Goodman Logistics Center Fullerton

TRAFFIC ANALYSIS
CITY OF FULLERTON

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SEPTEMBER 11, 2020 (REVISED)
JUNE 1, 2020

13156-11 TA Report

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LIST OF ABBREVIATED TERMS

[1]	Reference
AC	Asphalt Concrete
ADA	Americans with Disability Act
ADT	Average Daily Traffic
BL	Bike Lane
CA MUTCD	California Manual on Uniform Traffic Control Devices
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CMP	Congestion Management Program
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HDM	Highway Design Manual
ICU	Intersection Capacity Utilization
ITE	Institute of Transportation Engineers
LED	Light Emitting Diode
LOS	Level of Service
OCTA	Orange County Transportation Authority
OPR	Office of Planning and Research
PCE	Passenger Car Equivalents
PHF	Peak Hour Factor
Project	Goodman Logistics Center Fullerton
PUC	Public Utilities Commission
RTP	Regional Transportation Plan
SBCTA	San Bernardino County Transportation Authority
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategy
sf	Square Feet
SHS	State Highway System
TAPP	Transportation Assessment Policies and Procedures
TA	Traffic Analysis
tsf	Thousand Square Feet
TUMF	Transportation Uniform Mitigation Fee
V/C	Volume to Capacity
VMT	Vehicle Miles Traveled
WRCOG	Western Riverside Council of Governments

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1 INTRODUCTION

This report presents the results of the traffic analysis (TA) for the proposed Goodman Logistics Center Fullerton development ("Project"), which is located at the northeast corner of Acacia Avenue and Orangethorpe Avenue in the City of Fullerton as shown on Exhibit 1-1.

The purpose of this TA is to evaluate the potential deficiencies to traffic and circulation associated with the development of the proposed Project, and to recommend improvements in order to meet the City's applicable thresholds. The study follows the City of Fullerton's Transportation Assessment Policies and Procedures (TAPP) and the California Department of Transportation (Caltrans) Guide for the Preparation of Traffic Impact Studies (December 2002). [1] [2] The vehicle miles travelled (VMT) analysis, as required by changes to the California Environmental Quality Act (CEQA) adopted in December 2018 that require lead agencies to adopt VMT as a replacement for automobile delay-based level of service (LOS) as of July 1, 2020, has been provided as a separate report.

1.1 SUMMARY OF RECOMMENDATIONS

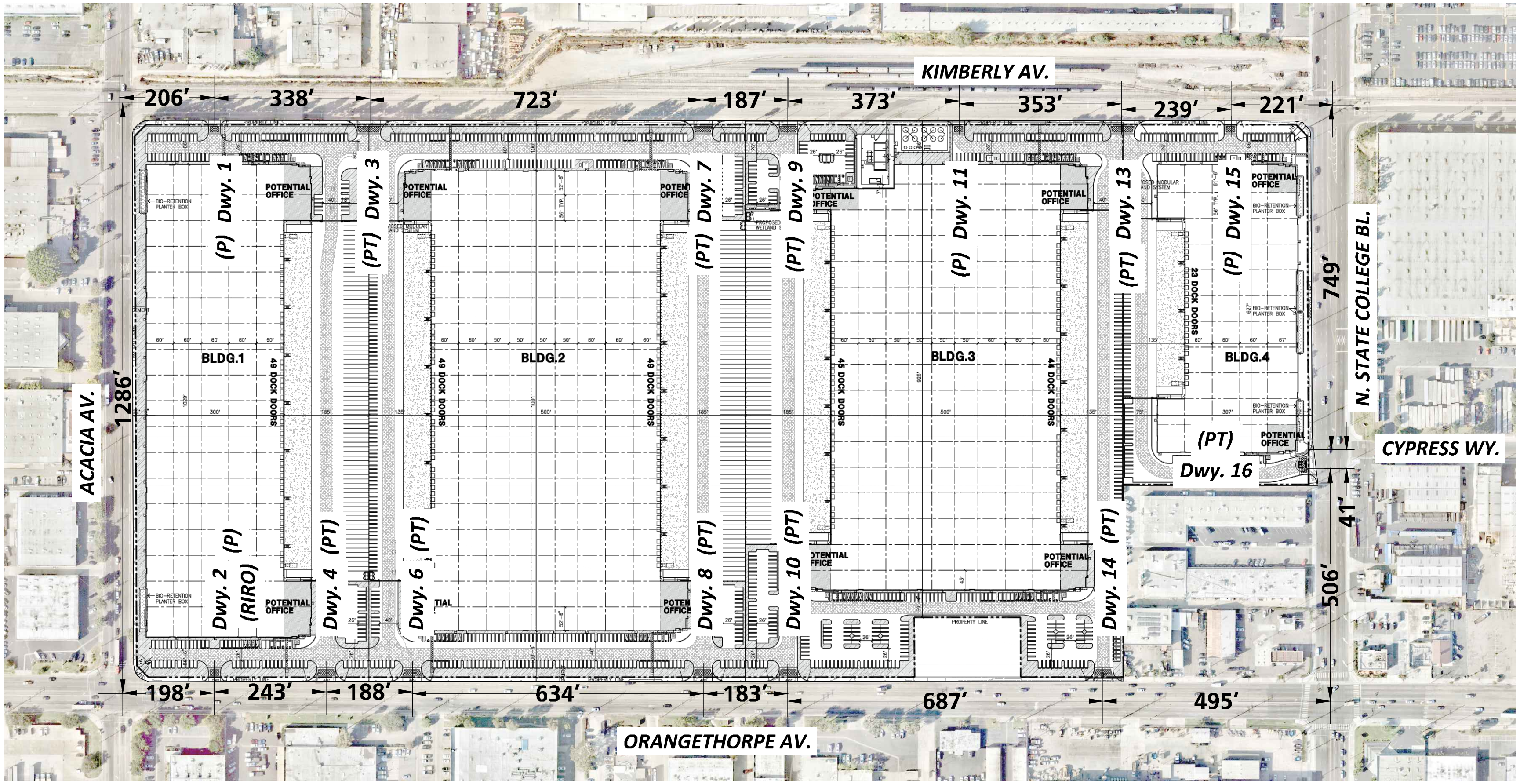
Following is a summary of recommended improvements to be implemented with the Project, based on the analysis presented in this TA. This includes recommendations for the Project site and intersections and roadways adjacent to the Project site. All recommendations below will be required conditions of approval for the Project.

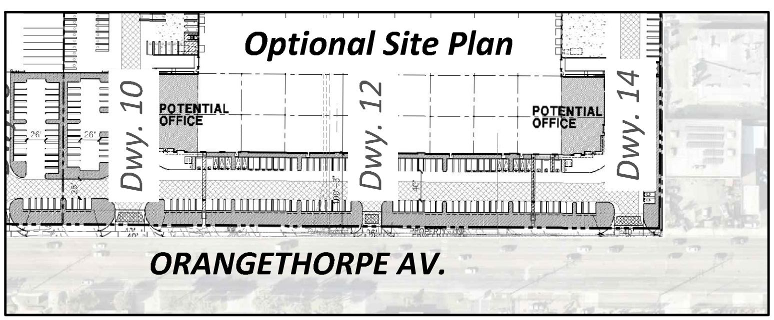
1.1.1 ON-SITE DRIVEWAY/ACCESS

The following on-site roadway improvements necessary to provide site access and on-site circulation are shown on Exhibit 6-1, and shall be constructed in conjunction with the Project and shall be completed prior to occupancy:

- Driveways 1, 3, 7, 9, 11, 13 and 15 & Kimberly Av.: Install a stop control for the northbound approach and construct a northbound shared left-right turn lane to facilitate site access. The existing painted median shall be utilized by left-turning vehicles on Kimberly Avenue to access the site.
- Driveway 2 & Orangethorpe Av.: Install a stop control for the southbound approach and construct a pork-chop island to prohibit left turns in conjunction with constructing a southbound right turn lane.
- Driveways 4, 8, 10, 12 (Optional Site Plan Only) and 14 & Orangethorpe Av.: Install a stop control for the southbound approach and construct a southbound shared left-right turn lane. The existing painted median shall be utilized by left-turning vehicles on Orangethorpe Avenue to access the site.
- Driveway 6 & Orangethorpe Av.: Install a stop control for the southbound approach and construct a southbound shared left-through-right turn lane. The existing painted median shall be utilized by left-turning vehicles on Orangethorpe Avenue to access the site.
- Driveway 16 & N. State College Bl: Install a stop control for the eastbound approach and one eastbound shared left-through-right turn lane.

Exhibit 1-1: Preliminary Site Plan





LEGEND:

RIRO = RIGHT-IN/RIGHT-OUT ONLY ACCESS
P = PASSENGER CARS ONLY
PT = PASSENGER CARS AND TRUCKS

NOTE: UNLESS NOTED, ALL DRIVEWAYS ARE ASSUMED TO BE FULL ACCESS.

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Additionally, to ensure adequate sight distance at the Project driveways:

- The Project shall maintain adequate sight distance by limiting objects and landscaping within the limited used areas identified in Section 6.6 on Exhibit 6-3.

1.1.2 Recommended Improvements at Intersections and Roadways Adjacent to the Project Site

Acacia Avenue and Kimberly Avenue Intersection (#5)

The intersection of Acacia Avenue and Kimberly Avenue is anticipated to operate at an acceptable LOS during the peak hours for both without and with the Project under Opening Year Cumulative traffic conditions. However, based on a multi-way stop warrant conducted for this intersection, all criteria identified in the California Manual on Uniform Traffic Control Devices (CA MUTCD) have been met under existing conditions, meaning left-turn phasing should be considered. Due to the addition of Project trucks, the following improvements are recommended:

- The Project shall install stop control on the northbound and southbound approaches at the intersection of Acacia Avenue and Kimberly Avenue to implement an all-way stop control intersection (refer to Exhibit 6-2, page 6 of 7). Flashing red beacons shall be installed in conjunction with signage for the new all-way stop controlled intersection. Advance warning signs for the new all-way stop control shall also be posted in the northbound and southbound directions.

Additionally, the following improvements are recommended to accommodate truck turning movements at this intersection:

- At the intersection of Acacia Avenue and Kimberly Avenue, all lanes in the northbound direction shall be setback 15-feet from the stop bar.
- The southeast corner shall be modified to accommodate a 45-foot curb radius. This improvement will be confirmed by the City during final design taking into consideration feasibility based on existing conditions and constraints.

Acacia Avenue and Orangethorpe Avenue Intersection (#6)

The intersection of Acacia Avenue and Kimberly Avenue is anticipated to operate at an acceptable LOS during the peak hours for both without and with the Project under Opening Year Cumulative traffic conditions. However, there is an existing need to protect the left-turn movements at this intersection on all approaches. Therefore, the following intersection improvement has been recommended in order to facilitate Project truck access to and from the site.

- The Project shall implement protected left-turn movements at the intersection of Acacia Avenue and Orangethorpe Avenue on all approaches, including installation/modifications required to physically install the appropriate signal head equipment and modification to the signal operations/timing.

N. State College Boulevard and Kimberly Avenue Intersection (#24)

The addition of Project traffic is anticipated to result in a deficiency at the intersection of N. State College Boulevard and Kimberly Avenue under the Opening Year Cumulative (2022) Traffic Conditions. The following improvements would address this deficiency:

- Per the City's TAPP, the Project must be conditioned to contribute its fair share cost for the installation of a traffic signal at this intersection, or construct the improvement if warranted and appropriate, in consultation with the City Traffic Engineer. The traffic signal shall:
  - Accommodate a protected left turn arrow for the northbound approach
  - Accommodate pedestrian facilities
  - Be designed in coordination with the Public Utilities Commission (PUC)
  - Be integrated with the train control system (the PUC will likely require safety upgrades at the crossing across N. State College Boulevard immediately north of Kimberly Avenue).

Additionally, the following improvements are recommended to accommodate truck turning movements at this intersection (refer to Exhibit 6-2, page 7 of 7):

- The Project shall restripe the northbound left turn lane with a 3-foot striped area on the west side of the turn lane in order to accommodate the turning radius of heavy trucks.
- The Project shall restripe the eastbound approach with a shared left-through-right turn lane and either accommodate a wider westbound through lane on the west leg or restripe with a painted median in order to accommodate southbound right turning trucks.

N. State College Boulevard and Driveway 16/Cypress Way (#25)

Based on the Project driveway queueing analysis results, the following improvement is recommended to provide additional storage for northbound N. State College Boulevard:

- The Project shall construct a northbound left-turn lane with a minimum of 50-feet of storage within the existing painted median.

1.2 PROJECT OVERVIEW

The proposed Project involves the demolition of all existing structures on the Project site, and the redevelopment of the Project site with four buildings totaling 1,561,522 square feet (sf). This includes 1,456,522 sf of high-cube warehouse space – expected to be used for fulfillment center and cold storage uses – and approximately 105,000 sf of office space (ground floor and mezzanine) (refer to the conceptual site plan provided on Exhibit 1-1). Note that due to a conflict with an existing utility pole on Kimberly Avenue, Driveway 3, and Driveway 5 (as noted on a previous site plan) were combined as a shared driveway (reflected as Driveway 3 on Exhibit 1-1). The Project Applicant may pursue the acquisition of an off-site property located north of E. Orangethorpe Avenue that abuts the southern boundary of the Project site (2301 E. Orangethorpe Avenue). In the event this property is acquired, the two existing buildings on that property would also be demolished and a maximum of approximately 1,609,384 sf of high-cube warehouse space would be provided on the Project site. The larger Project (Optional Site Plan) is the basis for analysis in this report and assumes 804,692 sf of high-cube fulfillment center use and 804,692 sf of high-cube cold storage warehouse use (see inset on Exhibit 1-1). The Project is anticipated to be operational by the year 2022.

As shown on Exhibit 1-1, which presents both the proposed and Optional Site Plan, vehicular access will be provided via the following driveways:

- Driveway 1 & Kimberly Av.: Passenger cars only
- Driveway 2 & Orangethorpe Av.: Passenger cars only

- Driveway 3 & Kimberly Av.: Passenger cars and trucks
- Driveway 4 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 6 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 7 & Kimberly Av.: Passenger cars and trucks
- Driveway 8 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 9 & Kimberly Av.: Passenger cars and trucks
- Driveway 10 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 11 & Kimberly Av.: Passenger cars only
- Driveway 12 & Orangethorpe Av.: Passenger cars only (Optional Site Plan only)
- Driveway 13 & Kimberly Av.: Passenger cars and trucks
- Driveway 14 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 15 & Kimberly Av.: Passenger cars only
- N. State College Bl. & Driveway 16: Passenger cars and trucks

All Project driveways are proposed to allow for full access with the exception of Driveway 2 on Orangethorpe Avenue, which will be restricted to right-in/right-out access only. The Optional Site Plan is consistent with the proposed Project site plan with the exception of an additional driveway on Orangethorpe Avenue (Driveway 12) which is proposed to serve passenger cars only.

The anticipated improvements within the public right-of-way to accommodate vehicular and non-vehicular circulation based on the preliminary conditions of approval established by the City for the Project are summarized below. These improvements will be confirmed by the City during final design taking into consideration feasibility based on existing conditions and constraints, and following completion of construction:

- Rehabilitate asphalt concrete (AC) pavement over the entire width of Kimberly Avenue and E. Orangethorpe Avenue.
- Removal of existing driveways that are no longer needed, and installation of a full height curb and gutter and sidewalk within the driveway removal limits.
- Acacia Avenue and State College Boulevard adjacent to the Project site were improved in 2017 and 2018, respectively, including repaving, and any improvements along these roadways would be subject to the City's paving requirements in moratorium streets. Further, any damage caused
- during construction would be repaired in compliance with City standards.
- Installation of full-width sidewalks per City standards along the Project site frontage where sidewalks do not currently exist.
- Removal and replacement of existing damaged/uplifted concrete sidewalk and curb and gutter along the Project site frontage, and repair of sidewalks damaged during construction. Replacement sidewalks would adhere to City standards.
- If existing curb ramps do not meet current ADA standards, improve curb and sidewalk returns along the Project site frontage, based on existing conditions, and as feasible. This includes but is not limited to re-grading, installation of landscaping/irrigation, reconstruction of concrete sidewalk, relocation of pull boxes, and the access ramp in accordance with the current City standards and ADA requirements.,.
- Construct a new concrete bus pad at the bus stop(s) on the north side of E. Orangethorpe Avenue per Orange County Transportation Authority (OCTA) standards. The conceptual site plan identifies a bus pad south of Building 2, but the final location of the bus stop would be determined in coordination with the City and OCTA.

As discussed in Section 3.4, in the vicinity of the Project site there are Class II (on-street, striped) bicycle lanes currently along Acacia Avenue and E. Orangethorpe Avenue. In compliance with Section 15.40.070 of the City's Municipal Code, which identifies required transportation demand strategies to reduce single occupancy vehicles, interior bicycle storage will be provided at Buildings 1 through 4 to encourage bicycle travel to the Project site. Additionally, exterior bicycle racks will be provided at each building.

Trips generated by the Project (Optional Site Plan) have been calculated based on trip generation rates collected by the Institute of Transportation Engineers (ITE) as presented in ITE's most current edition of Trip Generation Manual (10th Edition, 2017) for the proposed high-cube cold storage warehouse use (ITE Land Use Code 157) and the High Cube Warehouse Trip Generation Study (WSP, January 2019) for the proposed high-cube fulfillment center warehouse use. [3] [4] The Project is calculated to generate a total of approximately 3,422 trip-ends per day with 187 AM peak hour trips and 228 PM peak hour trips. With the credit for the trips generated by the existing Kimberly-Clark facility, the Project is calculated to generate a net total of approximately 2,692 trip-ends per day with 185 AM peak hour trips and 226 PM peak hour trips. The assumptions and methods used to estimate the Project's trip generation characteristics are discussed in detail in Section 4.1 *Project Trip Generation* of this report.

1.3 ANALYSIS SCENARIOS

For the purposes of this traffic study, potential deficiencies to traffic and circulation have been assessed for each of the following scenarios:

- Existing (2020)
- Opening Year Cumulative (2022) Without and With Project

The proposed Project's land use and zoning are consistent with The Fullerton Plan (the City's General Plan document), as such, long-range traffic conditions has not been evaluated.

1.3.1 EXISTING (2020) CONDITIONS

Information for Existing conditions is disclosed to represent the baseline traffic conditions as they existed at the time this report was prepared. Traffic counts were conducted in March 2020 based on vehicle classification prior to major closures associated with the currently ongoing COVID-19 pandemic. However, based on a review of historic traffic counts to the March 2020 traffic counts, it appears traffic volumes from March 2020 could be understated in the AM peak hour. Pursuant to discussions with City staff, the March 2020 AM peak hour volumes have been increased by 5% to conservatively account for potentially understated AM peak hour trips. Review of the March 2020 PM peak hour volumes indicated no adjustments were necessary in comparison to historic traffic counts. Consistent with other traffic studies in the City of Fullerton, passenger car equivalent (PCE) volumes have been utilized for the peak hour operations analysis, however, actual vehicles are reported on the exhibits. Applicable PCE traffic volumes are included in the technical appendices.

