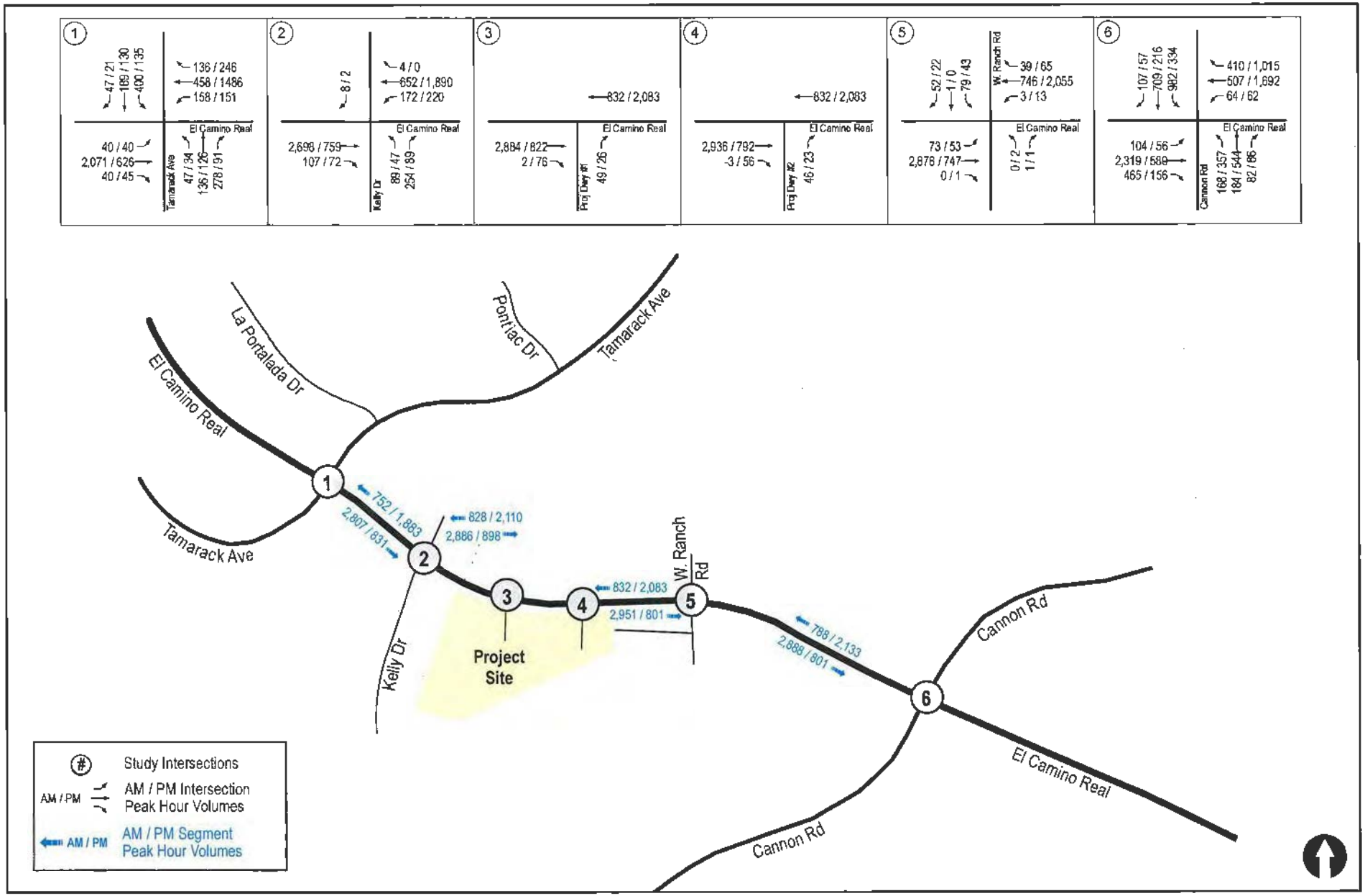
Date: 08/05/20

Figure 4-2

Project Traffic Volumes

MARJA ACRES



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Date: 08/31/20

Figure 4-3

Existing + Project Traffic Volumes

MARJA ACRES

8.0 PROJECT TRAFFIC

8.1 Project Trip Generation

The *Dos Colinas Subdivision* project proposes to develop 62 Cottage units, 166 Independent Living units, 81 Assisted Living units, and 29 Affordable Housing units. The trip generation estimates for the proposed development were based on *SANDAG's Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region - April 2002.* Two non-contiguous project sites along College Boulevard between Cannon Road and El Camino Real are proposed.

Western Project Site
The proposed 62 Cottage units consist of one and two bedroom dwelling units with attached garages. No centralized dining or other recreational facilities are proposed for these units. The *Retirement Community* trip rate was used as it best fits the description of this land use.

The proposed 166 Independent Living units are similar to the cottages; however, common areas for dining and recreational activities are provided and the units are expected to generate minimal traffic. Never-the-less, to be conservative, the *Retirement Community* trip rate was used.

The proposed 81 Assisted Living units are designed for the elderly and include assistance requirements for patients with special conditions such as Alzheimers. This land use also features common areas for dining and recreational activities and is expected to generate minimal traffic. To be conservative, the *Congregate Care Facility* trip rate was used.

Eastern Project Site
The proposed 29 Affordable Housing units consist of one, two and three bedroom units. The *Multi-family* trip rate was used as it best fits the description of this land use.

Table 8–1 tabulates the total project traffic generation. The total project is calculated to generate approximately 1,340 ADT with 27 inbound / 46 outbound trips during the AM peak hour and 62 inbound / 40 outbound trips during the PM peak hour.

TABLE 8–1
PROJECT TRIP GENERATION

Use	Size	Daily Trip Ends (ADT)		AM Peak Hour				PM Peak Hour			
		Rate	Volume[d]	% of ADT	In:Out Split	Volume		% Of ADT	In:Out Split	Volume	
						In	Out			In	Out
Western Project Site											
Cottage	62 units	4 / unit[a]	250	5%	40%:60%	5	8	7%	60%:40%	11	7
Independent Living	166 units	4 / unit[a]	660	5%	40%:60%	13	20	7%	60%:40%	28	18
Assisted Living	81 units	2.5 / unit[b]	200	4%	60%:40%	5	3	8%	50%:50%	8	8
Eastern Project Site											
Affordable Housing	29 units	8 / unit[c]	230	8%	20%:80%	4	15	9%	70%:30%	15	7
Total:			**1,340**	—	—	**27**	**46**	—	—	**62**	**40**

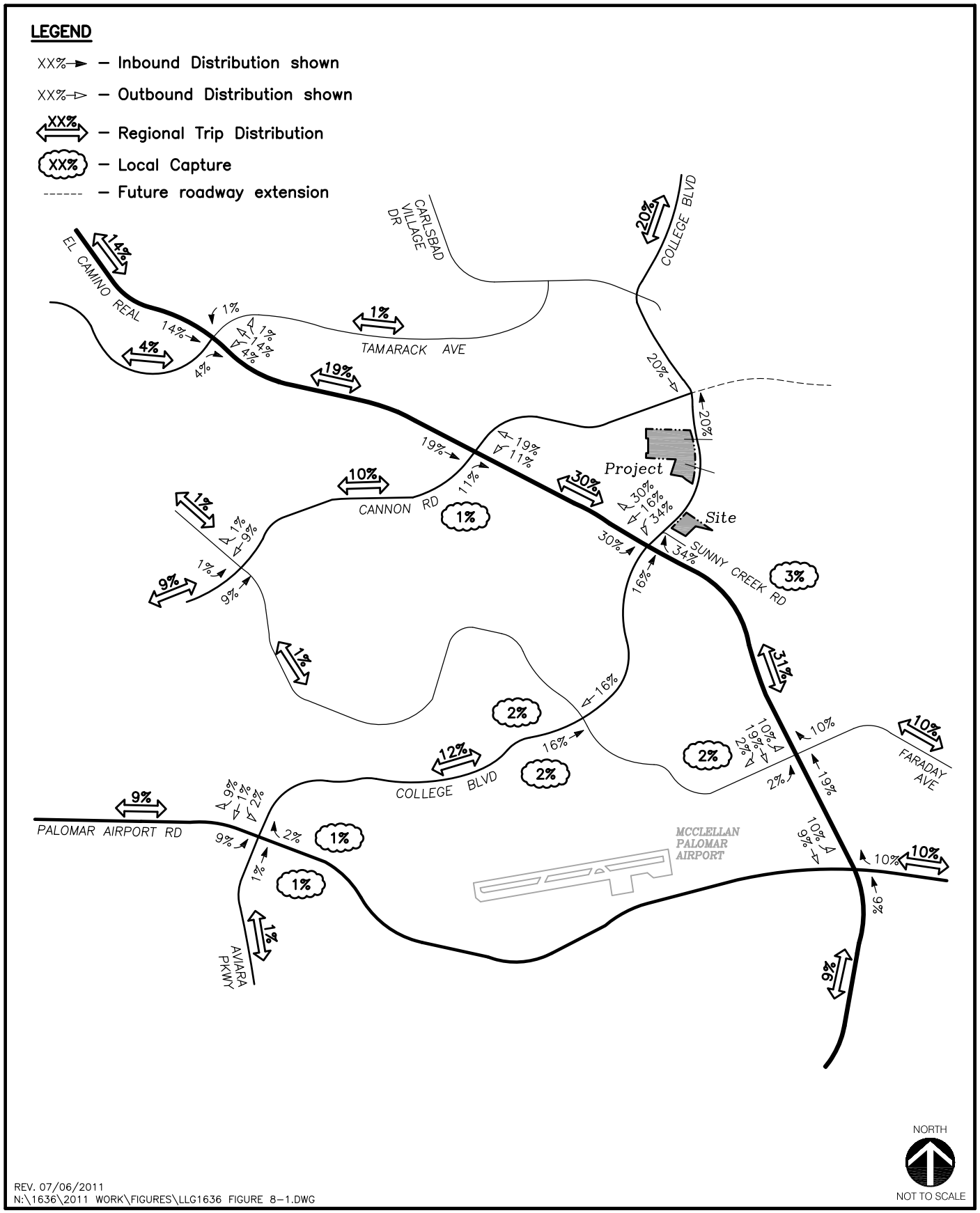
Footnotes:
a. Retirement Community rate based on *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region (SANDAG) - April 2002.*
b. Congregate Care Facility rate was used based on *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region (SANDAG) - April 2002.*
c. Multi-family (6-20 DU/acre) rate based on *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region (SANDAG) - April 2002.*
d. ADT volumes shown are rounded to the nearest 10.