1.3.2 OPENING YEAR CUMULATIVE (2022) CONDITIONS

The Opening Year Cumulative conditions analysis determines the Project's contribution to near-term traffic deficiencies based on a comparison of the "With Project" traffic scenario to the "Without Project" traffic scenario. To account for background traffic growth, traffic associated with other known cumulative development projects in conjunction with an ambient growth from Existing (2020) conditions of 2.01% (1.0% per year, compounded over two years) is included for Opening Year Cumulative, as well as traffic generated by cumulative projects that could affect the study intersections. Cumulative development projects were obtained from the City of Fullerton and other surrounding agencies. Traffic associated with cumulative development projects were manually routed through applicable study area intersections.

1.4 STUDY AREA

The study area was defined in conformance with the requirements of the City of Fullerton traffic study guidelines. Additional locations were then included as directed by City staff. A traffic study scoping agreement summarizing the study area, trip generation, trip distribution and analysis methodology was provided to the City of Fullerton for review. The agreement approved by the City of Fullerton is included in Appendix 1.1.

1.4.1 STUDY AREA INTERSECTIONS

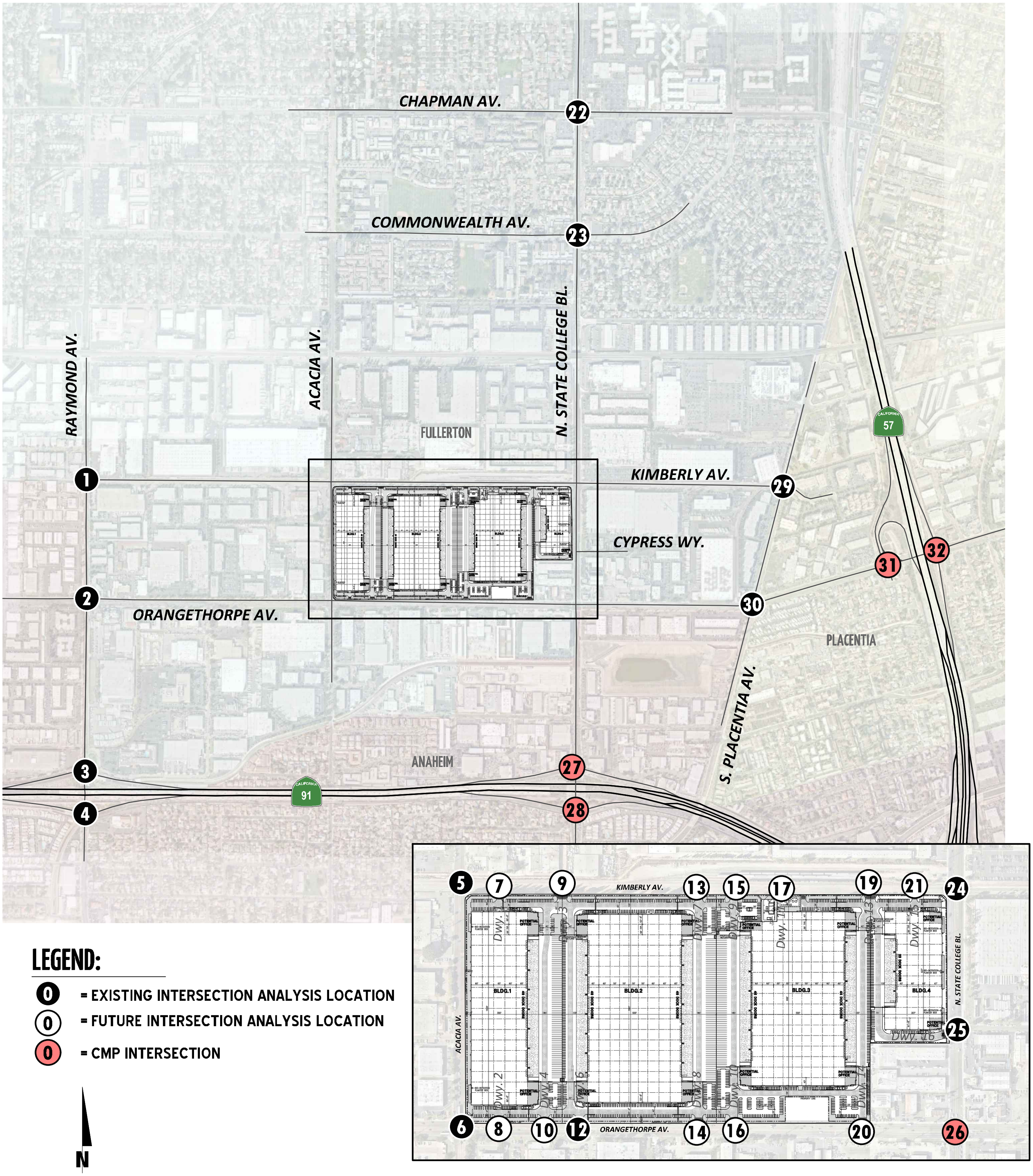
32 study area intersection locations shown on Exhibit 1-2 and listed in Table 1-1 were selected for this TA based on an approved scoping agreement with the City of Fullerton and the 50 peak hour trip criteria utilized by other agencies such as the City of Anaheim, City of Placentia, and Caltrans*.* Congestion Management Program (CMP) intersections have also been identified in Table 1-1.

TABLE 1-1: INTERSECTION ANALYSIS LOCATIONS

ID	Intersection Location	Jurisdiction	CMP Intersection?
1	Raymond Av. & Kimberly Av.*	Fullerton, Anaheim	No
2	Raymond Av. & Orangethorpe Av.	Fullerton, Anaheim	No
3	Raymond Av. & SR-91 WB Ramps *	Caltrans, Fullerton, Anaheim	No
4	Raymond Av. & SR-91 EB Ramps *	Caltrans, Anaheim	No
5	Acacia Av. & Kimberly Av. *	Fullerton	No
6	Acacia Av. & Orangethorpe Av. *	Fullerton	No
7	Driveway 1 & Kimberly Av. – Future intersection *	Fullerton	No
8	Driveway 2 & Orangethorpe Av. – Future intersection *	Fullerton	No
9	Driveway 3 & Kimberly Av. – Future intersection *	Fullerton	No
10	Driveway 4 & Orangethorpe Av. – Future intersection *	Fullerton	No
12	Driveway 6 & Orangethorpe Av.	Fullerton	No
13	Driveway 7 & Kimberly Av. – Future intersection	Fullerton	No
14	Driveway 8 & Orangethorpe Av. – Future intersection	Fullerton	No
15	Driveway 9 & Kimberly Av. – Future intersection	Fullerton	No
16	Driveway 10 & Orangethorpe Av. – Future intersection	Fullerton	No
17	Driveway 11 & Kimberly Av. – Future intersection	Fullerton	No
18	Driveway 12 & Orangethorpe Av. (Optional Site Plan Only) – Future intersection	Fullerton	No
19	Driveway 13 & Kimberly Av. – Future intersection	Fullerton	No
20	Driveway 14 & Orangethorpe Av. – Future intersection	Fullerton	No
21	Driveway 15 & Kimberly Av. – Future intersection	Fullerton	No
22	N. State College Bl. & Chapman Av. *	Fullerton	No
23	N. State College Bl. & Commonwealth Av. *	Fullerton	No
24	N. State College Bl. & Kimberly Av.	Fullerton	No
25	N. State College Bl. & Dwy. 16/Cypress Wy.	Fullerton	No
26	N. State College Bl. & Orangethorpe Av.	Fullerton, Anaheim	Yes
27	N. State College Bl. & SR-91 Westbound Ramps	Caltrans, Anaheim	Yes
28	N. State College Bl. & SR-91 Eastbound Ramps	Caltrans, Anaheim	Yes
29	S. Placentia Av. & Kimberly Av. *	Fullerton, Placentia	No
30	S. Placentia Av. & Orangethorpe Av.	Fullerton, Placentia, Anaheim	No
31	SR-57 Southbound Ramps/Iowa Pl. & Orangethorpe Av.	Caltrans, Placentia	Yes
32	SR-57 Northbound Ramps & Orangethorpe Av. *	Caltrans, Placentia	Yes

* Note: Project contributes less than 50 peak hour trips in both the AM and PM peak hours. As such, additional analysis locations beyond these intersections have not been included for analysis within the City of Anaheim, City of Placentia, and other Caltrans facilities.
Also note that the intersection of Driveway 5 and Kimberly Avenue has been removed as it has now combined with Driveway 3 (previous Intersection #11).

EXHIBIT 1-2: LOCATION MAP



1.4.2 FREEWAY FACILITY ANALYSIS LOCATIONS

The following freeway facility mainline segments and merge/diverge ramp junctions were selected for evaluation as part of this analysis (see Table 1-2).

TABLE 1-2: FREEWAY FACILITY ANALYSIS LOCATIONS

ID	Freeway Facility
1	SR-91 Freeway Westbound, West of N. State College Bl. (Basic Freeway Segment)
2	SR-91 Freeway Westbound, On-Ramp at N. State College Bl. (Merge Ramp Junction)
3	SR-91 Freeway Westbound, Off-Ramp at N. State College Bl. (Diverge Ramp Junction)
4	SR-91 Freeway Westbound, East of N. State College Bl. (Basic Freeway Segment)
5	SR-91 Freeway Eastbound, West of N. State College Bl. (Basic Freeway Segment)
6	SR-91 Freeway Eastbound, Off-Ramp at N. State College Bl. (Diverge Ramp Junction)
7	SR-91 Freeway Eastbound, On-Ramp at N. State College Bl. (Merge Ramp Junction)
8	SR-91 Freeway Eastbound, East of N. State College Bl. (Basic Freeway Segment)
9	SR-57 Freeway Southbound, North of Orangethorpe Av. (Basic Freeway Segment)
10	SR-57 Freeway Southbound, Off-Ramp at Orangethorpe Av. (Diverge Ramp Junction)
11	SR-57 Freeway Southbound, Loop On-Ramp at Orangethorpe Av. (Merge Ramp Junction)
12	SR-57 Freeway Southbound, South of Orangethorpe Av. (Basic Freeway Segment)
13	SR-57 Freeway Northbound, North of Orangethorpe Av. (Basic Freeway Segment)
14	SR-57 Freeway Northbound, Loop On-Ramp at Orangethorpe Av. (Merge Ramp Junction)
15	SR-57 Freeway Northbound, Off-Ramp at Orangethorpe Av. (Diverge Ramp Junction)
16	SR-57 Freeway Northbound, South of Orangethorpe Av. (Basic Freeway Segment)

1.5 SENATE BILL 743 – VEHICLE MILES TRAVELED (VMT)

Senate Bill 743 (SB 743), approved in 2013, changes the way transportation impacts are evaluated in CEQA documents. The Office of Planning and Research (OPR) recommended the use of vehicle miles traveled (VMT) as the replacement for automobile delay-based LOS. In December 2018, the Natural Resources Agency finalized updates to CEQA Guidelines to incorporate SB 743 (i.e., VMT).

Per the City's TAPP, "the City has selected the Origin/Destination VMT methodology to provide a more complete capture of all travel (car and truck trips) within the study area, including trips that may begin or end outside of the study area. VMT per service population is utilized to normalize VMT into a standard unit for comparison purposes while accounting for the population and/or employment in a given area. To determine whether or not there is a potentially significant impact, the analysis shall compare the project generated VMT to the VMT that is forecast to be generated from approved general plan growth and other transportation network modifications. The City has chosen General Plan Buildout as the basis for this threshold because the General Plan was adopted through a public process to reflect the goals and values of the City. The Fullerton Plan, adopted in 2012, implementation of the Fullerton Plan reduces the citywide VMT per service population from 29.9 to 29.41. Therefore, when a project generates a VMT per service population that exceeds the General Plan Buildout VMT in either the baseline or Horizon Year, a significant impact occurs."

The revised Caltrans traffic impact analysis guidelines are set to be available in September 2020, however, Caltrans acknowledges automobile delay will no longer be considered a CEQA impact for development projects and VMT will be the metric for determining impacts on the State Highway System (SHS).

The required VMT analysis to support the CEQA document for the Project has been prepared under separate cover. As such, the LOS operations analysis included in this TA for study area intersections is informational to be used to demonstrate General Plan consistency and will not be the basis for determining traffic impacts pursuant to CEQA.

1.6 LOS Analysis Findings

This section provides a summary of the analysis results for Existing and Opening Year Cumulative traffic conditions. For signalized intersections, analysis results are provided using both the Highway Capacity Methodology (HCM) and the Intersection Capacity Utilization (ICU), with the exception of Caltrans intersections which have been evaluated per the HCM methodology only per Caltrans guidelines.

Existing (2020) Conditions

A summary of level of service (LOS) results for Existing traffic conditions are presented in Exhibit 1-3. As shown, all of the study area intersections are currently operating at an acceptable LOS. There are also currently no peak hour queuing issues at the Raymond Avenue/SR-91 Freeway, N. State College Boulevard/SR-91 Freeway, and SR-57 Freeway/Orangethorpe Avenue off-ramps. The following freeway facilities currently operate at an unacceptable LOS under Existing (2020) traffic conditions:

- SR-91 Eastbound, West of State College Bl. (#5) – LOS E AM and PM peak hours
- SR-91 Eastbound Off-Ramp at N. State College Bl. (#6) – LOS E AM and PM peak hours
- SR-57 Southbound, North of Orangethorpe Av. (#9) – LOS E AM and PM peak hours
- SR-57 Southbound Off-Ramp at Orangethorpe Av. (#10) – LOS E AM and PM peak hours
- SR-57 Northbound Off-Ramp at Orangethorpe Av. (#15) – LOS E AM and PM peak hours

[1] Source: Fehr & Peers

EXHIBIT 1-3: SUMMARY OF DEFICIENT INTERSECTIONS BY ANALYSIS SCENARIO

#	Intersection	Existing (2020)	Opening Year Cumulative(2022) Without Project	Opening Year Cumulative(2022) With Project
1	Raymond Av. & Kimberly Av.	LOS A-D	LOS A-D	LOS A-D
2	Raymond Av. & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D
3	Raymond Av. & SR-91 WB Ramps	LOS A-D	LOS A-D	LOS A-D
4	Raymond Av. & SR-91 EB Ramps	LOS A-D	LOS A-D	LOS A-D
5	Acacia Av. & Kimberly Av.	LOS A-D	LOS A-D	LOS A-D
6	Acacia Av. & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D
7	Driveway 1 & Kimberly Av.	NA	NA	LOS A-D
8	Driveway 2 & Orangethorpe Av.	NA	NA	LOS A-D
9	Driveway 3 & Kimberly Av.	NA	NA	LOS A-D
10	Driveway 4 & Orangethorpe Av.	NA	NA	LOS A-D
12	Driveway 6 & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D
13	Driveway 7 & Kimberly Av.	NA	NA	LOS A-D
14	Driveway 8 & Orangethorpe Av.	NA	NA	LOS A-D
15	Driveway 9 & Kimberly Av.	NA	NA	LOS A-D
16	Driveway 10 & Orangethorpe Av.	NA	NA	LOS A-D
17	Driveway 11 & Kimberly Av.	NA	NA	LOS A-D
18	Driveway 12 & Orangethorpe Av.	NA	NA	LOS A-D
19	Driveway 13 & Kimberly Av.	NA	NA	LOS A-D
20	Driveway 14 & Orangethorpe Av.	NA	NA	LOS A-D
21	Driveway 15 & Kimberly Av.	NA	NA	LOS A-D
22	N. State College Bl. & Chapman Av.	LOS A-D	LOS A-D	LOS A-D
23	N. State College Bl. & Commonwealth Av.	LOS A-D	LOS A-D	LOS A-D
24	N. State College Bl. & Kimberly Av.	LOS A-D	LOS A-D	AM: LOS F / PM: LOS E
25	N. State College Bl. & Dwy. 16/Cypress Wy.	LOS A-D	LOS A-D	LOS A-D
26	N. State College Bl. & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D
	ICU Result for this Intersection	LOS A-D	LOS A-D	LOS A-D
27	N. State College Bl. & SR-91 WB Ramps	LOS A-D	LOS A-D	LOS A-D
28	N. State College Bl. & SR-91 EB Ramps	LOS A-D	LOS A-D	LOS A-D
29	S. Placentia Av. & Kimberly Av.	LOS A-D	LOS A-D	LOS A-D
	ICU Result for this Intersection	LOS A-D	LOS A-D	LOS A-D
30	S. Placentia Av. & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D
	ICU Result for this Intersection	LOS A-D	LOS A-D	LOS A-D
31	SR-57 SB Ramps/Iowa Pl. & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D
32	SR-57 NB Ramps & Orangethorpe Av.	LOS A-D	LOS A-D	LOS A-D

LEGEND:

- = AM PEAK HOUR
- = PM PEAK HOUR
- = LOS A-D
- = LOS E
- = LOS F
- NA = NOT AN ANALYSIS LOCATION FOR THIS SCENARIO

Note: Unless noted Summary of LOS is of HCM analysis results.

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Opening Year Cumulative (2022) Conditions

As shown on Exhibit 1-3, the study area intersections are anticipated to continue to operate at an acceptable LOS for Opening Year Cumulative (2022) Without Project traffic conditions except for the following intersection, which is anticipated to operate at an unacceptable LOS with the addition of Project traffic:

- N. State College Bl. & Kimberly Av. (#24) – LOS F AM peak hour; LOS E PM peak hour

There are no peak hour queuing issues anticipated at the Raymond Avenue/SR-91 Freeway, N. State College Boulevard/SR-91 Freeway, and SR-57 Freeway/Orangethorpe Avenue off-ramps Without and With Project traffic. However, the following freeway facilities are anticipated to operate at an unacceptable LOS under Opening Year Cumulative (2022) Without and With Project traffic conditions:

- SR-91 Eastbound, West of State College Bl. (#5) – LOS E AM and PM peak hours
- SR-91 Eastbound Off-Ramp at N. State College Bl. (#6) – LOS E AM and PM peak hours
- SR-57 Southbound, North of Orangethorpe Av. (#9) – LOS E AM and PM peak hours
- SR-57 Southbound Off-Ramp at Orangethorpe Av. (#10) – LOS E AM and PM peak hours
- SR-57 Northbound Off-Ramp at Orangethorpe Av. (#15) – LOS E AM and PM peak hours
- SR-57 Northbound, South of Orangethorpe Av. (#16) – LOS E PM peak hour only

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2 METHODOLOGIES

This section of the report presents the methodologies used to perform the traffic analyses summarized in this report. The methodologies described are consistent with the City of Fullerton traffic study requirements. [1]

2.1 LEVEL OF SERVICE

Traffic operations of roadway facilities are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic flow based on several factors such as speed, travel time, delay, and freedom to maneuver. Six levels are typically defined ranging from LOS A, representing completely free-flow conditions, to LOS F, representing breakdown in flow resulting in stop-and-go conditions. LOS E represents operations at or near capacity, an unstable level where vehicles are operating with the minimum spacing for maintaining uniform flow.

2.2 INTERSECTION CAPACITY ANALYSIS

The definitions of LOS for interrupted traffic flow (flow restrained by the existence of traffic signals and other traffic control devices) differ slightly depending on the type of traffic control. The LOS is typically dependent on the quality of traffic flow at the intersections along a roadway. LOS analysis was conducted to determine existing traffic conditions using the Intersection Capacity Utilization (ICU) methodology for signalized study intersections. [5] The Highway Capacity Manual (HCM) (6th Edition) methodology was used to determine LOS's for unsignalized intersections. The HCM (6th Edition) methodology expresses the LOS at an intersection in terms of average control delay time for the various intersection approaches. [6] The HCM uses different procedures depending on the type of intersection control.

2.2.1 SIGNALIZED INTERSECTIONS

Signalized CMP intersections are to be evaluated using the ICU methodology which compares the peak hour traffic volumes to intersection capacity. [7] Lane capacities of 1,700 vehicles per hour of green time have been assumed for the ICU calculations, with 0.05 lost time factor and inherent vehicle delay between cycles with an assumed signal cycle of 100 seconds. The ICU LOS definitions based on V/C ratio are presented in Table 2-1. The Traffix software package has been utilized to evaluate the signalized intersections using the ICU methodology with the analysis parameters discussed above.

The City of Fullerton, City of Placentia and Caltrans require signalized intersection operations analysis based on the methodology described in the HCM (6th Edition). Intersection LOS operations are based on an intersection's average control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. For signalized intersections LOS is directly related to the average control delay per vehicle and is correlated to a LOS designation as described in Table 2-2. Study area intersections have been evaluated using the Synchro (Version 10) analysis software package.

TABLE 2-1 INTERSECTION CAPACITY UTILIZATION (ICU) LOS DEFINITIONS

Level of Service	Critical Volume to Capacity Ratio
A	0.00 - 0.60
B	0.61 - 0.70
C	0.71 - 0.80
D	0.81 - 0.90
E	0.91 - 1.00
F	>1.00

Source: Orange County CMP

TABLE 2-2: SIGNALIZED INTERSECTION LOS THRESHOLDS

Description	Average Control Delay (Seconds), V/C ≤ 1.0	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Operations with very low delay occurring with favorable progression and/or short cycle length.	0 to 10.00	A	F
Operations with low delay occurring with good progression and/or short cycle lengths.	10.01 to 20.00	B	F
Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.01 to 35.00	C	F
Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.01 to 55.00	D	F
Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55.01 to 80.00	E	F
Operation with delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	80.01 and up	F	F

Source: HCM, 6th Edition

The peak hour traffic volumes have been adjusted using a peak hour factor (PHF) to reflect peak 15-minute volumes. Common practice for LOS analysis is to use a peak 15-mintue rate of flow. However, flow rates are typically expressed in vehicles per hour. The PHF is the relationship between the peak 15-minute flow rate and the full hourly volume (e.g. PHF = [Hourly Volume] / [4 x Peak 15-minute Flow Rate]). The use of a 15-minute PHF produces a more detailed analysis as compared to analyzing vehicles per hour. Existing PHFs have been used for all analysis scenarios for HCM intersections. ICU intersections have assumed a PHF of 1.00 per the ICU methodology. Per the HCM, PHF values over 0.95 often are indicative of high traffic volumes with capacity constraints on peak hour flows while lower PHF values are indicative of greater variability of flow during the peak hour. [6] As such, new intersections have been conservatively evaluated with a PHF of 0.92.

2.2.2 UNSIGNALIZED INTERSECTIONS

The City of Fullerton requires the operations of unsignalized intersections be evaluated using the methodology described in the HCM (6th Edition). [6] The LOS rating is based on the weighted average control delay expressed in seconds per vehicle (see Table 2-3).

TABLE 2-3: UNSIGNALIZED INTERSECTION HCM LOS THRESHOLDS

Description	Average Control Delay Per Vehicle (Seconds)	Level of Service, V/C ≤ 1.0	Level of Service, V/C > 1.0
Little or no delays.	0 to 10.00	A	F
Short traffic delays.	10.01 to 15.00	B	F
Average traffic delays.	15.01 to 25.00	C	F
Long traffic delays.	25.01 to 35.00	D	F
Very long traffic delays.	35.01 to 50.00	E	F
Extreme traffic delays with intersection capacity exceeded.	> 50.00	F	F

Source: HCM (6th Edition)

At two-way or side-street stop-controlled intersections, the LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole, but rather the delay/associated LOS is reported for the minor street turning movement with the highest delay. For all-way stop controlled intersections, LOS is based solely on control delay for assessment of LOS at the approach and intersection levels.

The traffic modeling software package Synchro (Version 10) has been utilized to analyze unsignalized intersections within the study area. Synchro is a macroscopic traffic software program that is based on the unsignalized intersection capacity analysis as specified in the HCM (6th Edition). [6] Macroscopic level models represent traffic in terms of aggregate measures for each movement at the study intersections. Equations are used to determine measures of effectiveness such as delay and queue length.

2.3 TRAFFIC SIGNAL WARRANT ANALYSIS METHODOLOGY

The term "signal warrants" refers to the list of established criteria used by Caltrans and other public agencies to quantitatively justify or ascertain the potential need for installation of a traffic signal at an otherwise unsignalized intersection. This TA uses the signal warrant criteria presented in the Caltrans 2014 California Manual on Uniform Traffic Control Devices (CA MUTCD) for all study area intersections. [8]

The signal warrant criteria for Existing conditions are based upon several factors, including volume of vehicular and pedestrian traffic, frequency of accidents, and location of school areas. The 2014 CAMUTCD indicates that the installation of a traffic signal should be considered if one or more of the signal warrants are met. [8] Specifically, this TA utilizes the Peak Hour Volume-based Warrant 3 as the appropriate representative traffic signal warrant analysis for Existing traffic conditions. Warrant 3 is appropriate to use for this TA because it provides specialized warrant criteria for intersections with rural characteristics (e.g. located in communities with populations of less than 10,000 persons or with adjacent major streets operating above 40 miles per hour). For the purposes of this study, the speed limit was the basis for determining whether Urban or Rural warrants were used for a given intersection.

Future intersections that do not currently exist have been assessed regarding the potential need for new traffic signals based on future average daily traffic (ADT) volumes, using the Caltrans planning level ADT-based signal warrant analysis worksheets.

Traffic signal warrant analyses were performed for the following unsignalized study area intersections (see Table 2-4):

TABLE 2-4: TRAFFIC SIGNAL WARRANT ANALYSIS LOCATIONS

ID	Intersection Location
1	Raymond Av. & Kimberly Av.
5	Acacia Av. & Kimberly Av.
7	Driveway 1 & Kimberly Av. – Future intersection
9	Driveway 3 & Kimberly Av. – Future intersection
10	Driveway 4 & Orangethorpe Av. – Future intersection
12	Driveway 6 & Orangethorpe Av.
13	Driveway 7 & Kimberly Av. – Future intersection
14	Driveway 8 & Orangethorpe Av. – Future intersection
15	Driveway 9 & Kimberly Av. – Future intersection
16	Driveway 10 & Orangethorpe Av. – Future intersection
17	Driveway 11 & Kimberly Av. – Future intersection
18	Driveway 12 & Orangethorpe Av. – Future intersection (Optional Site Plan only)
19	Driveway 13 & Kimberly Av. – Future intersection
20	Driveway 14 & Orangethorpe Av. – Future intersection
21	Driveway 15 & Kimberly Av. – Future intersection
24	N. State College Bl. & Kimberly Av.
25	N. State College Bl. & Dwy. 16/Cypress Wy.

It is important to note that a signal warrant defines the minimum condition under which the installation of a traffic signal might be warranted. Meeting this threshold condition does not require that a traffic control signal be installed at a particular location, but rather, that other traffic factors and conditions be evaluated in order to determine whether the signal is truly justified. It should also be noted that signal warrants do not necessarily correlate with LOS. An intersection may satisfy a signal warrant condition and operate at or above acceptable LOS or operate below acceptable LOS and not meet a signal warrant.

2.4 FREEWAY OFF-RAMP QUEUING ANALYSIS

Consistent with Caltrans requirements, the 95th percentile queuing of vehicles has been assessed at the off-ramps to determine potential queuing deficiencies at the freeway ramp intersections at the N. State College Boulevard/SR-91 Freeway and SR-57 Freeway/Orangethorpe Avenue interchanges. Specifically, the queuing analysis is utilized to identify any potential queuing and "spill back" onto the SR-91 Freeway or SR-57 Freeway mainline from the off-ramps.

The traffic progression analysis tool and HCM intersection analysis program, Synchro, has been used to assess the potential deficiencies/needs of the intersections with traffic added from the proposed Project. Storage (turn-pocket) length recommendations at the ramps have been based upon the 95th percentile queue resulting from the Synchro progression analysis. The footnote from the Synchro output sheets indicates if the 95th percentile cycle exceeds capacity. In practice, the 95th percentile queue shown will rarely be exceeded and the queues shown with the footnote are acceptable for the design of storage bays.

A vehicle is considered queued whenever it is traveling at less than 10 feet/second. A vehicle will only become queued when it is either at the stop bar or behind another queued vehicle. The queue length reported is for the lane with the highest queue in the lane group. The 95th percentile queue is derived from the average queue plus 1.65 standard deviations. The 95th percentile queue is not necessarily ever observed it is simply based on statistical calculations.

2.5 FREEWAY FACILITY ANALYSIS METHODOLOGY

2.5.1 BASIC FREEWAY SEGMENT ANALYSIS METHODOLOGY

Consistent with recent Caltrans guidance, the traffic study has evaluated all freeway segments where the Project is anticipated to access the SHS, in an effort to conduct a conservative analysis and overstate as opposed to understand potential deficiencies. It should be noted that the Project will contribute less than 50 peak hour trips to both the N. State College Boulevard/SR-91 Freeway and SR-57 Freeway/Orangethorpe Avenue interchanges. Caltrans utilizes the 50 peak hour trip criteria for determine analysis of their facilities. As such, Caltrans facilities with less than 50 peak hour trips have not been evaluated for the purposes of this traffic analysis.

The freeway system in the study area has been broken into segments defined by the freeway-to-arterial interchange locations. The freeway segments have been evaluated in this TA based upon peak hour directional volumes. The freeway segment analysis is based on the methodology described in the HCM and performed using Highway Capacity Software (HCS) 7 software. The performance measure preferred by Caltrans to calculate LOS is density. Density is expressed in terms of passenger cars per mile per lane. Table 2-5 illustrates the freeway segment LOS descriptions for each density range utilized for this analysis.

The number of lanes for existing baseline conditions has been obtained from field observations conducted by Urban Crossroads in March 10-12, 2020. These existing freeway geometrics have been utilized for Existing and Opening Year Cumulative Without and With Project traffic conditions.

The SR-91 Freeway and SR-57 Freeway mainline volume data was obtained from the Caltrans Performance Measurement System (PeMS) website for the segments of the SR-91 Freeway west of N. State College Boulevard and the SR-57 Freeway north of Orangethorpe Avenue. The data was obtained from March 10-12, 2020, consistent with the date of the traffic counts for the ramp-to-arterial intersections. In an effort to conduct a conservative analysis, the maximum value observed within the 3-day period was utilized for the weekday morning (AM) and weekday evening (PM) peak hours. Consistent with the existing peak hour operations analysis, the AM peak hour volumes for the freeway and ramps have been increased by 5%. In addition, truck traffic, represented as a percentage of total traffic and actual vehicles (as opposed to PCE volumes) have been utilized for the purposes of the basic freeway segment analysis. [9]

TABLE 2-5: DESCRIPTION OF FREEWAY MAINLINE LOS

Level of Service	Description	Density Range (pc/mi/ln)[1]
A	Free-flow operations in which vehicles are relatively unimpeded in their ability to maneuver within the traffic stream. Effects of incidents are easily absorbed.	0.0 – 11.0
B	Relative free-flow operations in which vehicle maneuvers within the traffic stream are slightly restricted. Effects of minor incidents are easily absorbed.	11.1 – 18.0
C	Travel is still at relative free-flow speeds, but freedom to maneuver within the traffic stream is noticeably restricted. Minor incidents may be absorbed, but local deterioration in service will be substantial. Queues begin to form behind significant blockages.	18.1 – 26.0
D	Speeds begin to decline slightly and flows, and densities begin to increase more quickly. Freedom to maneuver is noticeably limited. Minor incidents can be expected to create queuing as the traffic stream has little space to absorb disruptions.	26.1 – 35.0
E	Operation at capacity. Vehicles are closely spaced with little room to maneuver. Any disruption in the traffic stream can establish a disruption wave that propagates throughout the upstream traffic flow. Any incident can be expected to produce a serious disruption in traffic flow and extensive queuing.	35.1 – 45.0
F	Breakdown in vehicle flow.	>45.0

[1] pc/mi/ln = passenger cars per mile per lane. Source: HCM

2.5.2 FREEWAY MERGE/DIVERGE RAMP JUNCTION ANALYSIS METHODOLOGY

The freeway system in the study area has been broken into segments defined by freeway-to-arterial interchange locations resulting in 8 existing on and off ramp locations (see Table 1-2). It should be noted that the Project will contribute less than 50 peak hour trips to both the N. State College Boulevard/SR-91 Freeway and SR-57 Freeway/Orangethorpe Avenue interchanges. Although the HCM indicates the influence area for a merge/diverge junction is 1,500 feet, the analysis presented in this traffic study has been performed at all ramp locations with respect to the nearest on or off ramp at each interchange in an effort to be consistent with Caltrans guidance/comments on other projects Urban Crossroads has worked on in the region.

The merge/diverge analysis is based on the HCM Ramps and Ramp Junctions analysis method and performed using HCS 7 software. The measure of effectiveness (reported in passenger car/mile/lane) are calculated based on the existing number of travel lanes, number of lanes at the on and off ramps both at the analysis junction and at upstream and downstream locations (if applicable) and acceleration/deceleration lengths at each merge/diverge point. Table 2-6 presents the merge/diverge area level of service descriptions for each density range utilized for this analysis.

TABLE 2-6: DESCRIPTION OF FREEWAY MERGE AND DIVERGE LOS

Level of Service	Density Range (pc/mi/ln)[1]
A	≤10.0
B	10.0 – 20.0
C	20.0 – 28.0
D	28.0 – 35.0
E	>35.0
F	Demand Exceeds Capacity

[1] pc/mi/ln = passenger cars per mile per lane. Source: HCM

Similar to the basic freeway segment analysis, the SR-91 Freeway and SR-57 Freeway mainline volume data were obtained from the Caltrans maintained PeMS website. The ramp data (per the count data presented in Appendix 3.1) was then utilized to flow conserve the mainline volumes to determine the remaining SR-91 and SR-57 Freeway mainline segment volumes. Flow conservation checks ensure that traffic flows from north to south (and vice versa) of the interchange area with no unexplained loss of vehicles. The data was obtained from March 10-12, 2020 consistent with the ramp-to-arterial traffic count data. In an effort to conduct a conservative analysis, the maximum value observed within the 3-day period was utilized for the weekday morning (AM) and weekday evening (PM) peak hours. In addition, truck traffic, represented as a percentage of total traffic and actual vehicles (as opposed to PCE volumes) have been utilized for the purposes of the freeway ramp junction (merge/diverge) analysis. [9]

2.6 LOS CRITERIA

2.6.1 CITY OF FULLERTON

Per the City of Fullerton's TAPP, definition of acceptable operating conditions for signalized and unsignalized intersections is LOS D; unacceptable operations are LOS E and LOS F.

2.6.2 CITY OF ANAHEIM

The City of Anaheim identifies a current LOS standard of LOS D for intersections within the City per the City of Anaheim General Plan Circulation Element.

2.6.3 CITY OF PLACENTIA

The City of Placentia identifies a current LOS standard of LOS D for intersections within the City per the City of Placentia General Plan Circulation Element.

2.6.4 ORANGE COUNTY CMP

The CMP definition of deficiency is based on maintaining a level of service standard of LOS E or better at CMP facilities. [7] The following study area intersections are CMP intersections, where the acceptable LOS standard is LOS E, unless the baseline is lower than LOS E, in which case the ICU ratio cannot increase by more than 0.10 from the baseline condition:

- Orangethorpe Avenue and State College Boulevard
- SR-57 Ramps and Orangethorpe Avenue (however, LOS D is used consistent with Caltrans LOS requirements)
- State College Boulevard and SR-91 Ramps (however, LOS D is used consistent with Caltrans LOS requirements)

2.6.5 CALTRANS

Caltrans endeavors to maintain a target LOS at the transition between LOS C and LOS D on SHS facilities, however, Caltrans acknowledges that this may not always be feasible and recommends that the lead agency consult with Caltrans to determine the appropriate target LOS. If an existing State highway facility is operating at less than this target LOS, the existing LOS should be maintained. In general, the region-wide goal for an acceptable LOS on all freeways, roadway segments, and intersections is LOS D. Consistent with the City of Fullerton LOS threshold, LOS D will be used as the target LOS for freeway ramps.

2.7 THRESHOLD CRITERIA

2.7.1 CITY OF FULLERTON

The City of Fullerton's TAPP guidelines identify the following criteria when determining a project's effect on peak hour traffic operations: [1]

- The project causes a signalized or unsignalized intersection operating at or above an acceptable operating condition to degrade to an unacceptable condition, or
- The project causes a signalized or unsignalized intersection operating at an unacceptable operating condition to further degrade and for a signalized intersection the change is:
    - From LOS E to LOS F,
    - An increase of at least 4 seconds for an LOS E intersection, or
    - An increase of at least 2 seconds for an LOS F intersection.

2.7.2 City of Anaheim

The following criteria will be used to establish potential traffic deficiencies within the City of Anaheim for the LOS based traffic analysis (see Table 2-7). [10]

TABLE 2-7: CITY OF ANAHEIM THRESHOLDS OF SIGNIFICANT IMPACT

Level of Service	Final V/C Ratio	Project-Related Increase in V/C Ratio
C	> 0.701-0.800	≥ 0.050
D	> 0.801-0.900	≥ 0.030
E,F	> 0.901	≥ 0.010

Source: City of Anaheim, Criteria for Preparation of Traffic Impact Studies.
V/C = volume-to-capacity

2.7.3 City of Placentia

General Plan Policy CIR 1.1 of the City of Placentia Circulation Element states a significant deficiency would occur if the project causes an intersection to deteriorate from acceptable LOS (LOS D or better) to unacceptable LOS (LOS E or F). If an intersection is already operating at LOS E or F, a project deficiency would occur if the project causes an increase of 0.01 or more in the V/C ratio.

2.7.4 Orange County CMP

The Orange County CMP considers an increase of 0.10 or more in the V/C ratio at a location that reaches LOS F to be a significant impact. [7]

2.7.5 Caltrans Facilities

To determine whether the addition of project traffic to the SHS freeway segments would result in a deficiency, the following will be utilized:

- The traffic study finds that the off-ramp will degrade from acceptable 95th percentile queues to unacceptable 95th percentile queues.
- The traffic study finds that the LOS of a segment will degrade from D or better to E or F.
- The traffic study finds that the project will exacerbate an already deficient condition by contributing 50 or more peak hour trips. A segment that is operating at or near capacity is deemed to be deficient.