8.2 Trip Distribution/Assignment

The project generated traffic was distributed and assigned to the study area. The distribution of project traffic was based on site access parameters, roadway system characteristics, proximity to the freeways, population densities. Two separate distributions were developed to account for the future extension of Cannon Road (Reach 4B).

Figure 8–1 and 8–2 depict the project traffic distribution without and with the Cannon Road extension, respectively. The extension is expected to shift project trips from El Camino Real and College Boulevard to Cannon Road.

Figure 8–3 and 8–4 depict the project traffic assignment without and with the Cannon Road extension, respectively.



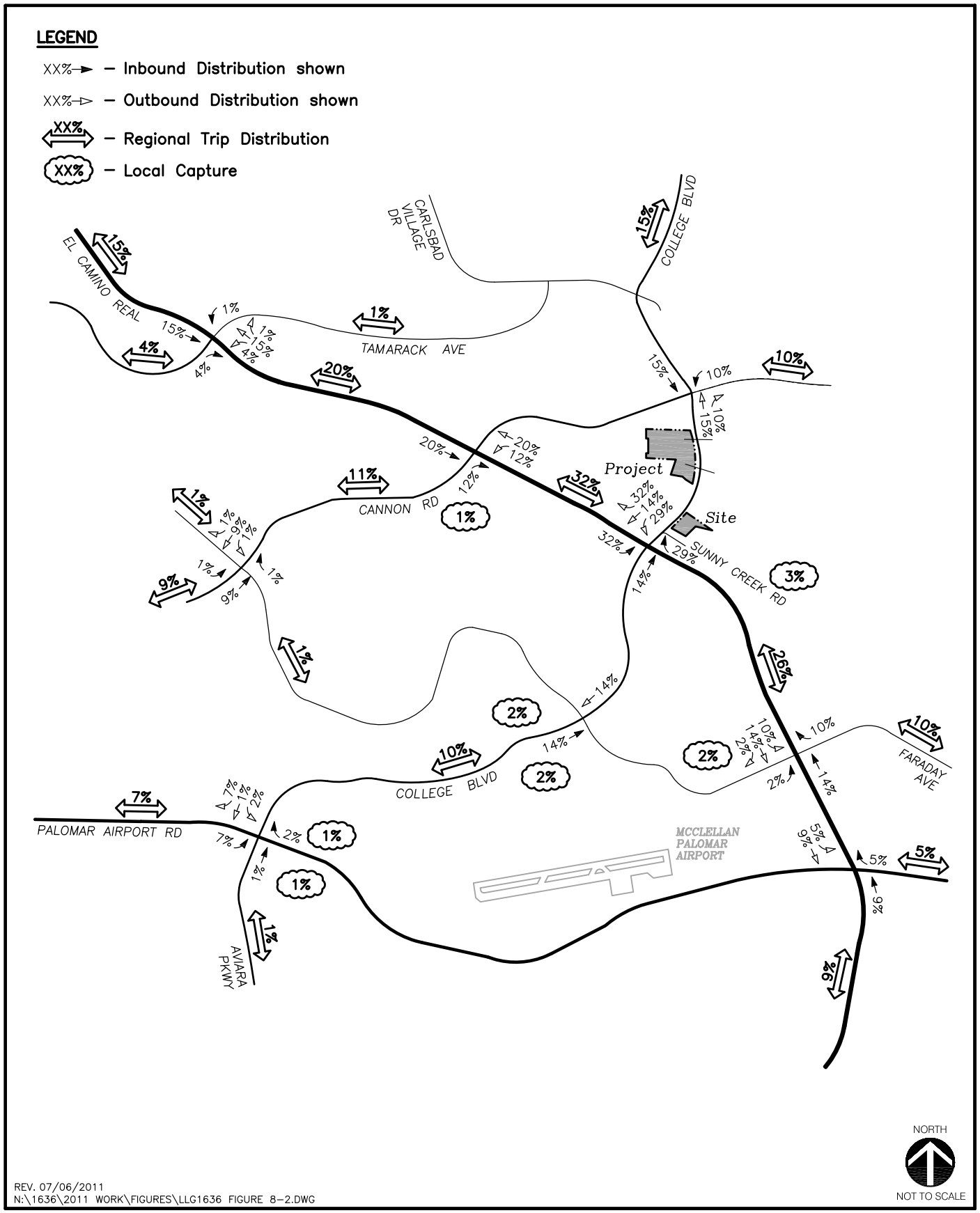
REV. 07/06/2011
N:\1636\2011 WORK\FIGURES\LLG1636 FIGURE 8-1.DWG

LINSCOTT LAW & GREENSPAN engineers

Figure 8-1

Project Traffic Distribution
(Without Cannon Road Extension)

DOS COLINAS



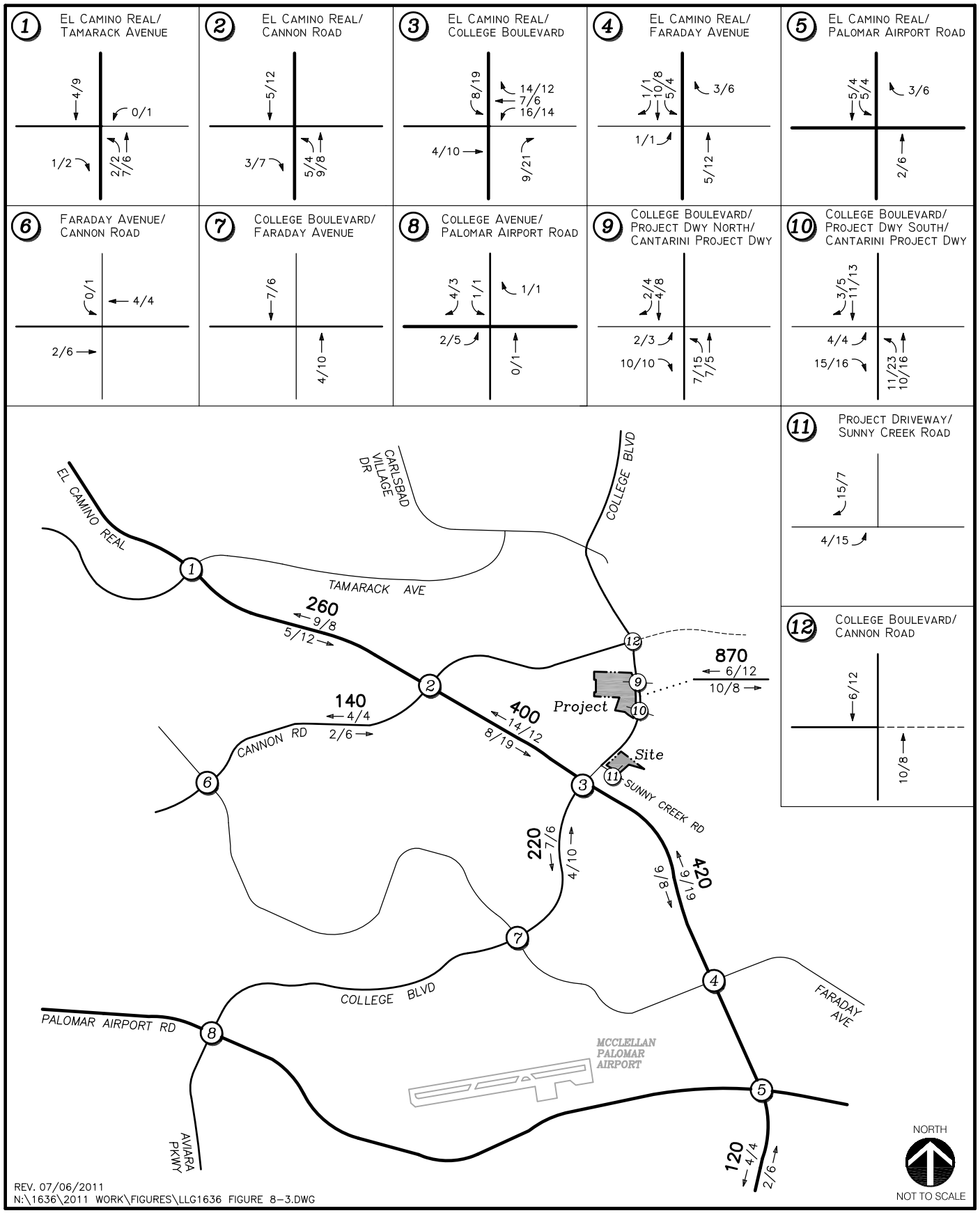
REV. 07/06/2011
N:\1636\2011 WORK\FIGURES\LLG1636 FIGURE 8-2.DWG

LINSCOTT LAW & GREENSPAN engineers

Figure 8-2

Project Traffic Distribution
(With Cannon Road Extension)

DOS COLINAS



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NOTES:

- ADT (Average Daily Traffic) shown midblock
- AM/PM peak hour volumes are shown at the intersections & midblock
- Intersection names: North–South/East–West

Figure 8-3

Project Traffic Volumes (Without Cannon Road Extension)

DOS COLINAS

Old Trip Generation

				AM			PM			
Land Use	Quantity	Rate	ADT	% Peak	Total	In	Out	% Peak	Total	In	Out
Cottage	62	4	250	5%	13	5	8	7%	18	11	7
Independent Living	166	4	660	5%	33	13	20	7%	46	28	18
Assisted Living	81	2.5	200	4%	8	5	3	8%	16	8	8
Affordable Housing	29	8	230	8%	19	4	15	9%	22	15	7
			1340		73	27	46		102	62	40

New Trip Generation

				AM			PM			
Land Use	Quantity	Rate	ADT	% Peak	Total	In	Out	% Peak	Total	In	Out
Cottage	58	4	232	5%	12	5	7	7%	16	10	6
Independent Living	166	4	664	5%	33	13	20	7%	46	28	18
Assisted Living	81	2.5	203	4%	8	5	3	8%	16	8	8
Affordable Housing	24	8	192	8%	16	3	13	9%	18	13	5
			1291		69	26	43		96	59	37

Nick Mesler

From: Jonathan Sanchez
Sent: Monday, November 04, 2019 7:03 AM
To: Nick Mesler
Subject: FW: Orion Center TIA - cumulative projects

From: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Sent: Tuesday, October 29, 2019 8:44 AM
To: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Cc: Stephen Cook <scook@chenryanmobility.com>; Kyrenne Chua <Kyrenne.Chua@carlsbadca.gov>; Tim Carroll <Tim.Carroll@CarlsbadCA.gov>; Steven Stewart <Steven.Stewart@carlsbadca.gov>
Subject: RE: Orion Center TIA - cumulative projects

Hi Jonathan,

Due to adding the segment of El Camino Real between College Blvd and Faraday to the study area, there are five cumulative projects in addition to the ones already discussed that need to be added to the cumulative projects list. These projects all have approved tentative maps with conditions of approval that the College Blvd extension will be constructed (between Cannon and El Camino Real); therefore the College Blvd extension will be added as a near-term network improvement. The five projects are Cantarini Ranch (CT 00-18), Holly Springs (CT 00-21), Dos Colinas (CUP 09-02), Rancho Milagro (CT 06-04), and Encinas Creek Apartments (SDP 01-10A).

The traffic impacts for Cantarini Ranch, Holly Springs, and Encinas Creek Apartments are covered by EIR 02-02, but these projects were not analyzed specifically. Instead, their trip generation was compared to a previous Bridge and Thoroughfare district traffic analysis to determine that the projects were equivalent to what had already been analyzed. Therefore, there is not trip distribution or trip assignment unique to these projects. Rancho Milagro did not have a traffic impact analysis completed. The Dos Colinas project has an approved EIR unique to that project (EIR 09-01). The trip distribution associated with the Dos Colinas project can be applied to all 5 projects. The trip generation for the projects are as follows:

- Cantarini Ranch- 105 single family homes
- Holly Springs- 43 single family homes
- Dos Colinas- see EIR
- Rancho Milagro- 19 single family homes
- Encinas Creek Apts- 127 apartments

All five projects are located on the section of College Boulevard between Cannon Rd and El Camino Real. Feel free to contact me if you need clarification on any of this.

Additionally, our CIP group does not have plans within the next five years to do any pavement maintenance on the west leg of Faraday Ave, so the near-term condition should analyze that approach in its current configuration.

Let me know if you have any question.

Thanks!

Jennifer Horodyski, T.E.
Associate Engineer
Community & Economic Development
City of Carlsbad
1635 Faraday Ave
Carlsbad, CA 92008
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760-602-2747 | 760-602-1052 fax | Jennifer.Horodyski@carlsbadca.gov

---

From: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Sent: Friday, October 25, 2019 6:12 PM
To: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Cc: Stephen Cook <scook@chenryanmobility.com>
Subject: RE: Orion Center TIA - cumulative projects

Got it. Sounds good.

Thanks!

Jonathan Sanchez

Chen Ryan Associates

3900 Fifth Avenue, Suite 310 | San Diego, CA 92103

(619) 468-2739

www.ChenRyanMobility.com

From: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Sent: Friday, October 25, 2019 11:34 AM
To: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Cc: Stephen Cook <scook@chenryanmobility.com>
Subject: RE: Orion Center TIA - cumulative projects

Hi again,

Actually, I need to get back to you on Monday before we finalize the cumulative projects list. Adding the section of ECR between College and Faraday has brought some additional considerations that I want to close the loop on.

Jennifer

From: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Sent: Friday, October 25, 2019 11:28 AM
To: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Cc: Stephen Cook <scook@chenryanmobility.com>
Subject: RE: Orion Center TIA - cumulative projects

Great! Thanks Jennifer 😃.

Jonathan Sanchez

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From: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Sent: Friday, October 25, 2019 11:25 AM
To: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Cc: Stephen Cook <scook@chenryanmobility.com>
Subject: RE: Orion Center TIA - cumulative projects

Hi Jonathan,

Yes, those three cumulative projects are the only projects that need to be added to the analysis.

I see the pdf you found for the airport master plan update has “draft” in the name. I’d use the one from this website: https://www.sandiegocounty.gov/content/sdc/dpw/airports/palomar/masterplan.html

The version of the Marja Acres TIA you found is the most recent, and the trip generation and trip assignment sheet I provided with my comments came from that version.

Let me know if you have any additional questions.

Have a great weekend!

Jennifer

From: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Sent: Friday, October 25, 2019 11:07 AM
To: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Cc: Stephen Cook <scook@chenryanmobility.com>
Subject: RE: Orion Center TIA - cumulative projects

Awesome 😃. Thanks for the information Jennifer. Just to confirm, the following additional cumulative projects will be added to the analysis:

- Marja Acres
- McClellan Airport
- Valley View

I was able to find information online regarding Marja Acres (March 26, 2019) and McClellan Airport (December 7, 2017). Could you confirm that these traffic studies are the latest ones, please? I am pretty sure they are but it does not hurt to ask.

McClellan Airport:
https://www.sandiegocounty.gov/content/dam/sdc/dpw/AIRPORTS/palomar/documents/McClellan-Palomar_Master-Plan-Update_2018_DRAFT.pdf

Marja Acres:
https://ceqanet.opr.ca.gov/2018041022/2/Attachment/qbhrPp

Thanks!!

Jonathan Sanchez

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(619) 468-2739

www.ChenRyanMobility.com

From: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Sent: Friday, October 25, 2019 10:33 AM
To: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Cc: scook@chenryanmobility.com
Subject: RE: Orion Center TIA - cumulative projects

Hi Jonathan,

The TIA for the Valley View project did not require vehicular LOS analysis since it is a Level 1 TIA, but here is the trip generation table.

TRIP GENERATION RATES[1]					
		AM PEAK		PM PEAK	
Land Use	Weekday Daily	% ADT	In:Out Ratio	% ADT	In:Out Ratio
Commercial Office	20 trips / ksf	14%	0.90 : 0.10	13%	0.20 : 0.80

TRIP GENERATION CALCULATIONS								
			AM PEAK			PM PEAK		
Land Use	Amount	ADT	In	Out	Total	In	Out	Total
Valley View	11.404 ksf	229	30	3	33	6	24	30

Notes:
ksf: 1,000 sf
1. The trip rates are based on *SANDAG's Brief Guide of Vehicular Trip Generation Rates for the San Diego Region, April 2002.*

I have confirmed that the Ventana Real project has been inactive since 2017; therefore, it does not need to be included as a cumulative project.