2.8 Project Fair Share Calculation Methodology

Per the City's TAPP, fair share contributions shall be determined in consultation with the City Traffic Engineer. As such, no fair share calculations have been provided as part of this TA.

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3 AREA CONDITIONS

This section provides a summary of the existing circulation network, The Fullerton Plan Mobility Element Network and a review of existing peak hour intersection operations, traffic signal warrant, and freeway facility analyses.

3.1 EXISTING CIRCULATION NETWORK

The study area includes a total of 32 existing and future intersections as shown previously on Exhibit 1-2. Exhibit 3-1 illustrates the study area intersections located near the proposed Project and identifies the number of through traffic lanes for existing roadways and intersection traffic controls.

3.2 CITY OF FULLERTON CIRCULATION NETWORK

As previously noted, the Project site is located within the City of Fullerton. Exhibit 3-2 shows street classification network, as identified on The Fullerton Plan: The Fullerton Built Environment. [11] The roadway classifications and planned (ultimate) roadway cross-sections of the major roadways within the study area per the City of Fullerton Engineering Department Typical Cross Section Standards. State College Boulevard, Orangethorpe Avenue, and Chapman Avenue (east of State College Boulevard) are classified as a Major Arterial Highway. Raymond Avenue, Placentia Avenue, Commonwealth Avenue, and Chapman Avenue (west of State College Boulevard) are classified as Primary Arterial Highways. Lastly, Acacia Avenue is classified as a Secondary Arterial Street within the study area. The roadway cross-sections for each of these classifications are defined on Exhibit 3-3. Exhibits 3-4 through 3-6 show the General Plan roadway classifications for the City of Anaheim and City of Placentia, respectively.

3.3 TRUCK ROUTES

The City of Fullerton designated truck route map is shown on Exhibit 3-7. Kimberly Avenue, Acacia Avenue, Raymond Avenue, Orangethorpe Avenue, and N. State College Boulevard are identified as truck routes within the study area. The City of Anaheim truck routes are shown on Exhibit 3-8 and also identify Orangethorpe Avenue and State College Boulevard as truck routes. Lastly, City of Placentia truck routes are identified on Exhibit 3-9 which identify Placentia Avenue and Orangethorpe Avenue as truck routes. The designated truck route maps have been utilized to route truck traffic from both the proposed Project and applicable future cumulative development projects throughout the study area.

EXHIBIT 3-1 (1OF2): EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS

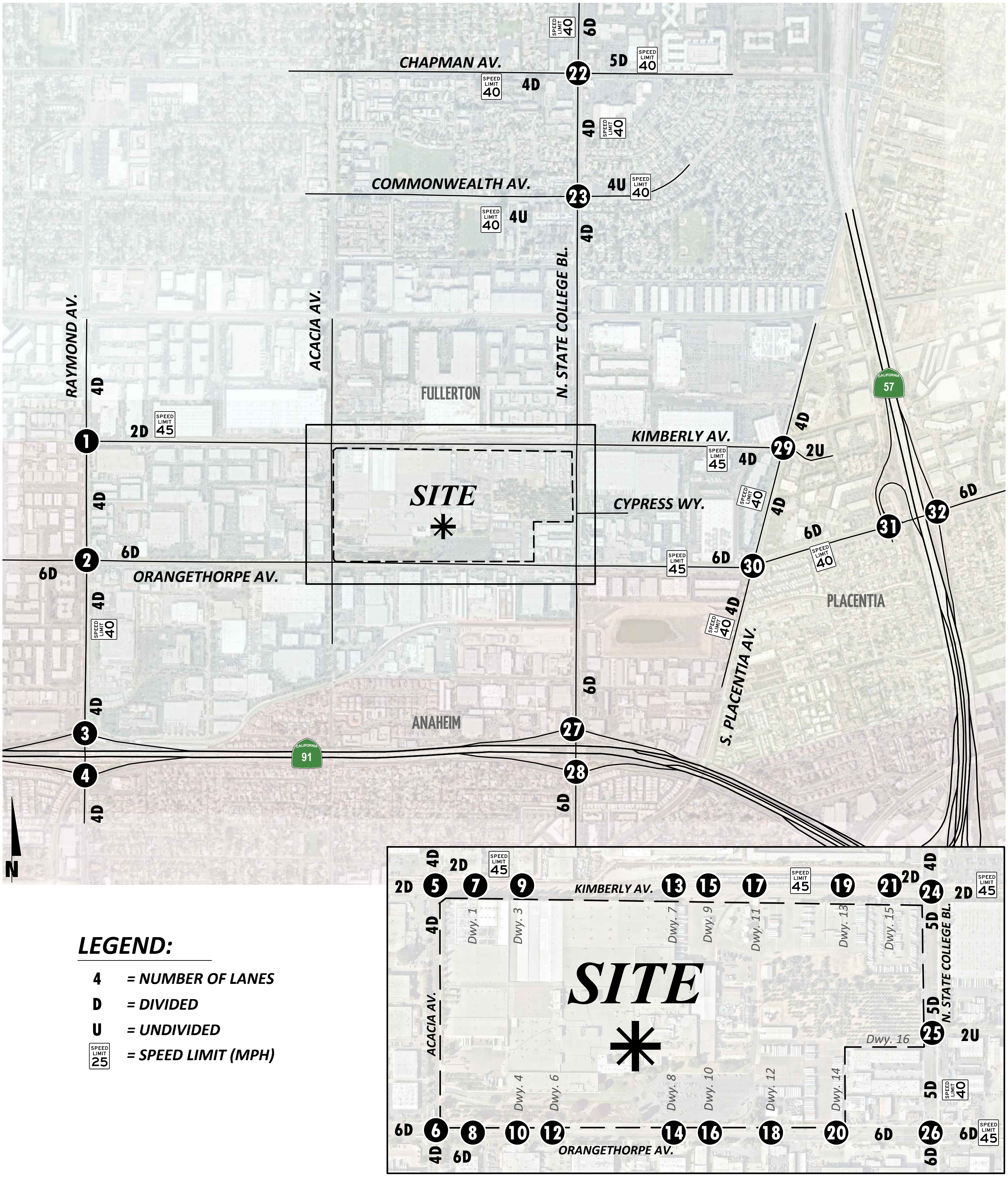
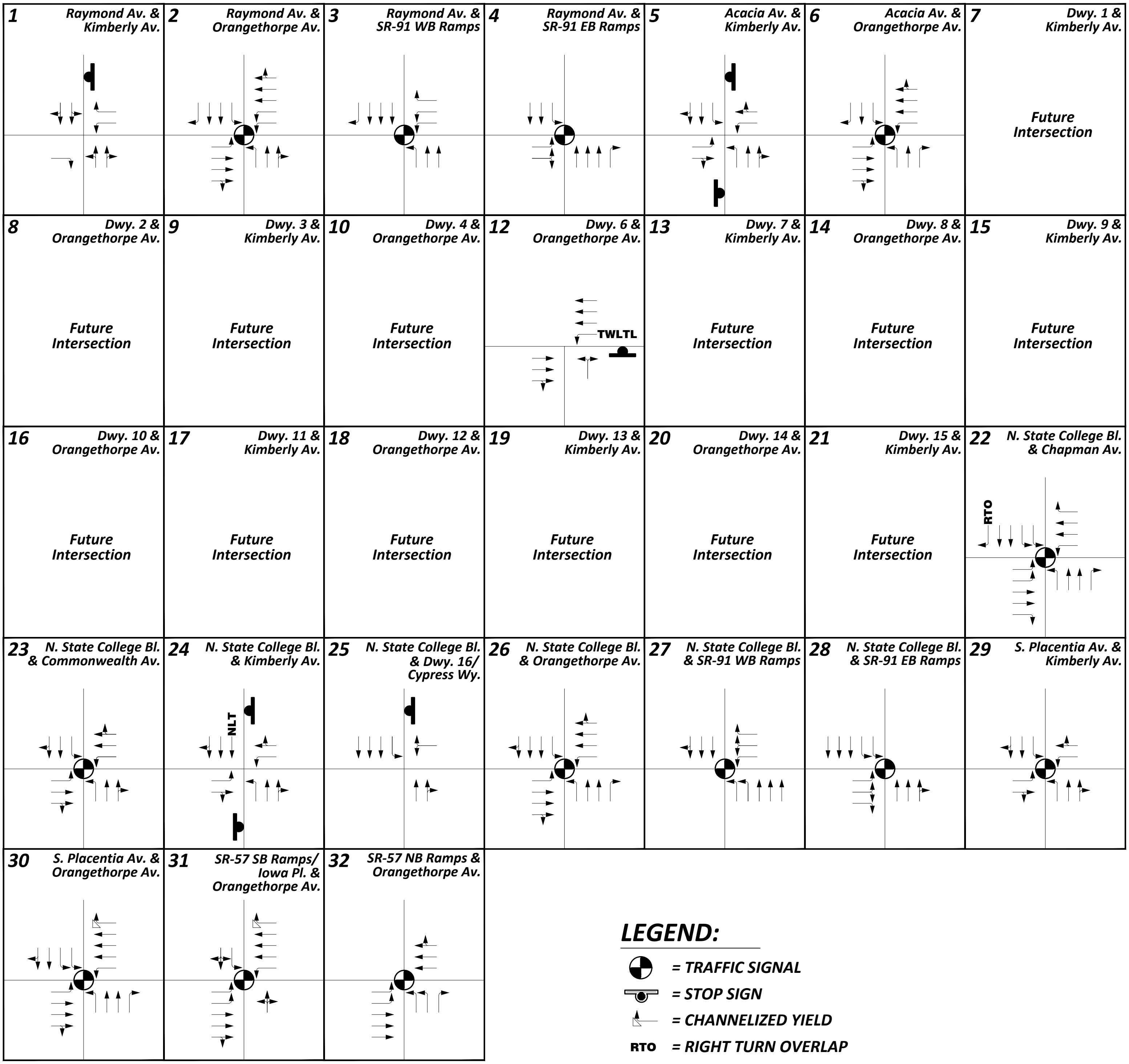


EXHIBIT 3-1 (2OF2): EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS

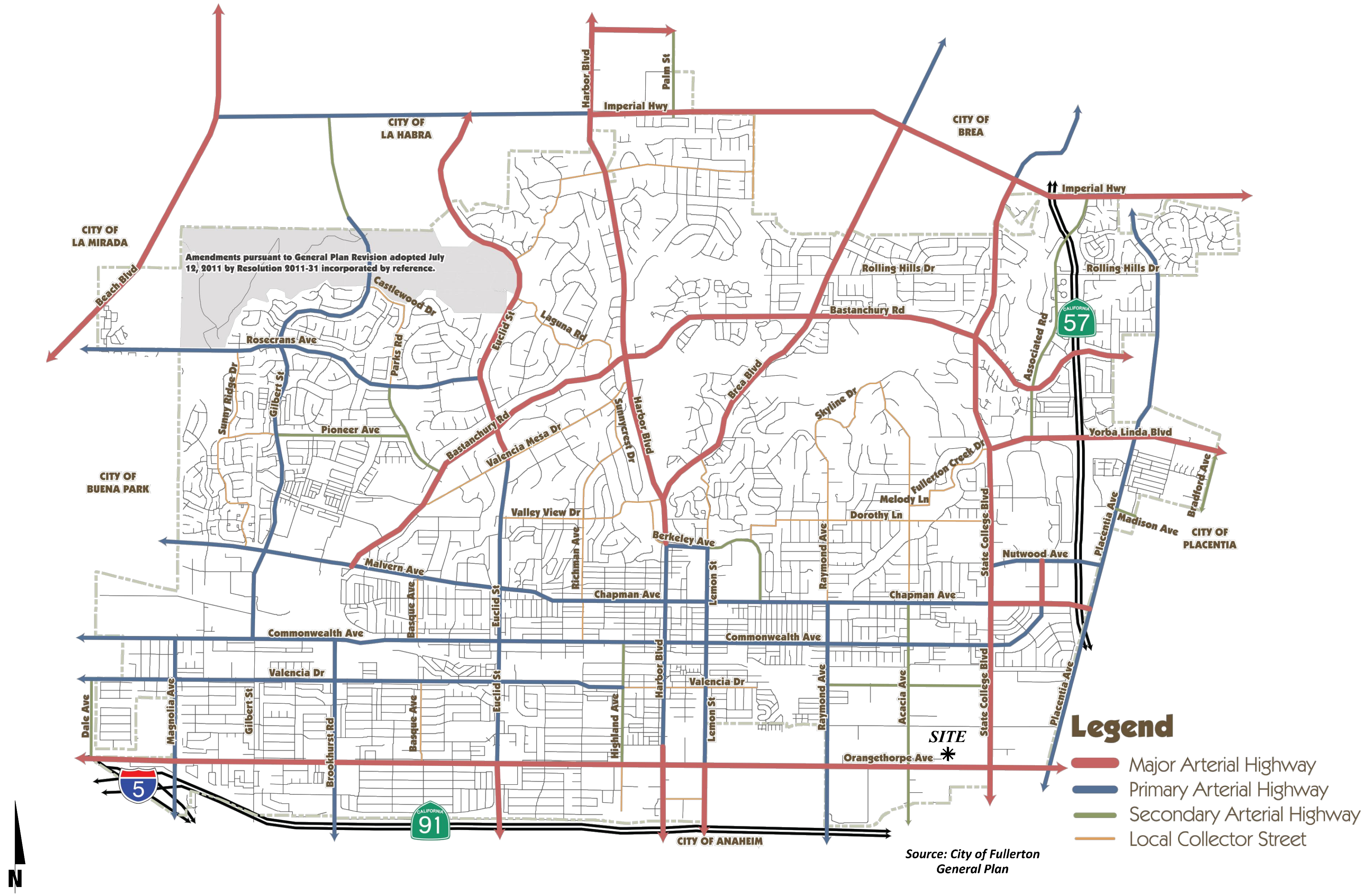


LEGEND:

- = TRAFFIC SIGNAL
- = STOP SIGN
- = CHANNELIZED YIELD
- RTO = RIGHT TURN OVERLAP
- NLT = NO LEFT TURN
- TWLTL = TWO WAY LEFT TURN LANE

N

EXHIBIT 3-2: THE FULLERTON PLAN ROADWAY CLASSIFICATIONS



Source: City of Fullerton General Plan

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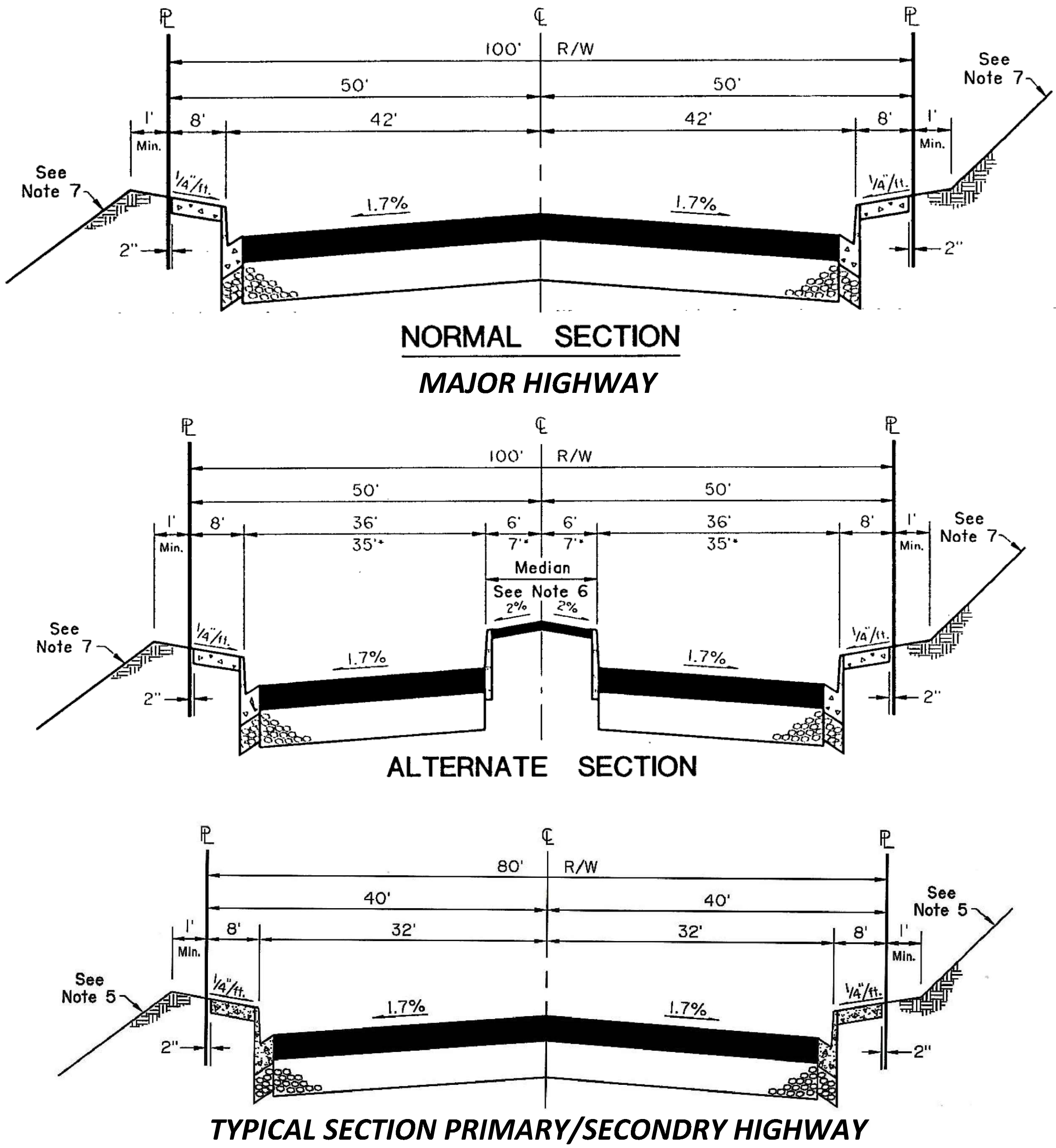
EXHIBIT 3-3: CITY OF FULLERTON GENERAL PLAN ROADWAY CROSS-SECTION