Let me know if you have any additional questions.

Thanks!

City of Carlsbad

Jennifer Horodyski, T.E.
Associate Engineer
Community & Economic Development
City of Carlsbad
1635 Faraday Ave
Carlsbad, CA 92008
www.carlsbadca.gov

760-602-2747 | 760-602-1052 fax | Jennifer.Horodyski@carlsbadca.gov

---

From: Jonathan Sanchez <jsanchez@chenryanmobility.com>
Sent: Wednesday, October 23, 2019 10:13 AM
To: Jennifer Horodyski <Jennifer.Horodyski@carlsbadca.gov>
Cc: scook@chenryanmobility.com
Subject: Orion Center TIA - cumulative projects

Good Morning Jennifer,

It was great to finally meet you last Monday 😃 ! I wanted to reach out to check in on the cumulative project information we discussed during our meeting. Do you happen to have an update regarding when we would be able to get the traffic studies for the two cumulative projects you mentioned? Oh, and another question – Do you happen to know how extensive the "Deeper Dive" analysis is? Other than doing a v/c comparison, does it require any sort of arterial analysis in Synchro? I know this is what will be explained during the meeting on November 4th but I am just trying to get a general idea for costing purposes.

Let me know if you have any questions.

Thanks!

Jonathan Sanchez

Chen Ryan Associates

3900 Fifth Avenue, Suite 310 | San Diego, CA 92103

(619) 468-2739

www.ChenRyanMobility.com

La Marea - Self Storage - Trip Generation

				AM				PM			
Land Use	Quantity	Rate	ADT	% Peak	Total	In	Out	% Peak	Total	In	Out
Self-Storage	136376	2	273	6%	16	8	8	9%	25	13	12

Trip Generation

				AM				PM			
Land Use	Quantity	Rate	ADT	% Peak	Total	In	Out	% Peak	Total	In	Out
La Marea	122	2.5	305	4%	12	7	5	8%	24	12	12

Appendix F – Fair-Share Calculations

ID	Intersection	Existing AM SBL	Project Trip Assignment AM SBL	Cumulative with Project AM SBL	Fairshare
2	El Camino Real & Faraday Avenue	581	32	875	10.9%
3	Orion Street & Faraday Avenue	12	2	14	100.0%

EQUITABLE SHARE RESPONSIBILITY: **Equation C-1**

NOTE: $T_E < T_B$, see explanation for T_B below.

$$P = \frac{T}{T_B - T_E}$$

Where:

P = The equitable share for the proposed project's traffic impact.

T = The vehicle trips generated by the project during the peak hour of adjacent State highway facility in vehicles per hour, vph.

T_B = The forecasted traffic volume on an impacted State highway facility at the time of general plan build-out (e.g., 20 year model or the furthest future model date feasible), vph.

T_E = The traffic volume existing on the impacted State highway facility plus other approved projects that will generate traffic that has yet to be constructed/opened, vph.

Appendix G – Transit Information

309

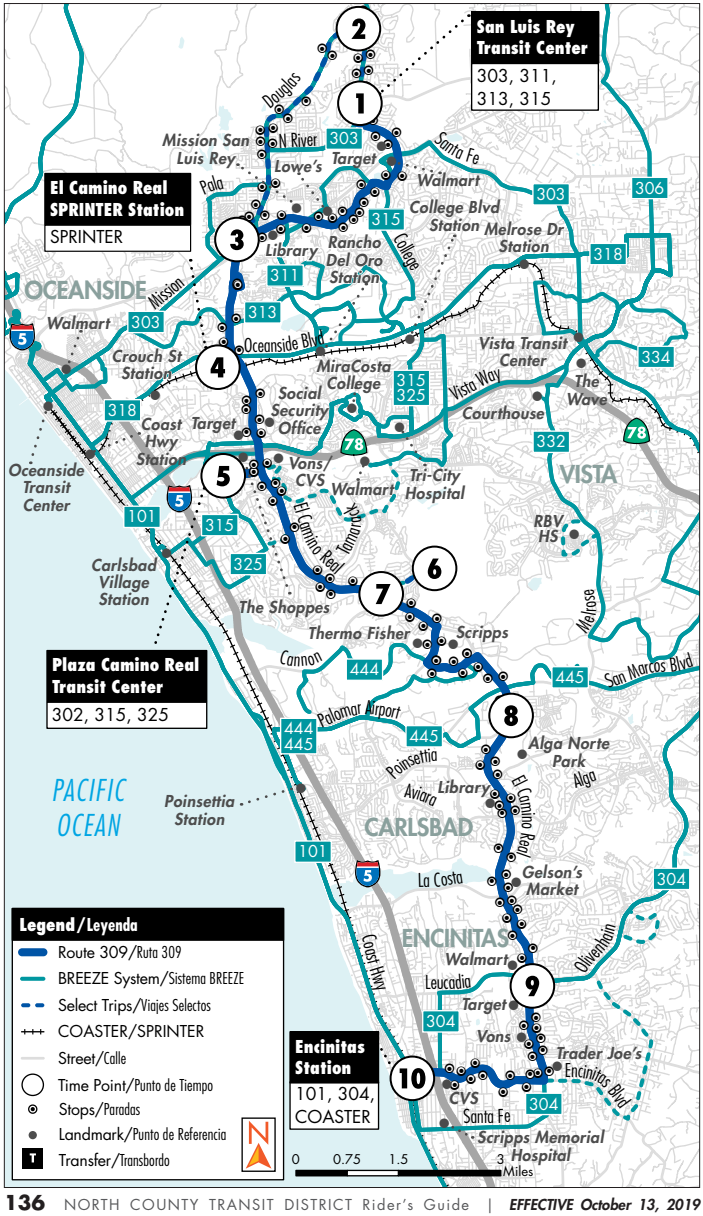
Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

M-F • SA • SU
L-V • SÁ • DO

Destinations/Destinos

- Encinitas City Hall
- Plaza Camino Real
- El Camino Real SPRINTER Station
- The Shoppes at Carlsbad
- Encinitas Ranch Town Center (Target)
- Sage Creek High School
- San Diego Botanic Gardens
- La Costa Resort & Spa
- Social Security Administration
- McClellan Palomar Airport



309 Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Monday - Friday
Southbound to Encinitas
Lunes a Viernes • Dirección hacia el sur a Encinitas

San Luis Rey Transit Center	Douglas Dr. & Vandegrift Bl.	Mission Ave. & El Camino Real	El Camino Real Station	Plaza Camino Real	College Bl. & Cannon Rd.	El Camino Real & Cannon Rd.	El Camino Real & Gateway Rd.	El Camino Real & Leucadia Bl.	Encinitas Station
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
4:04	–	4:14	4:21	4:30	–	4:37	4:47	4:57	5:11a
4:41	–	4:51	4:58	5:07	–	5:14	5:24	5:34	5:48
5:01	–	5:11	5:18	5:27	–	5:34	5:44	5:54	6:08
5:31	–	5:42	5:50	6:00	–	6:08	6:19	6:31	6:47
6:07	–	6:19	6:28	6:39	–	6:49	7:01	7:16	7:38
6:31	–	6:43	6:52	7:03	–	7:13	7:25	7:40	8:02
7:00	–	7:16	7:26	7:38	–	7:49	8:01	8:17	8:38
7:32	–	7:48	7:58	8:10	–	8:21	8:33	8:49	9:10
8:03	–	8:18	8:28	8:40	–	8:50	9:01	9:14	9:33
8:32	–	8:47	8:57	9:09	–	9:19	9:30	9:43	10:02
8:58	9:03	9:15	9:28	9:40	–	9:50	10:01	10:14	10:36
9:33	–	9:49	9:58	10:10	–	10:20	10:31	10:44	11:06
10:03	–	10:19	10:28	10:41	–	10:50	11:00	11:13	11:33
10:33	–	10:49	10:58	11:11	–	11:20	11:30	11:43	**12:03p**
10:59	11:04	11:16	11:28	11:43	–	11:52	**12:03**	**12:17**	**12:39**
11:26	–	11:43	11:53	**12:08**	**–**	**12:17**	**12:28**	**12:42**	**1:04**
11:54	–	**12:11**	**12:21**	**12:36**	**–**	**12:45**	**12:56**	**1:10**	**1:32**
12:24	**–**	**12:41**	**12:51**	**1:05**	**–**	**1:17**	**1:28**	**1:42**	**2:03**
12:52	**–**	**1:09**	**1:19**	**1:33**	**–**	**1:45**	**1:56**	**2:10**	**2:31**
1:22	**1:27**	**1:39**	**1:51**	**2:04**	**–**	**2:16**	**2:27**	**2:42**	**3:03**
1:54	**–**	**2:11**	**2:20**	**2:33**	**–**	**2:45**	**2:56**	**3:11**	**3:32**
–	**–**	**–**	**–**	**–**	**2:51**	**2:52**	**3:02**	**3:17**	**3:38**
2:24	**–**	**2:41**	**2:50**	**3:04**	**–**	**3:14**	**3:25**	**3:40**	**4:01**
2:53	**–**	**3:10**	**3:19**	**3:33**	**–**	**3:43**	**3:54**	**4:09**	**4:30**
3:24	**–**	**3:41**	**3:51**	**4:05**	**–**	**4:16**	**4:28**	**4:44**	**5:05**
3:53	**–**	**4:10**	**4:20**	**4:34**	**–**	**4:45**	**4:57**	**5:13**	**5:34**
4:27	**–**	**4:45**	**4:54**	**5:08**	**–**	**5:18**	**5:29**	**5:43**	**6:03**
5:01	**–**	**5:18**	**5:27**	**5:40**	**–**	**5:50**	**6:01**	**6:13**	**6:32**
5:32	**–**	**5:49**	**5:58**	**6:11**	**–**	**6:21**	**6:32**	**6:44**	**7:03**
6:33	**–**	**6:48**	**6:56**	**7:09**	**–**	**7:18**	**7:27**	**7:38**	**7:55**
7:34	**–**	**7:48**	**7:56**	**8:08**	**–**	**8:16**	**8:25**	**8:36**	**8:52**
8:31	**–**	**8:45**	**8:53**	**9:04**	**–**	**9:12**	**9:21**	**9:32**	**9:48**

Trips operate when Sage Creek High School is open. Trip operates on school days in regular school year (not during summer school).
El autobús opera cuando está abierta la Preparatoria de Sage Creek. El servicio opera en días escolares durante el año escolar regular (no durante la sesión escolar de verano).

309 Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Monday - Friday
Northbound to Oceanside

Lunes a Viernes • Dirección hacia el norte a Oceanside

Encinitas Station	El Camino Real & Leucadia Bl.	El Camino Real & Gateway Rd.	El Camino Real & Cannon Rd.	College Bl. & Cannon Rd.	Plaza Camino Real	El Camino Real Station	Mission Ave. & El Camino Real	Douglas Dr. & Vandegrift Bl.	San Luis Rey Transit Center
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
5:34	5:43	5:53	6:03	–	6:17	6:26	6:36	–	6:55
6:04	6:16	6:28	6:40	–	6:54	7:03	7:13	–	7:31
6:34	6:46	6:58	7:10	–	7:24	7:33	7:43	–	8:01
–	*6:46	*6:58	–	*7:10	–	–	–	–	–
7:05	7:17	7:29	7:41	–	7:55	8:04	8:14	–	8:32
7:22	7:37	7:51	8:04	–	8:17	8:27	8:37	–	8:55
–	*7:47	*8:01	–	*8:13	–	–	–	–	–
8:00	8:16	8:29	8:41	–	8:54	9:05	9:15	–	9:33
8:31	8:47	9:00	9:12	–	9:25	9:36	9:49	10:00	10:06
8:54	9:10	9:23	9:35	–	9:48	9:59	10:09	–	10:27
9:24	9:40	9:52	10:02	–	10:16	10:28	10:39	–	10:58
10:02	10:16	10:27	10:37	–	10:51	11:03	11:14	–	11:32
10:32	10:46	10:57	11:07	–	11:21	11:33	11:44	–	**12:02p**
10:57	11:11	11:22	11:32	–	11:46	11:58	**12:11**	**12:22**	**12:28**
11:23	11:41	11:54	**12:07**	–	**12:21**	**12:34**	**12:45**	–	**1:06**
11:47	**12:05**	**12:18**	**12:31**	–	**12:45**	**12:58**	**1:09**	–	**1:30**
12:19	**12:36**	**12:49**	**1:00**	–	**1:14**	**1:27**	**1:37**	–	**1:57**
12:49	**1:06**	**1:19**	**1:30**	–	**1:44**	**1:57**	**2:07**	–	**2:27**
1:16	**1:35**	**1:48**	**2:01**	–	**2:17**	**2:31**	**2:43**	–	**3:06**
1:50	**2:09**	**2:22**	**2:35**	–	**2:51**	**3:05**	**3:17**	–	**3:40**
2:17	**2:36**	**2:51**	**3:07**	–	**3:23**	**3:36**	**3:49**	–	**4:12**
2:46	**3:05**	**3:20**	**3:36**	–	**3:52**	**4:05**	**4:18**	–	**4:41**
3:14	**3:35**	**3:50**	**4:06**	–	**4:22**	**4:36**	**4:48**	–	**5:10**
3:46	**4:07**	**4:22**	**4:38**	–	**4:54**	**5:08**	**5:20**	–	**5:42**
4:20	**4:37**	**4:53**	**5:12**	–	**5:27**	**5:39**	**5:50**	–	**6:11**
4:47	**5:04**	**5:20**	**5:39**	–	**5:54**	**6:06**	**6:17**	–	**6:38**
5:23	**5:42**	**5:57**	**6:10**	–	**6:26**	**6:38**	**6:48**	–	**7:08**
5:47	**6:06**	**6:21**	**6:34**	–	**6:50**	**7:02**	**7:12**	–	**7:32**
6:30	**6:45**	**6:58**	**7:10**	–	**7:25**	**7:36**	**7:47**	–	**8:05**

* **Operates Monday, Tuesday, Thursday, and Friday.**
Opera Lunes, Martes, Jueves y Viernes.

** **Operates Wednesday only.**
Opera solamente los Miércoles.

Trips operate when Sage Creek High School is open. Trip operates on school days in regular school year (not during summer school).
Los viajes operan cuando Sage Creek High School está abierto. El viaje opera los días escolares durante el año regular de clases (no durante el verano).

309 Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Monday - Friday
Northbound to Oceanside
Lunes a Viernes • Dirección hacia el norte a Oceanside

Encinitas Station	El Camino Real & Leucadia Bl.	El Camino Real & Gateway Rd.	El Camino Real & Cannon Rd.	College Bl. & Cannon Rd.	Plaza Camino Real	El Camino Real Station	Mission Ave. & El Camino Real	Douglas Dr. & Vandegrift Bl.	San Luis Rey Transit Center
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
7:18	7:35	7:47	7:58	–	8:12	8:23	8:32	–	8:49
8:31	8:44	8:55	9:03	–	9:16	9:26	9:35	–	9:50
9:30	9:43	9:54	10:02	–	10:14	10:23	10:33	–	10:49

309 Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Saturday
Southbound to Encinitas
Sábado • Dirección hacia el sur a Encinitas

San Luis Rey Transit Center	Mission Ave. & El Camino Real	El Camino Real Station	Plaza Camino Real	El Camino Real & Cannon Rd.	El Camino Real & Gateway Rd.	El Camino Real & Leucadia Bl.	Encinitas Station
1	**3**	**4**	**5**	**7**	**8**	**9**	**10**
5:29	5:45	5:58	6:16	6:24	6:33	6:43	6:56a
6:29	6:45	6:58	7:16	7:24	7:33	7:43	7:56
7:30	7:47	7:58	8:16	8:25	8:35	8:46	9:02
8:27	8:44	8:55	9:13	9:22	9:32	9:43	9:59
9:00	9:17	9:28	9:46	9:55	10:05	10:16	10:32
9:29	9:47	9:58	10:16	10:25	10:35	10:46	11:02
9:58	10:16	10:27	10:45	10:54	11:04	11:15	11:31
10:28	10:46	10:57	11:15	11:24	11:34	11:45	**12:01p**
10:58	11:16	11:27	11:45	11:54	**12:04**	**12:15**	**12:31**
11:28	11:46	11:57	**12:15**	**12:24**	**12:34**	**12:45**	**1:01**
11:56	**12:14**	**12:25**	**12:43**	**12:52**	**1:02**	**1:13**	**1:29**
12:26	**12:44**	**12:56**	**1:14**	**1:22**	**1:32**	**1:43**	**1:59**
12:56	**1:14**	**1:26**	**1:44**	**1:52**	**2:02**	**2:13**	**2:29**
1:25	**1:43**	**1:55**	**2:12**	**2:21**	**2:31**	**2:43**	**2:59**
1:55	**2:13**	**2:25**	**2:42**	**2:51**	**3:01**	**3:13**	**3:29**
2:26	**2:43**	**2:55**	**3:12**	**3:21**	**3:31**	**3:43**	**3:59**
2:56	**3:13**	**3:25**	**3:42**	**3:51**	**4:01**	**4:13**	**4:29**
3:26	**3:43**	**3:55**	**4:12**	**4:21**	**4:31**	**4:43**	**4:59**
3:56	**4:13**	**4:25**	**4:42**	**4:51**	**5:01**	**5:13**	**5:29**
4:28	**4:46**	**4:58**	**5:15**	**5:24**	**5:34**	**5:46**	**6:02**
4:58	**5:16**	**5:28**	**5:45**	**5:54**	**6:04**	**6:16**	**6:32**
5:28	**5:46**	**5:58**	**6:15**	**6:24**	**6:34**	**6:46**	**7:02**
5:59	**6:16**	**6:28**	**6:46**	**6:55**	**7:05**	**7:16**	**7:31**
6:22	**6:39**	**6:51**	**7:09**	**7:18**	**7:28**	**7:39**	**7:54**
7:29	**7:46**	**7:58**	**8:16**	**8:25**	**8:35**	**8:46**	**9:01**
8:29	**8:46**	**8:58**	**9:15**	**9:23**	**9:31**	**9:41**	**9:55**
9:33	**9:46**	**9:58**	**10:15**	**10:23**	**10:31**	**10:41**	**10:55**