Source: City of Fullerton Engineering Department Typical Cross Section Standards

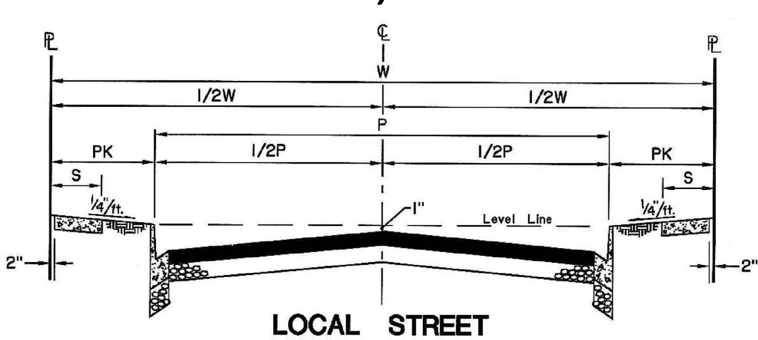
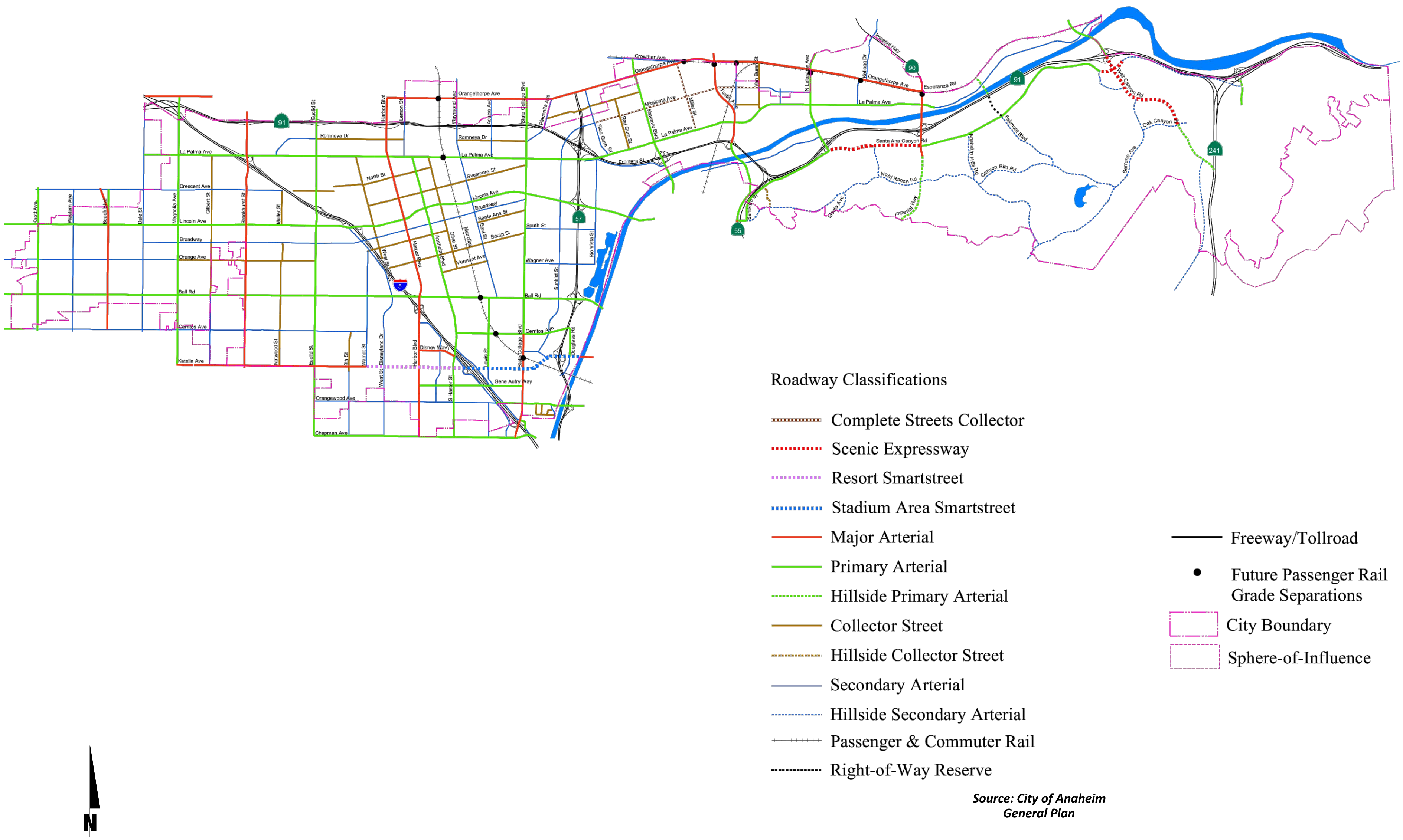


EXHIBIT 3-4: CITY OF ANAHEIM GENERAL PLAN ROADWAY CLASSIFICATIONS



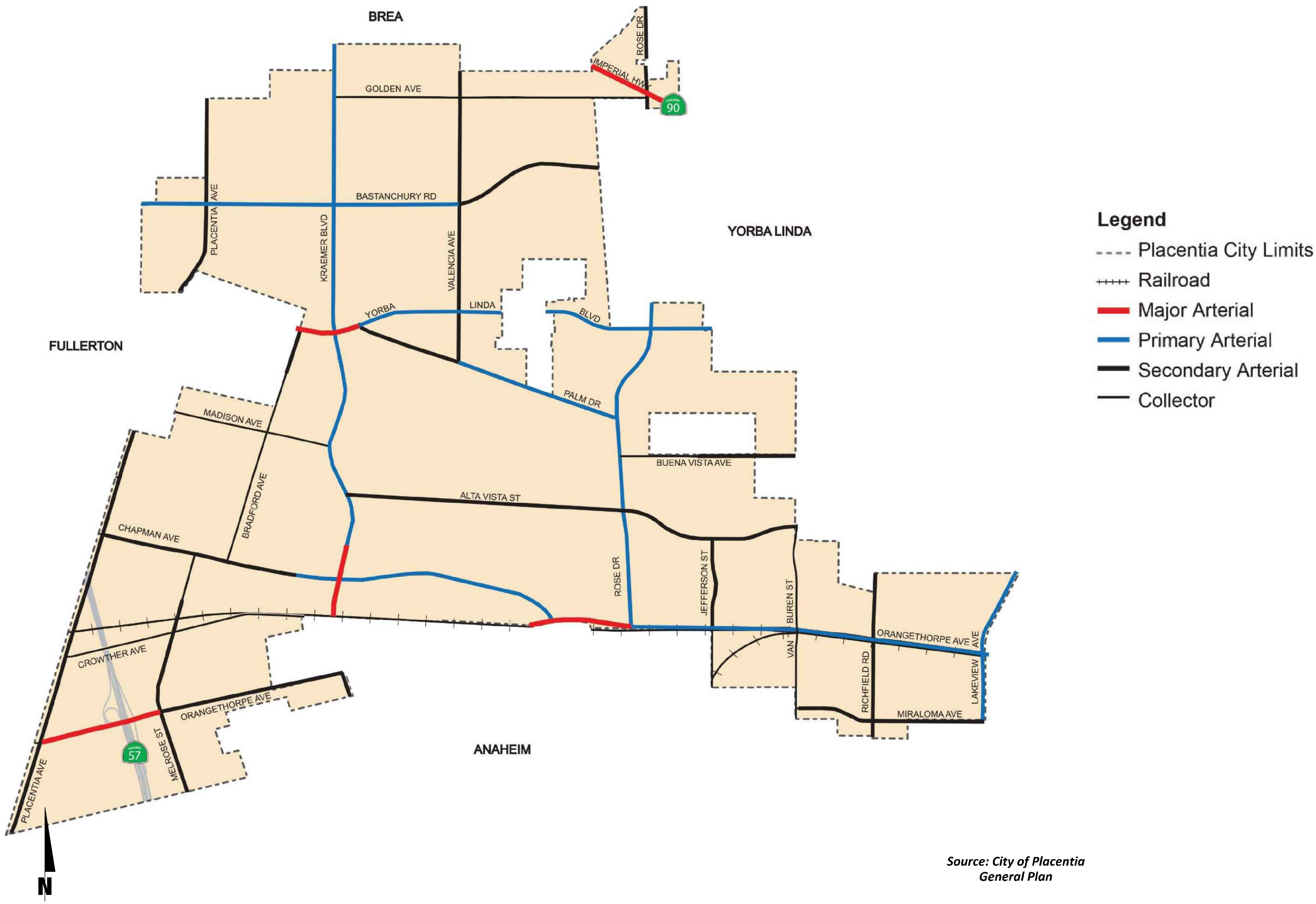
Source: City of Anaheim General Plan

EXHIBIT 3-5: CITY OF ANAHEIM GENERAL PLAN STREET CLASSIFICATIONS

	RIGHT OF WAY	DESIGN SPEED MPH	STD. DTL. NO.
Major Arterial	94'-102'	60	160
Primary Arterial	106'	55	160
Secondary Arterial	90'	50	160
Industrial Street	64'	35	160
Collector Street	64'	35	160
Interior Street	60'	25	160
Hillside Primary Highway	106' - 118'	55*	161
Hillside Secondary Hwy	66' - 78'	50*	161
Hillside Collector Street	37' - 49'	35	161
Hillside Interior Street	35' - 25'	25	161
Private Street		25	162

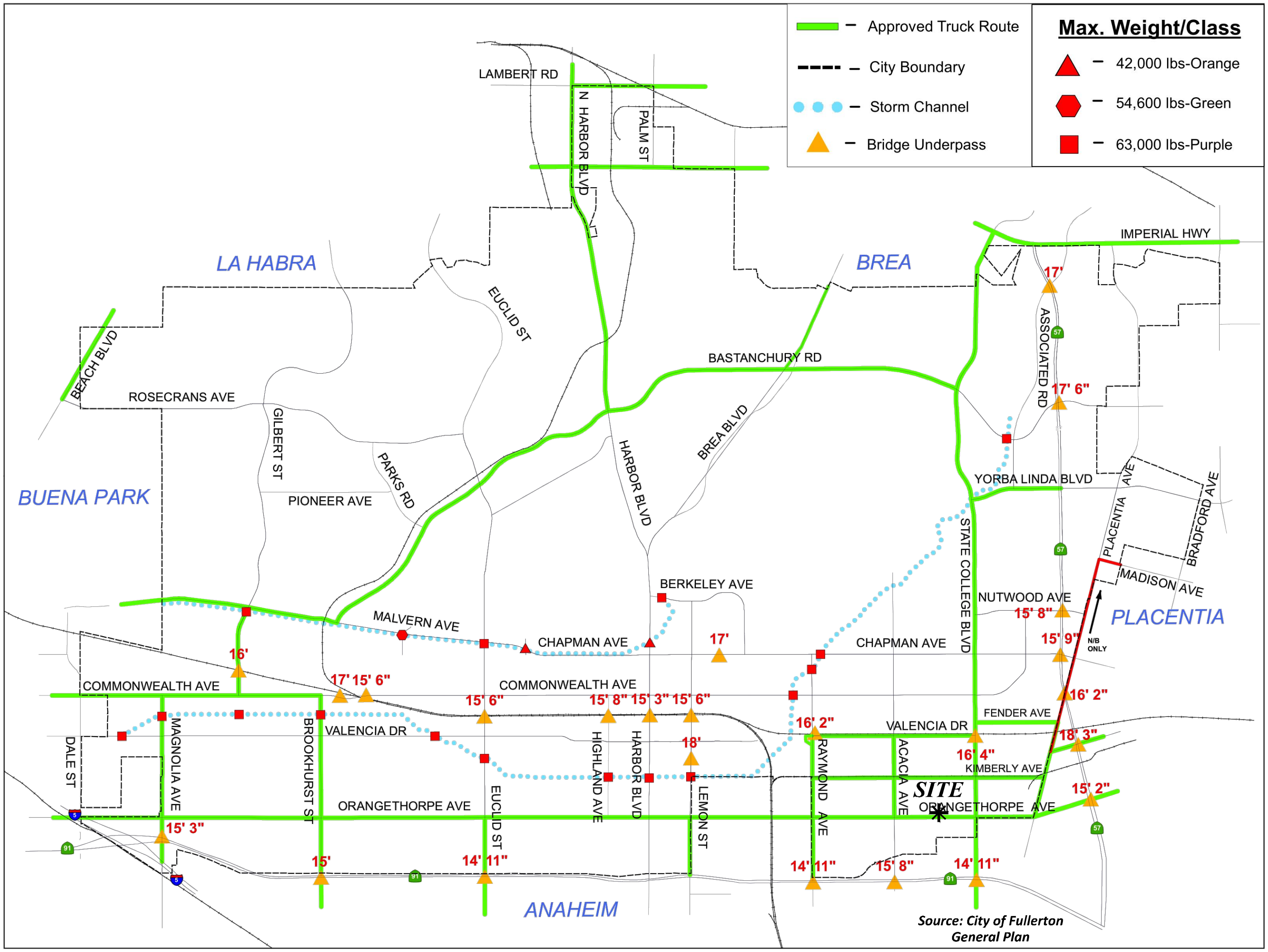
Source: City of Anaheim General Plan

EXHIBIT 3-6: CITY OF PLACENTIA GENERAL PLAN ROADWAY CLASSIFICATIONS



Source: City of Placentia General Plan

EXHIBIT 3-7: CITY OF FULLERTON TRUCK ROUTES



Source: City of Fullerton General Plan

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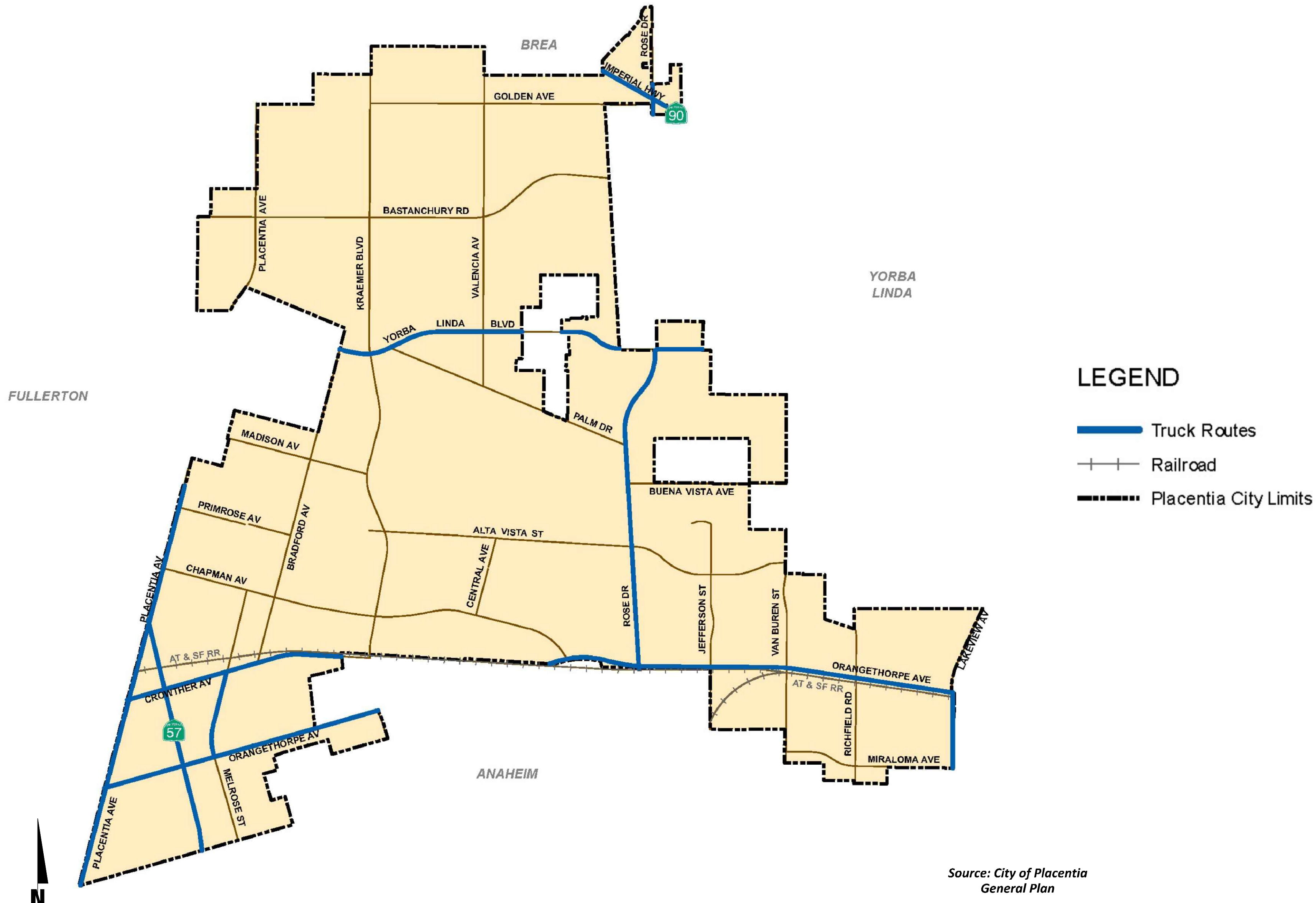
EXHIBIT 3-8: CITY OF ANAHEIM TRUCK ROUTES

Source: City of Anaheim General Plan

13156 - anaheim.dwg

EXHIBIT 3-9: CITY OF PLACENTIA TRUCK ROUTES



Source: City of Placentia General Plan

3.4 BICYCLE & PEDESTRIAN FACILITIES

The City of Fullerton's existing bike network is shown on Exhibit 3-10. Class II bikeways are on-road, striped bike routes. There are Class II bike lanes currently along Acacia Avenue, Orangethorpe Avenue (west of N. State College Boulevard), and Commonwealth Avenue (west of N. State College Boulevard) within the study area. Commonwealth Avenue currently has Class III route between Acacia Avenue and N. State College Boulevard (signed, but unstriped, on-road bike route).

Exhibit 3-11 shows the existing and planned bicycle facilities within the City of Anaheim. As shown, Class II bike lanes are proposed along Orangethorpe Avenue west of Raymond Avenue and east of N. State College Boulevard. Exhibit 3-12 shows the existing and planned bicycle facilities within the City of Placentia. As shown, Class II bike lanes are proposed along Orangethorpe Avenue. Exhibit 3-12 also shows a planned Class I (off-road bike path) that runs south of and parallel to Orangethorpe Avenue.

Exhibit 3-13 shows the City of Fullerton trails; there are no existing or planned trails in the vicinity of the Project site. Existing pedestrian facilities (sidewalk and crosswalk) and bus stop locations within the study area are shown on Exhibit 3-14.

3.5 TRANSIT SERVICE

The study area is currently served by OCTA, a municipal transit agency serving the City of Fullerton and surrounding Orange County communities. OCTA existing transit routes in the study area are shown on Exhibit 3-15. The existing OCTA Route 30 would likely serve the proposed Project. OCTA Route 57 also identifies a portion that runs along the Project's frontage along N. State College Boulevard, however, OCTA identifies there is no service on some trips along the portion north of Orangethorpe Avenue. There are existing bus stops along Orangethorpe Avenue and N. State College Boulevard, which adjacent to the site or are less than ½ a mile from the site. The transit frequency at these stops are approximately every 10-minutes. As such, the Project is located within a Transit Priority Area.

The Project will construct a bus stop on the north side of E. Orangethorpe Avenue. The bus stop is expected to be located south of Building 2, but the final location of the bus stop would be determined in coordination with OCTA.