309 Oceanside to Encinitas via El Camino Real
Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Saturday
Northbound to Oceanside
Sábado • Dirección hacia el norte a Oceanside

Encinitas Station	El Camino Real & Leucadia Bl.	El Camino Real & Gateway Rd.	El Camino Real & Cannon Rd.	Plaza Camino Real	El Camino Real Station	Mission Ave. & El Camino Real	San Luis Rey Transit Center
10	**9**	**8**	**7**	**5**	**4**	**3**	**1**
5:35	5:48	5:57	6:06	6:17	6:28	6:39	6:51a
6:35	6:48	6:57	7:06	7:17	7:28	7:39	7:51
7:30	7:44	7:53	8:03	8:15	8:28	8:41	8:56
8:30	8:44	8:53	9:03	9:15	9:28	9:41	9:56
9:00	9:14	9:23	9:33	9:45	9:58	10:11	10:26
9:30	9:46	9:55	10:04	10:15	10:28	10:41	10:56
10:06	10:22	10:31	10:40	10:51	11:04	11:17	11:32
10:30	10:46	10:55	11:04	11:15	11:28	11:41	11:56
11:00	11:16	11:25	11:34	11:45	11:58	**12:12**	**12:28p**
11:30	11:46	11:55	**12:04**	**12:15**	**12:28**	**12:42**	**12:58**
12:00	**12:16**	**12:25**	**12:34**	**12:45**	**12:58**	**1:12**	**1:28**
12:30	**12:46**	**12:55**	**1:04**	**1:15**	**1:28**	**1:42**	**1:58**
1:00	**1:16**	**1:25**	**1:34**	**1:45**	**1:58**	**2:12**	**2:28**
1:29	**1:45**	**1:54**	**2:03**	**2:14**	**2:28**	**2:42**	**2:59**
1:55	**2:11**	**2:21**	**2:32**	**2:44**	**2:58**	**3:13**	**3:30**
2:25	**2:41**	**2:51**	**3:02**	**3:14**	**3:28**	**3:43**	**4:00**
2:55	**3:11**	**3:21**	**3:32**	**3:44**	**3:58**	**4:13**	**4:30**
3:25	**3:41**	**3:51**	**4:02**	**4:14**	**4:28**	**4:43**	**5:00**
3:55	**4:11**	**4:21**	**4:32**	**4:44**	**4:58**	**5:13**	**5:30**
4:29	**4:45**	**4:55**	**5:06**	**5:18**	**5:32**	**5:47**	**6:04**
4:54	**5:10**	**5:20**	**5:31**	**5:43**	**5:57**	**6:12**	**6:29**
5:25	**5:41**	**5:51**	**6:02**	**6:14**	**6:28**	**6:43**	**7:00**
5:55	**6:11**	**6:21**	**6:32**	**6:44**	**6:58**	**7:13**	**7:30**
6:27	**6:43**	**6:52**	**7:02**	**7:14**	**7:28**	**7:41**	**7:58**
7:30	**7:45**	**7:54**	**8:03**	**8:14**	**8:28**	**8:40**	**8:55**
8:30	**8:45**	**8:54**	**9:03**	**9:14**	**9:28**	**9:40**	**9:54**
9:33	**9:46**	**9:55**	**10:04**	**10:15**	**10:28**	**10:39**	**10:53**

309 Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Sunday & Holidays
Southbound to Encinitas
Domingo y Días Festivos • Dirección hacia el sur a Encinitas

San Luis Rey Transit Center	Mission Ave. & El Camino Real	El Camino Real Station	Plaza Camino Real	El Camino Real & Cannon Rd.	El Camino Real & Gateway Rd.	El Camino Real & Leucadia Bl.	Encinitas Station
1	3	4	5	7	8	9	10
5:29	5:45	5:58	6:16	6:24	6:33	6:43	6:56a
6:29	6:45	6:58	7:16	7:24	7:33	7:43	7:56
7:30	7:47	7:58	8:16	8:25	8:35	8:46	9:02
8:27	8:44	8:55	9:13	9:22	9:32	9:43	9:59
9:29	9:47	9:58	10:16	10:25	10:35	10:46	11:02
10:28	10:46	10:57	11:15	11:24	11:34	11:45	**12:01p**
11:28	11:46	11:57	**12:15**	**12:24**	**12:34**	**12:45**	**1:01**
12:26	**12:44**	**12:56**	**1:14**	**1:22**	**1:32**	**1:43**	**1:59**
1:25	**1:43**	**1:55**	**2:12**	**2:21**	**2:31**	**2:43**	**2:59**
2:26	**2:43**	**2:55**	**3:12**	**3:21**	**3:31**	**3:43**	**3:59**
3:26	**3:43**	**3:55**	**4:12**	**4:21**	**4:31**	**4:43**	**4:59**
4:28	**4:46**	**4:58**	**5:15**	**5:24**	**5:34**	**5:46**	**6:02**
5:28	**5:46**	**5:58**	**6:15**	**6:24**	**6:34**	**6:46**	**7:02**
6:22	**6:39**	**6:51**	**7:09**	**7:18**	**7:28**	**7:39**	**7:54**
7:29	**7:46**	**7:58**	**8:16**	**8:25**	**8:35**	**8:46**	**9:01**
8:29	**8:46**	**8:58**	**9:15**	**9:23**	**9:31**	**9:41**	**9:55**
9:33	**9:46**	**9:58**	**10:15**	**10:23**	**10:31**	**10:41**	**10:55**

309 Oceanside to Encinitas via El Camino Real

Oceanside a Encinitas vía El Camino Real

See pg. 6 for Holiday schedules/Ver pág. 246 para obtener los horarios de días festivos

Sunday & Holidays
Northbound to Oceanside
Domingo y Días Festivos • Dirección hacia el norte a Oceanside

Encinitas Station	El Camino Real & Leucadia Bl.	El Camino Real & Gateway Rd.	El Camino Real & Cannon Rd.	Plaza Camino Real	El Camino Real Station	Mission Ave. & El Camino Real	San Luis Rey Transit Center
10	**9**	**8**	**7**	**5**	**4**	**3**	**1**
5:35	5:48	5:57	6:06	6:17	6:28	6:39	6:51a
6:35	6:48	6:57	7:06	7:17	7:28	7:39	7:51
7:30	7:44	7:53	8:03	8:15	8:28	8:41	8:56
8:30	8:44	8:53	9:03	9:15	9:28	9:41	9:56
9:30	9:46	9:55	10:04	10:15	10:28	10:41	10:56
10:30	10:46	10:55	11:04	11:15	11:28	11:41	11:56
11:30	11:46	11:55	**12:04**	**12:15**	**12:28**	**12:42**	**12:58**
12:30	**12:46**	**12:55**	**1:04**	**1:15**	**1:28**	**1:42**	**1:58**
1:29	**1:45**	**1:54**	**2:03**	**2:14**	**2:28**	**2:42**	**2:59**
2:25	**2:41**	**2:51**	**3:02**	**3:14**	**3:28**	**3:43**	**4:00**
3:25	**3:41**	**3:51**	**4:02**	**4:14**	**4:28**	**4:43**	**5:00**
4:29	**4:45**	**4:55**	**5:06**	**5:18**	**5:32**	**5:47**	**6:04**
5:25	**5:41**	**5:51**	**6:02**	**6:14**	**6:28**	**6:43**	**7:00**
6:27	**6:43**	**6:52**	**7:02**	**7:14**	**7:28**	**7:41**	**7:58**
7:30	**7:45**	**7:54**	**8:03**	**8:14**	**8:28**	**8:40**	**8:55**
8:30	**8:45**	**8:54**	**9:03**	**9:14**	**9:28**	**9:40**	**9:54**
9:33	**9:46**	**9:55**	**10:04**	**10:15**	**10:28**	**10:39**	**10:53**

Appendix H – Signal Warrants

Warrant 1, Eight (8) Hour Warrant

The minimum vehicular volume warrant is intended for applications where the volume of intersecting traffic is the principle reason for consideration of a signal installation. The warrant is satisfied as follows:

- For each of any eight (8) hours, of an average day the traffic volumes indicated in the warrant sheet occur on the major street (both approaches) and on the minor street (higher volumes approach) of the intersection.
- The major street and minor street volumes must occur during the same 8 hours.
- During these 8 hours, the direction of higher volume on the minor street may be on one approach, while during some hours it may occur on the opposite approach.
- The left-turn movements from the major street may be included with the minor street volumes if a separate phase is to be provided with the proposed signal.
- The left-turn volume in the highest direction may be added to the minor street volume on the highest approach. However, the major street volumes must be reduced by the same number.