Exhibit 3-10: City of Fullerton Existing Bike Network

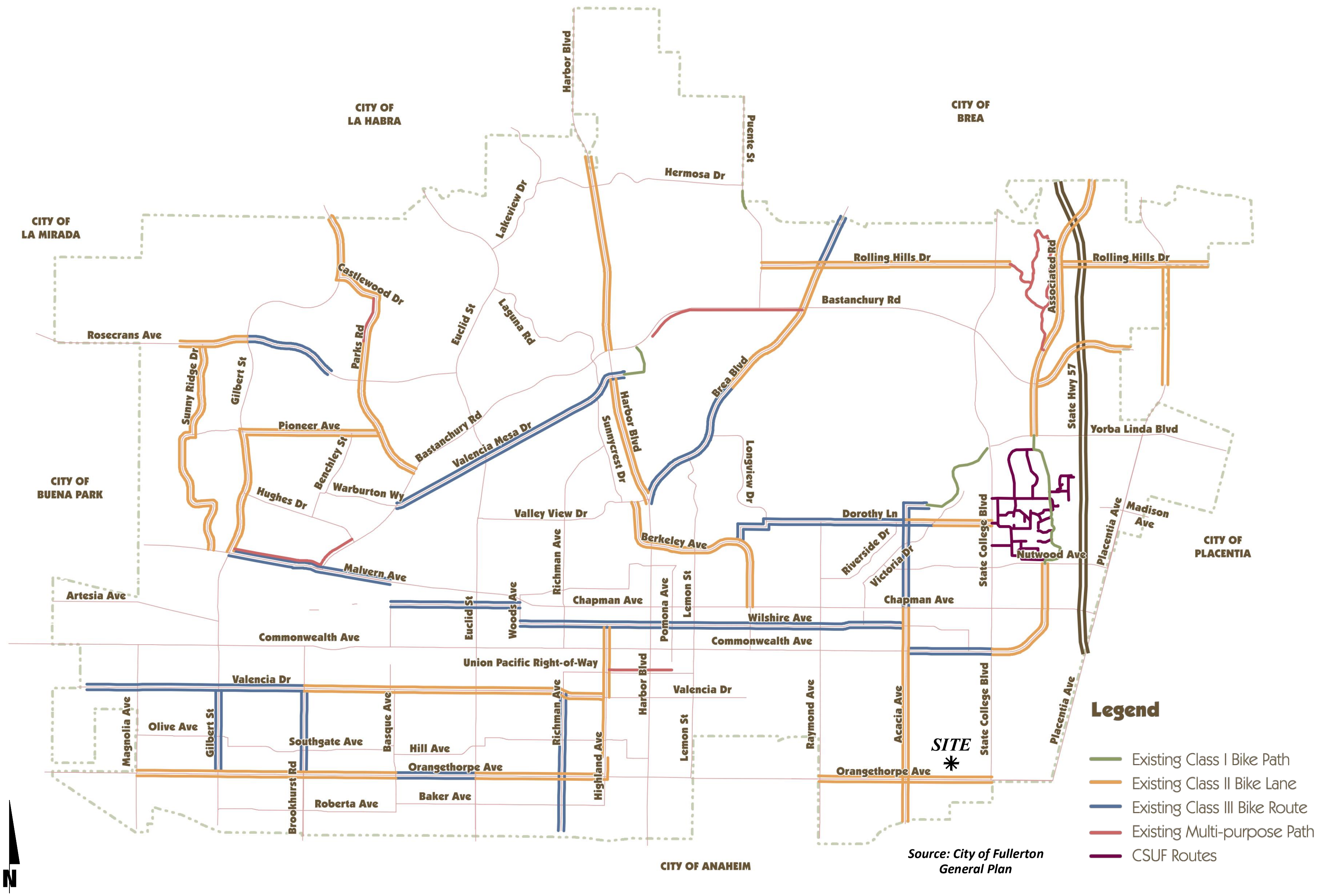


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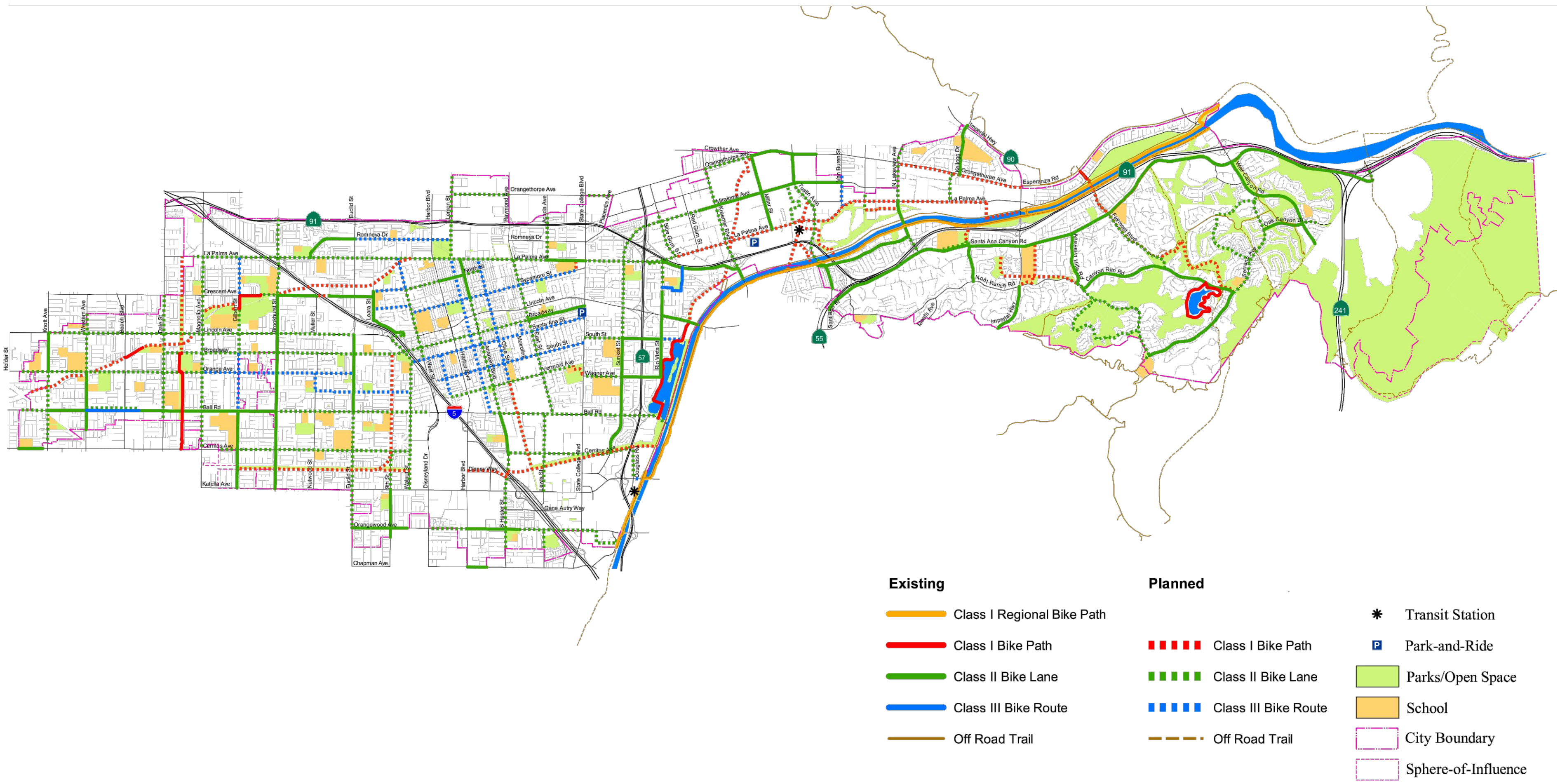
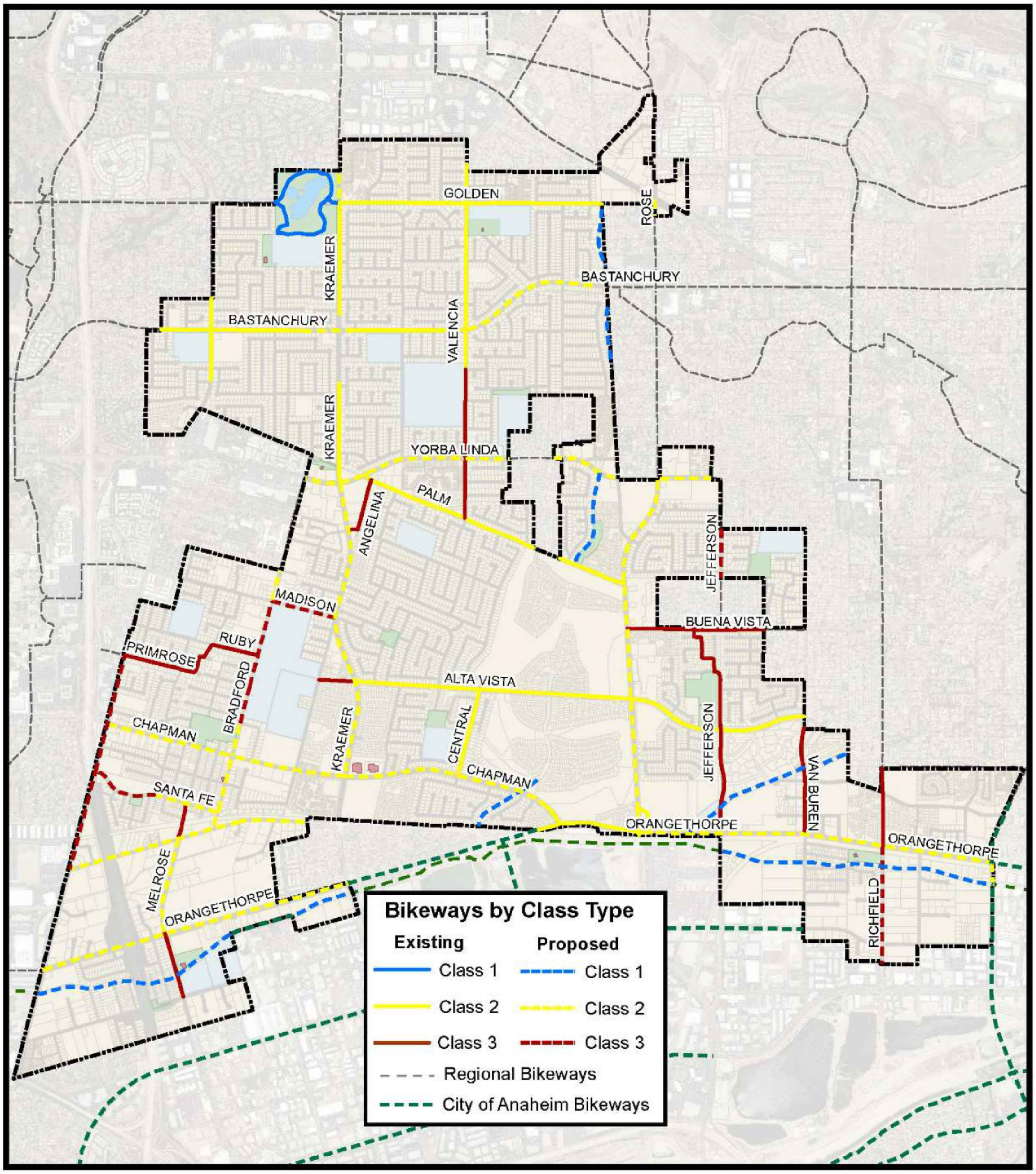
EXHIBIT 3-11: CITY OF ANAHEIM EXISTING AND PLANNED BICYCLE FACILITIES



Source: City of Anaheim General Plan

EXHIBIT 3-12: CITY OF PLACENTIA GENERAL PLAN EXISTING AND PROPOSED BIKE NETWORK



Source: City of Placentia General Plan

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Exhibit 3-13: City of Fullerton Trails