Warrant 2, Four (4) Hour Warrant

The interruption of continuous traffic warrant is intended for applications where operating conditions where traffic volumes on the major street are so heavy that traffic on the minor intersecting street encounters excessive delays as a hazard in entering or crossing the major street. The warrant is satisfied as follows:

- For each of any four (4) hours, of an average traffic day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicle per hour on the minor-street (higher-volume approach only) all fall above the applicable curve for the existing combination of approach lanes.
  On the minor street, the higher volume shall not be required to be on the same approach during each of these four (4) hours.

Warrant 3, Peak Hour

Warrant 3 is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. Furthermore, this signal warrant shall be applied in cases where surrounding uses are such that attract or discharge large numbers of vehicles over a short time. These land uses include office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities.

Warrant 4, Pedestrian Volume

The pedestrian volume traffic signal warrant is intended for applications where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. The warrant is satisfied as follows:

- For each of any four (4) hours of an average traffic day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve (See Appendix A); or
- For one (1) hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve.

It is important to note that the pedestrian volume traffic signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign is less than 300 feet away, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant 5, School Crossing

The school crossing traffic signal warrant is intended for applications where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students. The warrant is satisfied as follows:

- An engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing location, across the major street is conducted and verifies that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period and there are a minimum of 20 schoolchildren during the highest crossing hour.

It is important to note that before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The school crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant 6, Coordinated Signal System

The coordinated signal system traffic signal warrant is intended for applications where a coordinated signal system needs installing traffic control signals at intersections where they would not otherwise be needed in order to maintain the proper platooning of vehicles within the corridor. This warrant is satisfied as follows:

- On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.
- On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a more progressive operation.

It is important to note that the coordinated signal system traffic signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.

Warrant 7, Crash Experience

The crash experience traffic signal warrant is intended for applications where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal. This warrant is satisfied as follows:

- Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

- Vehicular and pedestrian volumes are not less than 80 percent of the requirements specified in Warrants 1,2, or 3.

The common opinion of the general public that traffic signals materially reduce the number of accidents is rarely substantiated by experience. The Traffic Commission recognizes that there can be more accidents with unwarranted traffic signals in operation than before signal installation.

In consideration of the above statement, a careful analysis should be performed to ascertain if previous accidents have been of the types which are susceptible of correction by signalization.

Warrant 8, Roadway Network

The roadway network traffic signal warrant is intended for applications where some intersections might be justified to be signalized to encourage concentration and organization of traffic flow on a roadway network. This warrant is satisfied as follows:

- The intersection of two or more major routes has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has a 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1,2, and 3 during an average weekday.
- The intersection of two or more major routes has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

A major route is considered to have the following characteristics:

- It is part of the street system that serves as the principal roadway network for through traffic flow.
- It connects areas of principle traffic generation.
- It includes rural or suburban streets outside of entering or traversing the City.
- It has surface street, freeways, or expressway ramp terminals.
- It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.

Warrant 9, Intersection Near a Grade Crossing

The intersection near a grade crossing traffic signal warrant is intended for applications at a location where none of the conditions described in the other eight (8) traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal. This warrant is satisfied as follows:

- A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and
- During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve.

Location: **Orion Street & Impala Drive**

Jurisdiction: **City of Carlsbad**

Count Data Date: **March 2019**

Analysis Date: **March 5, 2021**

Main Roadway Speed: **25 MPH**

Population less than 10,000?: **No**

Analyst: **Cristian Belmudez**

Scenario: Existing Conditions

Intersection Diagram

CHEN RYAN

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

DIST ____ CO ____ RTE ____ PM ____

COUNT DATE ____
CALC ____ DATE ____
CHK ____ DATE ____

Major St: Orion Street — Critical Approach Speed 25 mph
Minor St: Impala Drive — Critical Approach Speed 35 mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐
or
In built up area of isolated community of < 10,000 population..... ☐ } RURAL (R)
☒ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume SATISFIED YES ☐ NO ☒
(Condition A or Condition B or combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume 100% SATISFIED YES ☐ NO ☒
80% SATISFIED YES ☐ NO ☒

APPROACH LANES	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS) 1 U	1 R	2 or More U	2 or More R	10:15 AM	11:15 AM	12:15 PM	1:15 PM	2:15 PM	3:15 PM	4:15 PM	5:15 PM
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	39	32	43	35	39	42	35	19
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	39	52	43	35	44	77	70	47

Hour

Condition B - Interruption of Continuous Traffic 100% SATISFIED YES ☐ NO ☒
80% SATISFIED YES ☐ NO ☒

APPROACH LANES	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS) 1 U	1 R	2 or More U	2 or More R	10:15 AM	11:15 AM	12:15 PM	1:15 PM	2:15 PM	3:15 PM	4:15 PM	5:15 PM
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	39	32	43	35	39	42	35	19
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	39	52	43	35	44	77	70	47

Hour

Combination of Conditions A & B SATISFIED YES ☐ NO ☒

REQUIREMENT	CONDITION	✓	FULFILLED
TWO CONDITIONS SATISFIED 80%	A. MINIMUM VEHICULAR VOLUME		Yes ☐ No ☒
	AND, B. INTERRUPTION OF CONTINUOUS TRAFFIC		
AND, AN ADEQUATE TRIAL OF OTHER ALTERNATIVES THAT COULD CAUSE LESS DELAY AND INCONVENIENCE TO TRAFFIC HAS FAILED TO SOLVE THE TRAFFIC PROBLEMS			Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☒**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	1:45 PM	2:45PM	3:45PM	4:45PM	Hour
Both Approaches - Major Street	X		44	32	41	28	
Higher Approach - Minor Street	X		44	69	61	71	

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐	No ☒
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐	No ☐

WARRANT 3 - Peak Hour (Part A or Part B must be satisfied) **SATISFIED YES ☐ NO ☒**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐	No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐	No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐	No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	Hour
Both Approaches - Major Street	X		77
Higher Approach - Minor Street	X		26

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐	No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 3 of 5)

WARRANT 4 - Pedestrian Volume
(Parts 1 and 2 Must Be Satisfied)

SATISFIED YES ☐ NO ☒

Part 1 (Parts A or B must be satisfied)

	Hours - - ->				
A.	Vehicles per hour for any 4 hours				
	Pedestrians per hour for any 4 hours				

Figure 4C-5 or Figure 4C-6
SATISFIED YES ☐ NO ☐

	Hours - - ->	7:00 AM	8:00 AM	4:00 PM	5:00 PM
B.	Vehicles per hour for any 1 hour	93	105	93	92
	Pedestrians per hour for any 1 hour	1	3	3	2

Figure 4C-7 or Figure 4C-8
SATISFIED YES ☐ NO ☒

Part 2 **SATISFIED YES ☐ NO ☐**

AND, The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐ No ☐
OR, The proposed traffic signal will not restrict progressive traffic flow along the major street.	Yes ☐ No ☐

WARRANT 5 - School Crossing
(Parts A and B Must Be Satisfied)

SATISFIED YES ☐ NO ☒

Part A
Gap/Minutes and # of Children

SATISFIED YES ☐ NO ☐

		Hour
Gaps vs Minutes	Minutes Children Using Crossing	
	Number of Adequate Gaps	
School Age Pedestrians Crossing Street / hr		

Gaps < Minutes YES ☐ NO ☐
AND Children > 20/hr YES ☐ NO ☐

AND, Consideration has been given to less restrictive remedial measures.	Yes ☐ No ☐

Part B **SATISFIED YES ☐ NO ☐**

The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐ No ☐
OR, The proposed signal will not restrict the progressive movement of traffic.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 4 of 5)

WARRANT 6 - Coordinated Signal System **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	
≥ 1000 ft	N _____ ft, S 950 ft, E _____ ft, W _____ ft	Yes ☐ No ☒
On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.		Yes ☐ No ☒
OR, On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.		