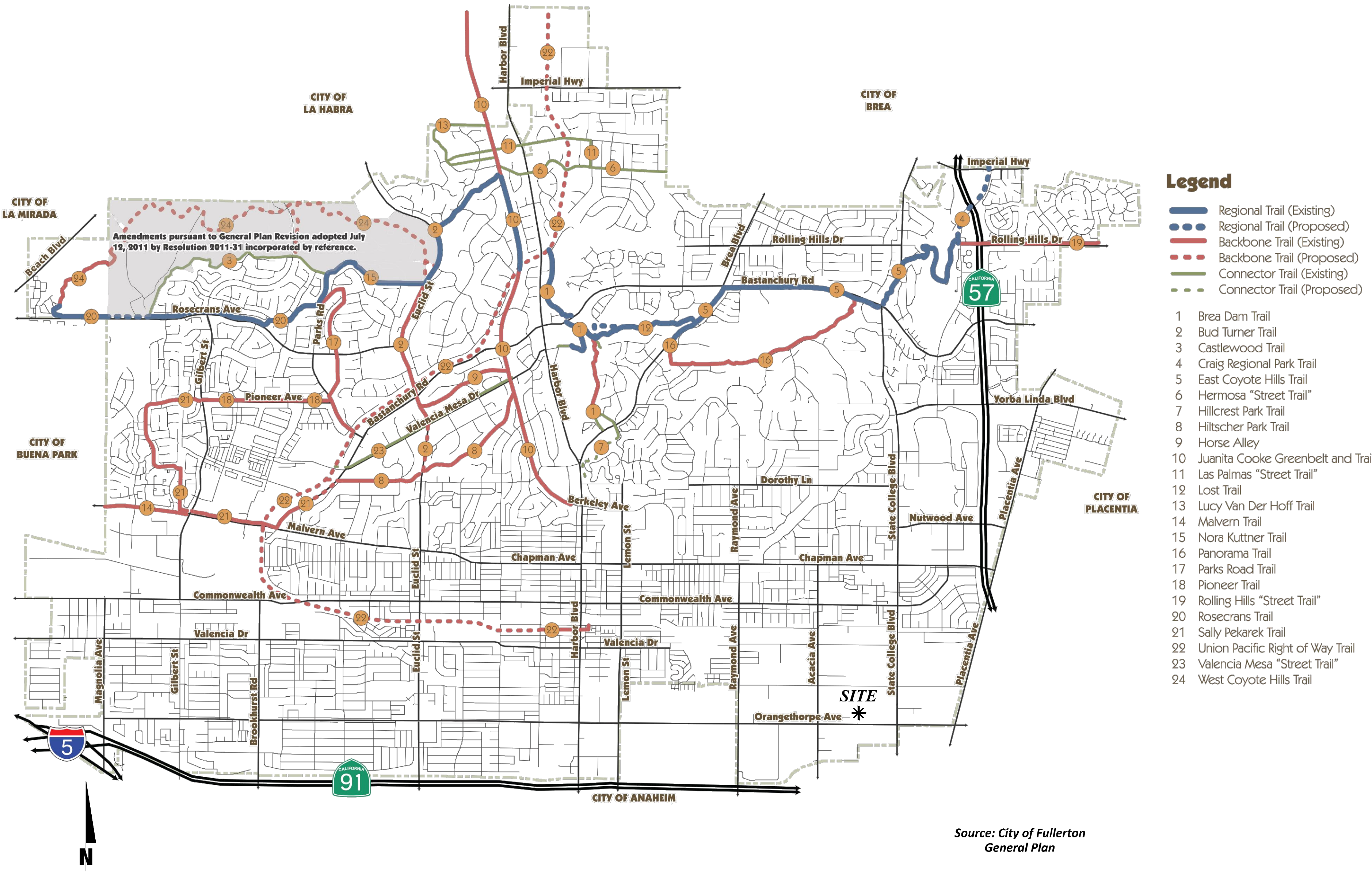

EXHIBIT 3-14: EXISTING PEDESTRIAN FACILITIES

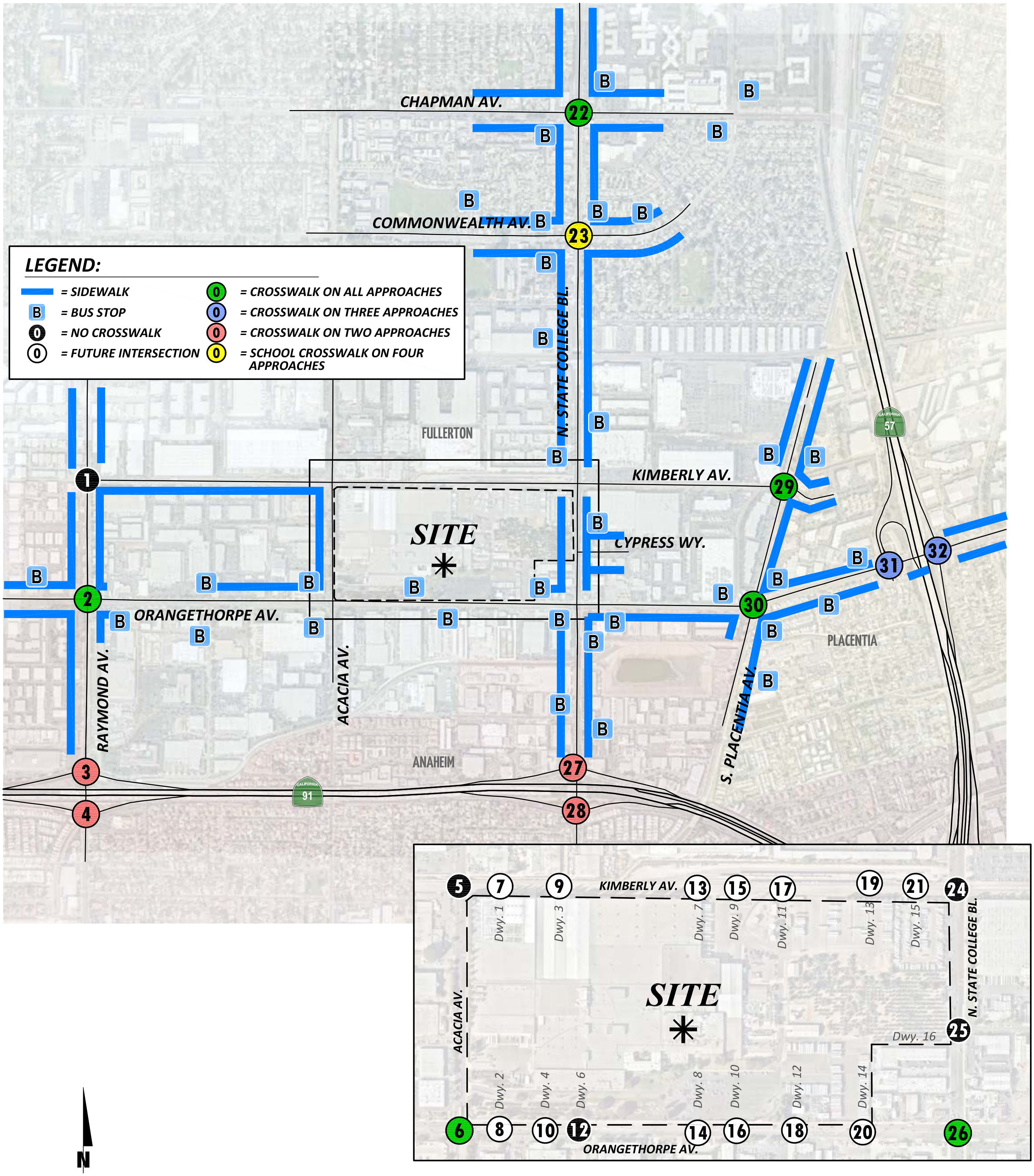

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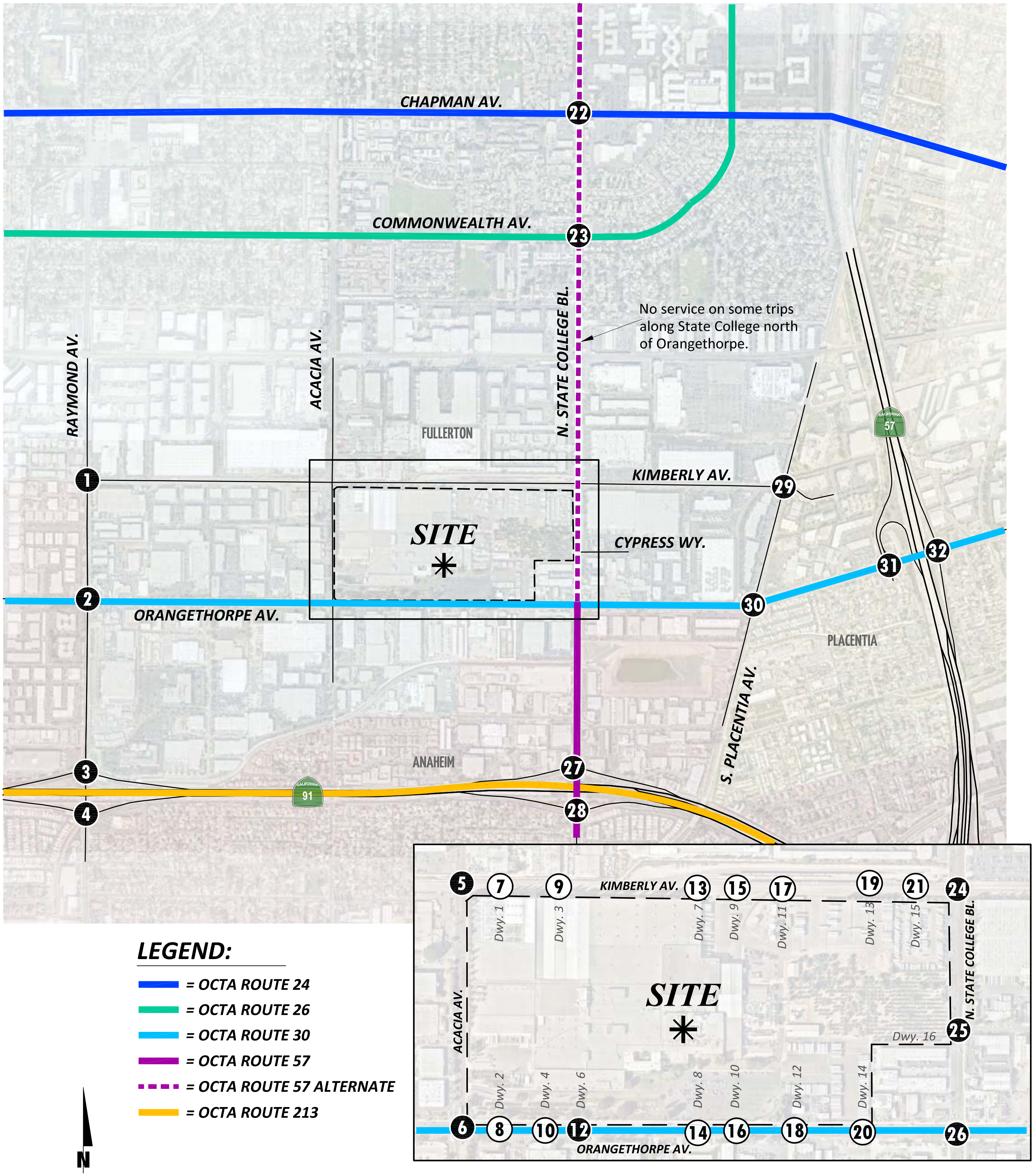
EXHIBIT 3-15: EXISTING TRANSIT ROUTES



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3.6 EXISTING TRAFFIC COUNTS

Manual weekday AM and PM peak hour turning movement counts were conducted on March 12, 2020, prior to the major closures of schools and local businesses related to the currently ongoing COVID-19 pandemic. The raw manual peak hour turning movement traffic count data sheets are included in Appendix 3.1. The traffic counts collected in March 2020 include the vehicle classifications as shown below:

- Passenger Cars
- 2-Axle Trucks
- 3-Axle Trucks
- 4 or More Axle Trucks

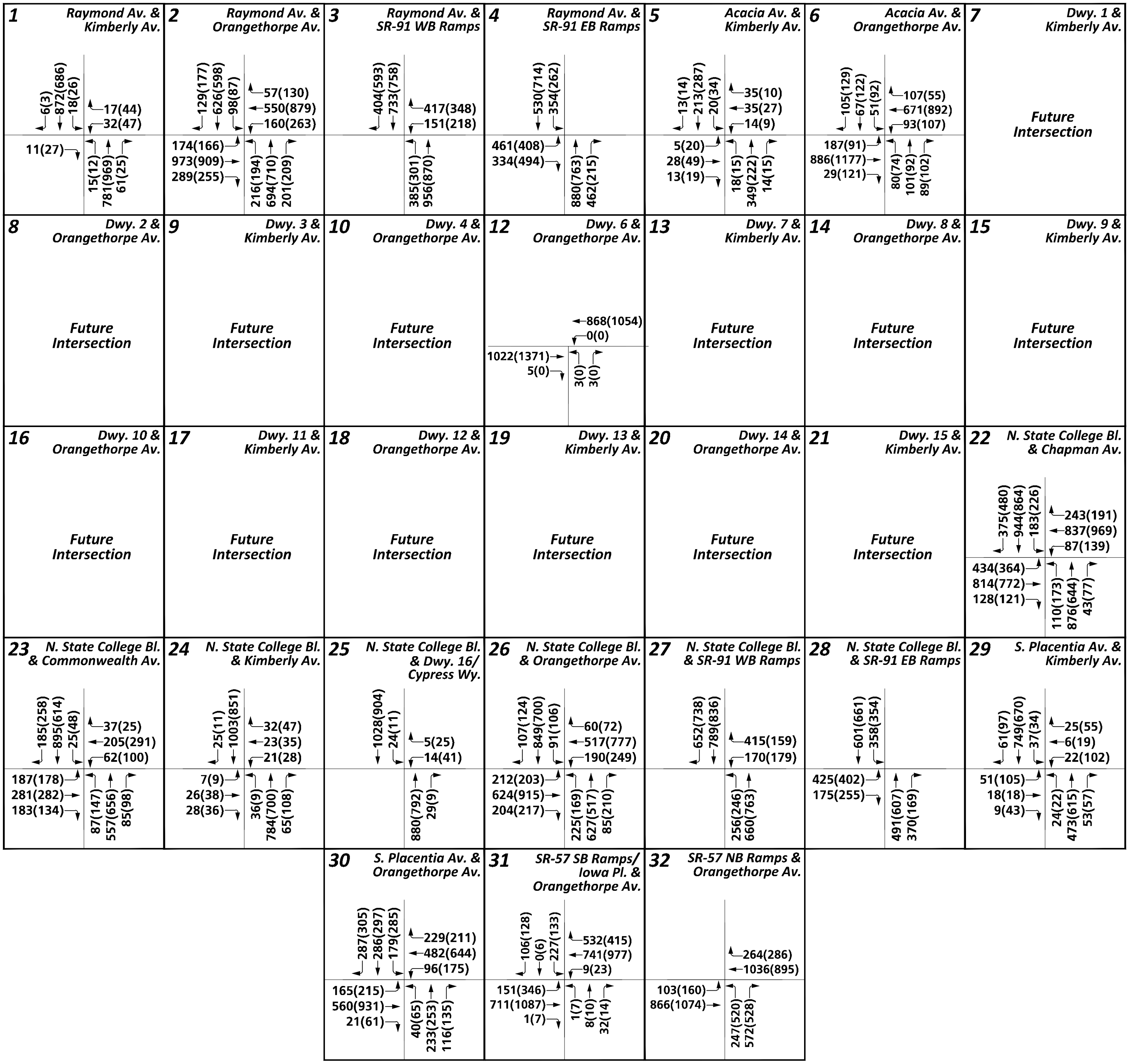
Based on a review of historic data versus the March 12, 2020 count data, it appears that growth is observed between the historic count data (2019 or older) and 2020 counts. The City reviewed historic count data from January 2019, which was obtained from the Orange County Transportation Authority (OCTA), at the following locations:

- State College Boulevard at Orangethorpe Avenue
- State College Boulevard at SR-91 Westbound Ramps
- State College Boulevard at SR-91 Eastbound Ramps
- SR-57 Southbound Ramps & Orangethorpe Avenue
- SR-57 Northbound Ramps & Orangethorpe Avenue

Based on a review of the data, a comparison of the AM peak hour indicated the March 2020 data could be understated. As such, based on the change between the historic (January 2019) and March 2020 data, the March 2020 AM peak hour volumes have been increased by 5% for baseline traffic conditions to conservatively account for potential understated March 2020 AM trips. However, March 2020 PM peak hour volumes indicated growth over January 2019 data, as such, no adjustment factor was applied to the March 2020 PM peak hour volumes. Consistent with other City traffic studies, the peak hour operations analysis utilizes PCE volumes; however, actual vehicles are reported on the volume exhibits contained within this TA. PCE volumes used for Existing traffic conditions are provided in Appendix 3.1. Consistent with OCTA CMP guidelines, a PCE factor of 1.5 has been applied to 2-axle trucks, 2.0 for 3-axle trucks and 3.0 for 4+-axle trucks to estimate each turning movement. [7]

Existing AM and PM peak hour intersection volumes are also shown on Exhibit 3-16. All of the intersection turning movement volumes illustrated on the exhibits and used in the peak hour operations analyses are shown in terms of actual vehicles. PCE volume calculations for the intersection of N. State College Boulevard and Orangethorpe Avenue are provided in Appendix 3.2.

EXHIBIT 3-16: EXISTING (2020) TRAFFIC VOLUMES



LEGEND:

10(10) *= AM(PM) PEAK HOUR INTERSECTION VOLUMES*

N

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URBAN CROSSROADS

3.7 EXISTING CONDITIONS INTERSECTION OPERATIONS ANALYSIS

Existing peak hour traffic operations have been evaluated for the study area intersections based on the analysis methodologies presented in Section 2.2 *Intersection Capacity Analysis* of this report. The intersection operations analysis results are summarized in Table 3-1 which indicates that all of the study area intersections are currently operating at an acceptable LOS during the peak hours. Consistent with Table 3-1, a summary of the peak hour intersection LOS for Existing conditions is shown on Exhibit 3-17. The intersection operations analysis worksheets are included in Appendix 3.2 of this TA.

3.8 EXISTING CONDITIONS TRAFFIC SIGNAL WARRANTS ANALYSIS

Traffic signal warrants for Existing traffic conditions are based on existing peak hour intersection turning volumes. For Existing traffic conditions, the following study area intersections currently warrant a traffic signal based on the peak hour traffic volumes (See Appendix 3.3):

- Raymond Av. & Kimberly Av. (#1)
- N. State College Bl. & Kimberly Av. (#24)

3.9 EXISTING (2020) CONDITIONS OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the SR-91 Freeway/Raymond Avenue, SR-91 Freeway/N. State College Boulevard, and SR-57 Freeway/Orangethorpe Avenue interchanges to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the SR-91 Freeway or SR-57 Freeway mainline. Queuing analysis findings are presented in Table 3-2. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown in Table 3-2, there are no movements that are currently experiencing queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows. This finding is consistent with field observations at the time traffic counts were conducted. Worksheets for Existing (2020) traffic conditions off-ramp queuing analysis are provided in Appendix 3.4.

3.10 EXISTING (2020) FREEWAY FACILITY ANALYSIS

Existing (2020) mainline directional volumes for the AM and PM peak hours are provided on Exhibit 3-18. As shown in Table 3-3, the following freeway facilities evaluated as part of this study were found to operate at an unacceptable LOS (i.e., LOS E or worse) during the peak hours for Existing (2020) traffic conditions:

- SR-91 Eastbound, West of State College Bl. (#5) – LOS E AM and PM peak hours
- SR-91 Eastbound Off-Ramp at N. State College Bl. (#6) – LOS E AM and PM peak hours
- SR-57 Southbound, North of Orangethorpe Av. (#9) – LOS E AM and PM peak hours
- SR-57 Southbound Off-Ramp at Orangethorpe Av. (#10) – LOS E AM and PM peak hours
- SR-57 Northbound Off-Ramp at Orangethorpe Av. (#15) – LOS E AM and PM peak hours

Existing (2020) freeway facility analysis worksheets are provided in Appendix 3.5.

EXHIBIT 3-17: EXISTING (2020) SUMMARY OF LOS

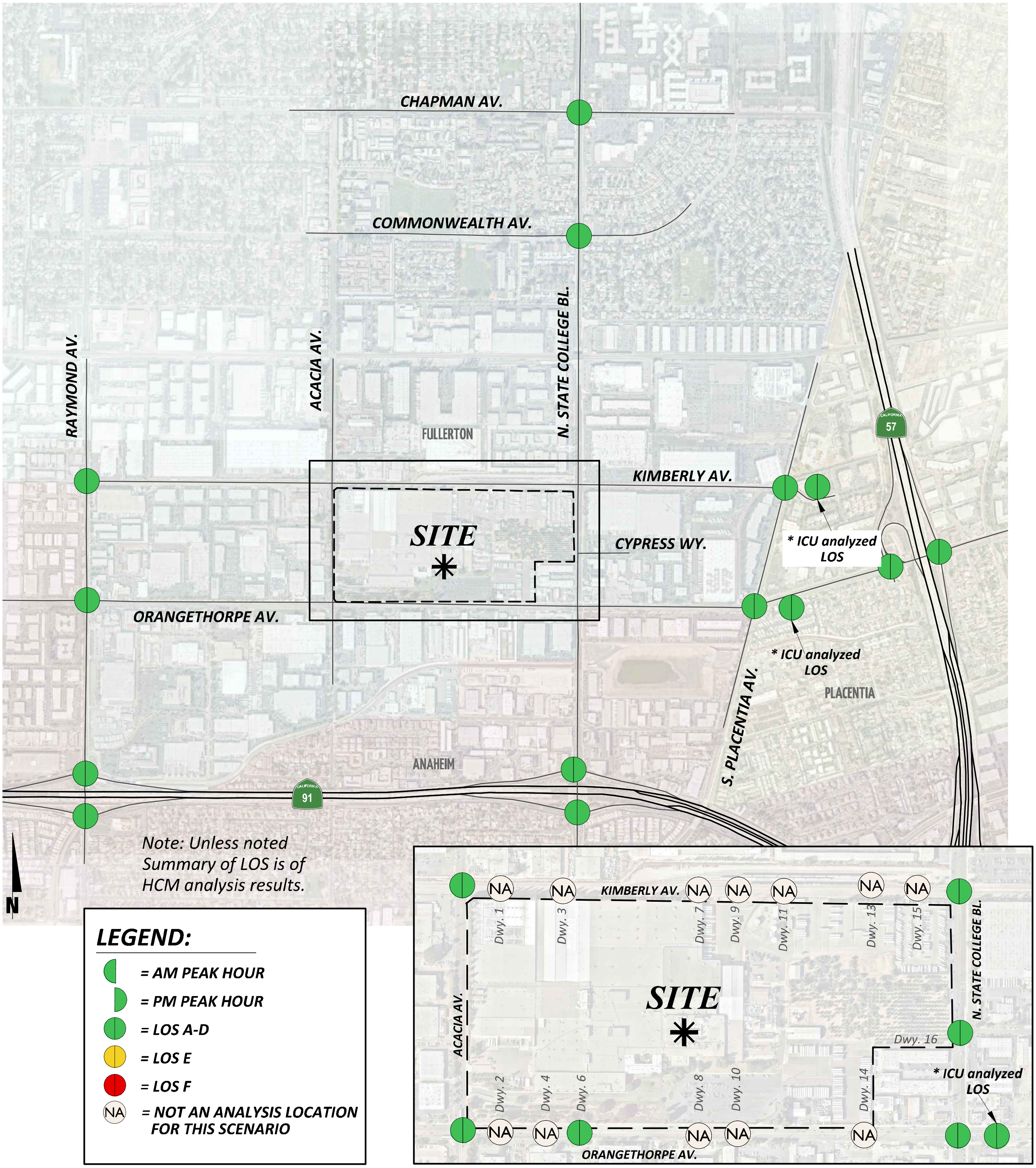
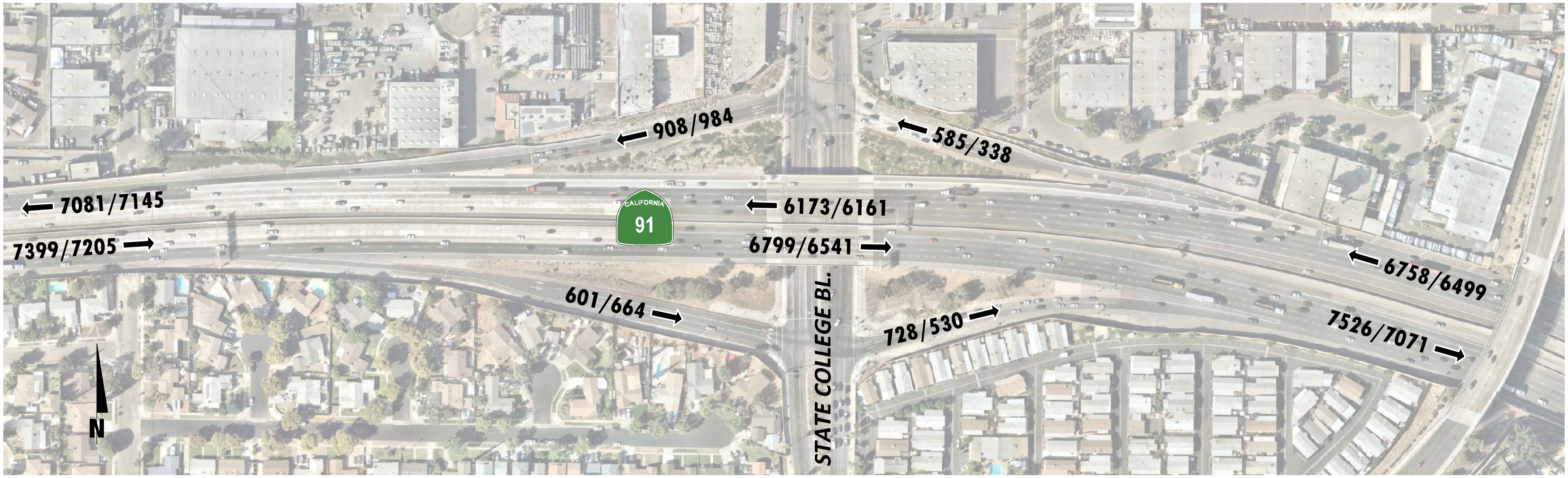