WARRANT 7 - Crash Experience Warrant **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency.			Yes ☐ No ☐
REQUIREMENTS	Number of crashes reported within a 12 month period susceptible to correction by a traffic signal, and involving injury or damage exceeding the requirements for a reportable crash.		Yes ☐ No ☒
5 OR MORE			
REQUIREMENTS	CONDITIONS	✓	
ONE CONDITION SATISFIED 80%	Warrant 1, Condition A - Minimum Vehicular Volume		Yes ☐ No ☐
	OR, Warrant 1, Condition B - Interruption of Continuous Traffic		
	OR, Warrant 4, Pedestrian Volume Condition Ped Vol ≥ 80% of Figure 4C-5 through Figure 4C-8		

WARRANT 8 - Roadway Network **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM VOLUME REQUIREMENTS	ENTERING VOLUMES - ALL APPROACHES	✓	FULFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour _____ Veh/Hr and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3 during an average weekday.		Yes ☐ No ☐
	OR During Each of Any 5 Hrs. of a Sat. or Sun _____ Veh/Hr		

CHARACTERISTICS OF MAJOR ROUTES	MAJOR ROUTE A	MAJOR ROUTE B	
Hwy. System Serving as Principal Network for Through Traffic			
Rural or Suburban Highway Outside Of, Entering, or Traversing a City			
Appears as Major Route on an Official Plan			
Any Major Route Characteristics Met, Both Streets			Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 5 of 5)

WARRANT 9 - Intersection Near a Grade Crossing **SATISFIED YES ☐ NO ☒**
(Both Parts A and B Must Be Satisfied)

PART A A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach. Track Center Line to Limit Line _____ ft	Yes ☐ No ☐
PART B **There is one minor street approach lane at the track crossing -** During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-9. Major Street - Total of both approaches: _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = _____ VPH	Yes ☐ No ☐
OR, There are two or more minor street approach lanes at the track crossing - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-10. Major Street - Total of both approaches : _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calcualte AF) = _____ VPH	

The minor street approach volume may be multiplied by up to three following adjustment factors (AF) as described in Section 4C.10.

1- Number of Rail Traffic per Day_____ Adjustment factor from table 4C-2____

2- Percentage of High-Occupancy Buses on Minor Street Approach_____ Adjustment factor from table 4C-3____

3- Percentage of Tractor-Trailer Trucks on Minor Street Approach_____ Adjustment factor from table 4C-4____

NOTE: If no data is availale or known, then use AF = 1 (no adjustment)

Location: **Orion Street & Impala Drive**

Jurisdiction: **City of Carlsbad**

Count Data Date: **March 2019**

Analysis Date: **March 5, 2021**

Main Roadway Speed: **25 MPH**

Population less than 10,000?: **No**

Analyst: **Cristian Belmudez**

Scenario: Existing with Project

Intersection Diagram

CHEN RYAN

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

DIST ____ CO ____ RTE ____ PM ____

COUNT DATE ____
CALC ____ DATE ____
CHK ____ DATE ____

Major St: Orion Street — Critical Approach Speed 25 mph
Minor St: Impala Drive — Critical Approach Speed 35 mph

Speed limit or critical speed on major street traffic > 40 mph..... ☐
or
In built up area of isolated community of < 10,000 population..... ☐ } RURAL (R)
☒ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume SATISFIED YES ☐ NO ☒
(Condition A or Condition B or combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume 100% SATISFIED YES ☐ NO ☒
80% SATISFIED YES ☐ NO ☒

APPROACH LANES	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS) 1 U	1 R	2 or More U	2 or More R	10:15 AM	11:15 AM	12:15 PM	1:15 PM	2:15 PM	3:15 PM	4:15 PM	5:15 PM
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	39	32	43	35	39	42	71	19
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	39	52	43	35	44	77	70	47

Hour

Condition B - Interruption of Continuous Traffic 100% SATISFIED YES ☐ NO ☒
80% SATISFIED YES ☐ NO ☒

APPROACH LANES	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS) 1 U	1 R	2 or More U	2 or More R	10:15 AM	11:15 AM	12:15 PM	1:15 PM	2:15 PM	3:15 PM	4:15 PM	5:15 PM
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	39	32	43	35	39	42	71	19
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	39	52	43	35	44	77	70	47

Hour

Combination of Conditions A & B SATISFIED YES ☐ NO ☒

REQUIREMENT	CONDITION	✓	FULFILLED
TWO CONDITIONS SATISFIED 80%	A. MINIMUM VEHICULAR VOLUME		Yes ☐ No ☒
	AND, B. INTERRUPTION OF CONTINUOUS TRAFFIC		
AND, AN ADEQUATE TRIAL OF OTHER ALTERNATIVES THAT COULD CAUSE LESS DELAY AND INCONVENIENCE TO TRAFFIC HAS FAILED TO SOLVE THE TRAFFIC PROBLEMS			Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☒**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	1:45 PM	2:45PM	3:45PM	4:45PM	Hour
Both Approaches - Major Street	X		44	32	77	28	
Higher Approach - Minor Street	X		44	69	61	71	

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐	No ☒
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐	No ☐

WARRANT 3 - Peak Hour
(Part A or Part B must be satisfied) **SATISFIED YES ☐ NO ☒**

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐	No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐	No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐	No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	Hour
Both Approaches - Major Street	X		109
Higher Approach - Minor Street	X		32

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐	No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 3 of 5)

WARRANT 4 - Pedestrian Volume
(Parts 1 and 2 Must Be Satisfied)

SATISFIED YES ☐ NO ☒

Part 1 (Parts A or B must be satisfied)

	Hours - - ->				
A.	Vehicles per hour for any 4 hours				
	Pedestrians per hour for any 4 hours				

Figure 4C-5 or Figure 4C-6
SATISFIED YES ☐ NO ☐

	Hours - - ->	7:00 AM	8:00 AM	4:00 PM	5:00 PM
B.	Vehicles per hour for any 1 hour	93	105	93	92
	Pedestrians per hour for any 1 hour	1	3	3	2

Figure 4C-7 or Figure 4C-8
SATISFIED YES ☐ NO ☒

Part 2 **SATISFIED YES ☐ NO ☐**

AND, The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐ No ☐
OR, The proposed traffic signal will not restrict progressive traffic flow along the major street.	Yes ☐ No ☐

WARRANT 5 - School Crossing
(Parts A and B Must Be Satisfied)

SATISFIED YES ☐ NO ☒

Part A
Gap/Minutes and # of Children

SATISFIED YES ☐ NO ☐

		Hour
Gaps vs Minutes	Minutes Children Using Crossing	
	Number of Adequate Gaps	
School Age Pedestrians Crossing Street / hr		

Gaps < Minutes YES ☐ NO ☐
AND Children > 20/hr YES ☐ NO ☐

AND, Consideration has been given to less restrictive remedial measures.	Yes ☐ No ☐

Part B **SATISFIED YES ☐ NO ☐**

The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐ No ☐
OR, The proposed signal will not restrict the progressive movement of traffic.	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 4 of 5)

WARRANT 6 - Coordinated Signal System **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	
≥ 1000 ft	N _____ ft, S 950 ft, E _____ ft, W _____ ft	Yes ☐ No ☒
On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.		Yes ☐ No ☒
OR, On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.		

WARRANT 7 - Crash Experience Warrant **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency.			Yes ☐ No ☐
REQUIREMENTS	Number of crashes reported within a 12 month period susceptible to correction by a traffic signal, and involving injury or damage exceeding the requirements for a reportable crash.		Yes ☐ No ☒
5 OR MORE			
REQUIREMENTS	CONDITIONS	✓	
ONE CONDITION SATISFIED 80%	Warrant 1, Condition A - Minimum Vehicular Volume		Yes ☐ No ☐
	OR, Warrant 1, Condition B - Interruption of Continuous Traffic		
	OR, Warrant 4, Pedestrian Volume Condition Ped Vol ≥ 80% of Figure 4C-5 through Figure 4C-8		

WARRANT 8 - Roadway Network **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM VOLUME REQUIREMENTS	ENTERING VOLUMES - ALL APPROACHES	✓	FULFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour 141 Veh/Hr and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3 during an average weekday.		Yes ☐ No ☒
	OR During Each of Any 5 Hrs. of a Sat. or Sun _____ Veh/Hr		

CHARACTERISTICS OF MAJOR ROUTES	MAJOR ROUTE A	MAJOR ROUTE B	
Hwy. System Serving as Principal Network for Through Traffic			
Rural or Suburban Highway Outside Of, Entering, or Traversing a City			
Appears as Major Route on an Official Plan			
Any Major Route Characteristics Met, Both Streets			Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 5 of 5)

WARRANT 9 - Intersection Near a Grade Crossing **SATISFIED YES ☐ NO ☒**
(Both Parts A and B Must Be Satisfied)

PART A A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach. Track Center Line to Limit Line _____ ft	Yes ☐ No ☒
PART B **There is one minor street approach lane at the track crossing -** During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-9. Major Street - Total of both approaches: _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = _____ VPH	Yes ☐ No ☒
OR, There are two or more minor street approach lanes at the track crossing - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-10. Major Street - Total of both approaches : _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calcualte AF) = _____ VPH	

The minor street approach volume may be multiplied by up to three following adjustment factors (AF) as described in Section 4C.10.

1- Number of Rail Traffic per Day_____ Adjustment factor from table 4C-2____

2- Percentage of High-Occupancy Buses on Minor Street Approach_____ Adjustment factor from table 4C-3____

3- Percentage of Tractor-Trailer Trucks on Minor Street Approach_____ Adjustment factor from table 4C-4____

NOTE: If no data is availale or known, then use AF = 1 (no adjustment)