EXHIBIT 3-18: EXISTING (2020) FREEWAY MAINLINE VOLUMES



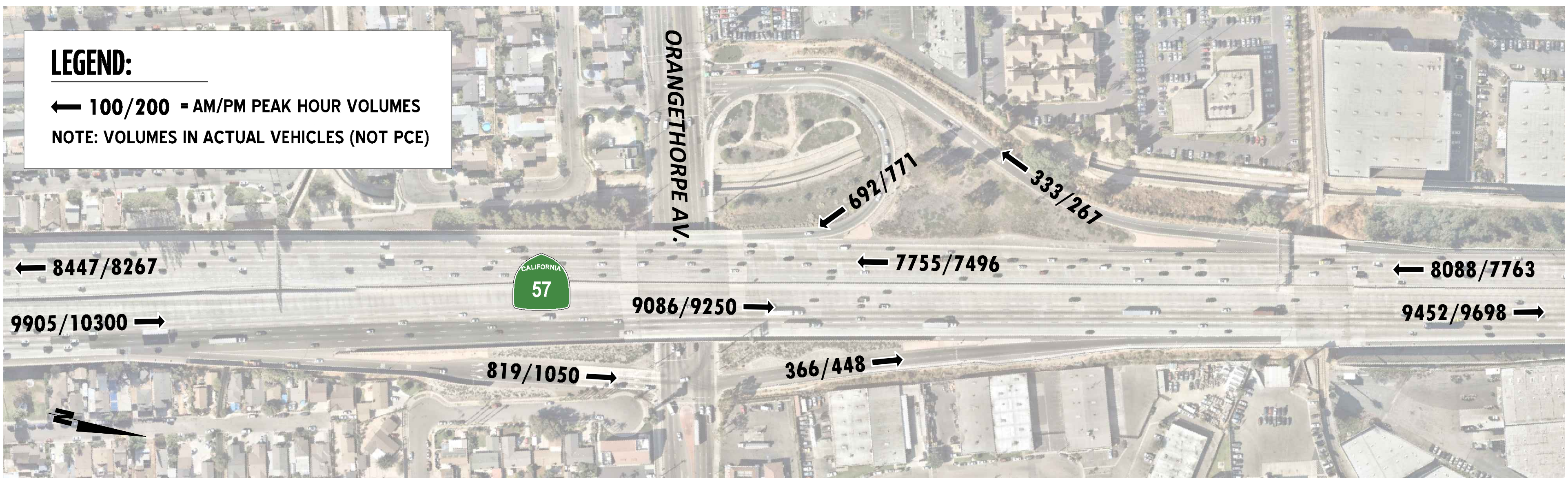


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Table 3-1

Intersection Analysis for Existing (2020) Conditions

#	Intersection	Traffic Control[4]	Intersection Approach Lanes[1]												HCM Delay[2] (secs.)		Level of Service		ICU[3] (v/c)		Level of Service	
			Northbound			Southbound			Eastbound			Westbound										
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
1	Raymond Av. & Kimberly Av.	CSS	0	2	0	0	2	0	0	1	0	1	0	1	21.0	18.2	C	C	Not Applicable[5]			
2	Raymond Av. & Orangethorpe Av.	TS	1	2	0	1	2	1	1	3	0	2	3	0	46.9	40.8	D	D	Not Applicable[5]			
3	Raymond Av. & SR-91 WB Ramps	TS	1	2	0	0	3	1	0	0	0	2	0	1	18.5	15.1	B	B	Not Applicable[5]			
4	Raymond Av. & SR-91 EB Ramps	TS	0	3	1	1	2	0	1	1	0	0	0	0	34.3	49.8	C	D	Not Applicable[5]			
5	Acacia Av. & Kimberly Av.	CSS	1	2	0	1	2	0	1	1	0	1	1	0	15.5	16.3	C	C	Not Applicable[5]			
6	Acacia Av. & Orangethorpe Av.	TS	1	1	1	1	1	1	1	3	0	1	3	0	9.5	11.2	A	B	Not Applicable[5]			
7	Driveway 1 & Kimberly Av.						Future Intersection												Not Applicable[5]			
8	Driveway 2 & Orangethorpe Av.						Future Intersection												Not Applicable[5]			
9	Driveway 3 & Kimberly Av.						Future Intersection												Not Applicable[5]			
10	Driveway 4 & Orangethorpe Av.						Future Intersection												Not Applicable[5]			
12	Driveway 6 & Orangethorpe Av.	CSS	0	1	0	0	0	0	0	3	0	1	3	0	10.7	0.0	B	A	Not Applicable[5]			
13	Driveway 7 & Kimberly Av.						Future Intersection												Not Applicable[5]			
14	Driveway 8 & Orangethorpe Av.						Future Intersection												Not Applicable[5]			
15	Driveway 9 & Kimberly Av.						Future Intersection												Not Applicable[5]			
16	Driveway 10 & Orangethorpe Av.						Future Intersection												Not Applicable[5]			
17	Driveway 11 & Kimberly Av.						Future Intersection												Not Applicable[5]			
18	Driveway 12 & Orangethorpe Av.						Future Intersection												Not Applicable[5]			
19	Driveway 13 & Kimberly Av.						Future Intersection												Not Applicable[5]			
20	Driveway 14 & Orangethorpe Av.						Future Intersection												Not Applicable[5]			
21	Driveway 15 & Kimberly Av.						Future Intersection												Not Applicable[5]			
22	N. State College Bl. & Chapman Av.	TS	1	2	1	2	2	1>	2	2	1	1	2	1	44.3	48.2	D	D	Not Applicable[5]			
23	N. State College Bl. & Commonwealth Av.	TS	1	2	0	1	2	0	1	1	1	1	2	0	25.7	26.0	C	C	Not Applicable[5]			
24	N. State College Bl. & Kimberly Av.	CSS	1	2	0	0	3	0	1	1	0	1	1	0	20.8	21.0	C	C	Not Applicable[5]			
25	N. State College Bl. & Dwy. 16/Cypress Wy.	CSS	1	2	0	1	3	0	0	0	0	0	1	0	11.5	11.3	B	B	Not Applicable[5]			
26	N. State College Bl. & Orangethorpe Av.	TS	1	2	1	1	3	0	1	3	0	1	3	0	35.0	38.7	C	D	0.676	0.710	B	C
27	N. State College Bl. & SR-91 WB Ramps	TS	2	3	0	0	3	0	0	0	0	1	1	1	22.8	17.1	C	B	Not Applicable[5]			
28	N. State College Bl. & SR-91 EB Ramps	TS	0	3	0	2	3	0	1	1	1	0	0	0	20.3	19.2	C	B	Not Applicable[5]			
29	S. Placentia Av. & Kimberly Av.	TS	1	2	0	1	2	0	1	1	0	1	1	0	10.8	13.9	B	B	0.361	0.403	A	A
30	S. Placentia Av. & Orangethorpe Av.	TS	1	2	1	2	2	0	1	3	0	1	3	1	27.8	30.1	C	C	0.485	0.584	A	A
31	SR-57 SB Ramps/Iowa Pl. & Orangethorpe Av.	TS	0	1	0	1	1	0	2	3	0	1	3	1	24.7	18.2	C	B	Not Applicable[5]			
32	SR-57 NB Ramps & Orangethorpe Av.	TS	2	0	1	0	0	0	2	3	0	0	3	0	34.4	24.8	C	C	Not Applicable[5]			

Note: Intersection #11 no longer exists based on the latest site plan.

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right; > = Right Turn Overlap Phasing

2 Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

3 Intersection capacity utilization (ICU) methodology results are presented as a volume-to-capacity ratio.

4 AWS = All Way Stop; CSS = Cross-street Stop; TS = Traffic Signal

5 ICU reported for CMP or City of Placentia intersection only.

Table 3-2

Peak Hour Queuing Summary for Existing (2020) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	95th Percentile Queue (Feet)		Acceptable? [1]	
			AM Peak Hour	PM Peak Hour	AM	PM
Raymond Av. & SR-91 WB Ramps	WBL	940	61	82	Yes	Yes
	WBR	270	384 [2,3]	294 [2]	Yes	No
Raymond Av. & SR-91 EB Ramps	EBL	170	464 [2,3]	269 [3]	Yes	Yes
	EBR	1,060	154	410 [2]	Yes	Yes
N. State College Bl. & SR-91 WB Ramps	WBL	280	161	136	Yes	Yes
	WBL/R	760	80	93	Yes	Yes
	WBR	280	63	49	Yes	Yes
N. State College Bl. & SR-91 EB Ramps	EBL	1,000	216	216	Yes	Yes
	EBL/R	430	185	220	Yes	Yes
	EBR	350	49	55	Yes	Yes
SR-57 SB Ramps & Orangethorpe Av.	SBL	500	225	169	Yes	Yes
	SBL/T/R	1,350	93	78	Yes	Yes
SR-57 NB Ramps & Orangethorpe Av.	NBL	885	86	170	Yes	Yes
	NBR	350	760 [2,3]	461 [3]	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Although 95th percentile queue is anticipated to exceed the available storage for the turn lane, the adjacent through lane has sufficient storage to accommodate any spillover without spilling back and affecting the SR-91 or SR-57 Freeway mainline.

Table 3-3

Freeway Facility Analysis for Existing (2020) Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	Ramp Lane(s)	Density[2]		LOS[3]	
					AM	PM	AM	PM
SR-91 Freeway	Westbound	West of N. State College Bl.	5	--	24.4	23.8	C	C
		Westbound On-Ramp at N. State College Bl.	4	1	20.5	19.8	C	C
		Westbound Off-Ramp at N. State College Bl.	4	1	33.1	29.9	D	D
		East of N. State College Bl.	4	--	31.0	28.1	D	D
	Eastbound	West of N. State College Bl.	4	--	**37.2**	**38.5**	**E**	**E**
		Eastbound Off-Ramp at N. State College Bl.	4	1	**37.0**	**37.9**	**E**	**E**
		Eastbound On-Ramp at N. State College Bl.	4	1	23.4	23.9	C	C
		East of N. State College Bl.	5	--	26.6	26.4	C	D
SR-57 Freeway	Southbound	North of Orangethorpe Av.	4	--	**42.7**	**38.6**	**E**	**E**
		Southbound Off-Ramp at Orangethorpe Av.	4	1	**37.3**	**35.2**	**E**	**E**
		Southbound Loop On-Ramp at Orangethorpe Av.	5	1	21.6	20.3	C	C
		South of Orangethorpe Av.	6	--	24.2	23.0	C	C
	Northbound	North of Orangethorpe Av.	6	--	31.5	31.5	D	D
		Northbound On-Ramp at Orangethorpe Av.	6	1	31.0	31.3	D	D
		Northbound Off-Ramp at Orangethorpe Av.	6	1	**39.7**	**41.3**	**E**	**E**
		South of Orangethorpe Av.	6	--	33.5	34.2	D	D

BOLD = LOS does not meet Caltrans requirements (i.e., unacceptable LOS or LOS E/F).

[1] Number of lanes are in the specified direction and is based on existing conditions.

[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).

[3] LOS = Level of Service

3.11 IMPROVEMENTS

Improvement strategies needed to achieve acceptable LOS (i.e., LOS D or better) at intersections and freeway facilities that have been identified as deficient under Existing (2020) traffic conditions are discussed below.

3.11.1 IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

As shown previously in Table 3-1, there are currently no peak hour intersection operations deficiencies at the study area intersections. As such, no improvements have been recommended.

3.12.2 IMPROVEMENTS TO ADDRESS OFF-RAMP QUEUES

As shown previously in Table 3-2, there are no peak hour queuing issues at the SR-91 Freeway/Raymond Avenue, SR-91 Freeway/N. State College Boulevard, and SR-57 Freeway/Orangethorpe Avenue interchanges. As such, no improvements have been recommended.

3.11.3 IMPROVEMENTS TO ADDRESS DEFICIENCIES ON FREEWAY FACILITIES

At this time, the Caltrans does not have any near-term plans to make capacity enhancements to the SR-91 Freeway or SR-57 Freeway within the study area. All Caltrans projects along the SR-91 and SR-57 Freeways, including but not limited to the Integrated Corridor Management Project, are anticipated to occur after the Project's opening year. As such, no improvements have been recommended to address the Existing deficiencies on the State Highway System (SHS), because additional improvements/enhancements to the SR-91 Freeway and SR-57 Freeway are proposed to occur after the Project buildout year of 2022.

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4 PROJECTED FUTURE TRAFFIC

This section presents the traffic volumes estimated to be generated by the Project, as well as the Project's trip assignment onto the study area roadway network. For purposes of this TA, the Project with the Optional Site Plan is to consist of four buildings totaling 1,609,384 sf (804,692 sf of high-cube fulfillment center use and 804,692 sf of high-cube cold storage warehouse use). The Project is anticipated to be constructed by the year 2022. Vehicular access will be provided via the following driveways:

- Driveway 1 & Kimberly Av.: Passenger cars only
- Driveway 2 & Orangethorpe Av.: Passenger cars only
- Driveway 3 & Kimberly Av.: Passenger cars and trucks
- Driveway 4 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 6 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 7 & Kimberly Av.: Passenger cars and trucks
- Driveway 8 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 9 & Kimberly Av.: Passenger cars and trucks
- Driveway 10 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 11 & Kimberly Av.: Passenger cars only
- Driveway 12 & Orangethorpe Av.: Passenger cars only (Optional Site Plan only)
- Driveway 13 & Kimberly Av.: Passenger cars and trucks
- Driveway 14 & Orangethorpe Av.: Passenger cars and trucks
- Driveway 15 & Kimberly Av.: Passenger cars only
- N. State College Bl. & Driveway 16: Passenger cars and trucks

All Project driveways are proposed to allow for full access with the exception of the passenger car driveway (Driveway 2) on Orangethorpe Avenue, which will be restricted to right-in/right-out access only.

4.1 PROJECT TRIP GENERATION

Trip generation represents the amount of traffic which is produced by a development. Determining traffic generation for a specific project is therefore based upon forecasting the amount of traffic that is expected to be both attracted to and produced by the specific land uses being proposed for a given development. The Institute of Transportation Engineers (ITE) Trip Generation Manual is a nationally recognized source for estimating site-specific trip generation. The trip generation rates used for the Project are based upon data collected by ITE in their Trip Generation Manual (10th Edition, 2017) for the proposed high-cube cold storage warehouse use (ITE Land Use Code 157) and the High Cube Warehouse Trip Generation Study (WSP, January 2019) for the proposed high-cube fulfillment center warehouse use. [3] [4]

4.1.1 EXISTING USE

The site located at 2001 E. Orangethorpe Avenue is currently occupied by Kimberly-Clark Worldwide facility, which includes approximately 1,210,720 sf (418,720 sf for manufacturing and 792,000 sf of warehousing space). The following existing data has been supplied by Kimberly-Clark; however, where AM/PM peak hour splits or inbound/outbound splits are unavailable, the splits identified for the high-cube transload and short-term storage warehouse use (ITE Land Use Code 154) from the ITE Trip Generation Manual has been utilized: [3]

- Passenger Cars: Based on a memo provided by Kimberly-Clark (dated October 24, 2019), the historical average number of employees (305 employees) and contractors (20 contractors) over the last 5 years has been utilized to calculate the baseline passenger car traffic. As such, the daily passenger car traffic calculation is as follows: (305+20) x 2 (inbound and outbound) = 650 trip-ends/day. The current shifts (6AM-2PM, 2PM-10PM, 10PM-6AM) have employees arriving and departing outside of the typical peak hours (7-9 AM and 4-6 PM). As such, there are no employee trips during the morning and evening peak hours. However, nominal trips are included to account for trips associated with contractors that occur during the peak hours.
- Trucks: As there is no historical data available for trucks, no reductions have been taken to account for existing truck activity during the peak hours (reductions for existing trucks have been taken on a daily basis only). Based on information supplied by Kimberly-Clark Worldwide, typical truck activity ranges between 30-50 inbound and outbound trucks with high-volume traffic days occurring 10-20 percent of time (where there could be as many as 80 inbound/outbound trucks per day). As such, the average of 40 inbound and 40 outbound trucks have been accounted for. The estimate of 80 trucks per day is far lower (therefore more conservative) than the number of trucks that would be typically estimated for 418,720 square feet of manufacturing and 792,000 square feet of warehousing use.

As shown on Table 4-1, the existing site currently generates a total of 730 trip-ends per day with 2 AM peak hour trips and 2 PM peak hour trips.

Table 4-1

Existing Trip Generation Summary

Land Use	AM Peak Hour			PM Peak Hour			Daily
	In	Out	Total	In	Out	Total	
Trip Generation Summary (Actual Vehicles)							
Existing: Kimberly Clark Worldwide							
Passenger Cars:	1	1	2	1	1	2	650
Truck Trips:							
2-axle:	0	0	0	0	0	0	0
3-axle:	0	0	0	0	0	0	0
4+-axle:	0	0	0	0	0	0	80
- Truck Trips (Actual)	0	0	0	0	0	0	80
TOTAL TRIPS (Actual) [1]	**1**	**1**	**2**	**1**	**1**	**2**	**730**
Trip Generation Summary (PCE)							
Existing: Kimberly Clark Worldwide							
Passenger Cars:	1	1	2	1	1	2	650
Truck Trips:							
2-axle (PCE = 1.5):	0	0	0	0	0	0	0
3-axle (PCE = 2.0):	0	0	0	0	0	0	0
4+-axle (PCE = 3.0):	0	0	0	0	0	0	240
- Truck Trips (PCE)	0	0	0	0	0	0	240
TOTAL TRIPS (PCE) [1]	**1**	**1**	**2**	**1**	**1**	**2**	**890**

[1] TOTAL TRIPS = Passenger Cars + Truck Trips.

4.1.2 PROPOSED PROJECT

Trip generation rates for the Project are shown on Table 4-2 illustrating daily and peak hour trip generation estimates based on the ITE Trip Generation Manual and the WSP High Cube Warehouse Trip Generation Study were used to estimate the trip generation. The following ITE land use codes and vehicle mixes will be utilized for the Project:

- ITE land use code 157 (High-Cube Cold Storage Warehouse) has been used to derive site specific trip generation estimates for up to 804,692 sf (50% of the total building square footage). High-cube cold storage warehouses include warehouses characterized by the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses. High-cube cold storage warehouses are facilities typified by temperature-controlled environments for frozen food or other perishable products. The High-Cube Cold Storage Warehouse vehicle mix (passenger cars versus trucks) has been obtained from the ITE's Trip Generation Manual Supplement (dated February 2020). This study provides the following vehicle mix: AM Peak Hour: 73.0% passenger cars and 27.0% trucks; PM Peak Hour: 77.0% passenger cars and 23.0% trucks; Weekday Daily: 65.0% passenger cars and 35.0% trucks. The truck percentages were further broken down by axle type per the following South Coast Air Quality Management District (SCAQMD) recommended truck mix for cold-storage warehouses: 2-Axle = 34.7%; 3-Axle = 11.0%; 4+-Axle = 54.3%.
- High-Cube Fulfillment Center Warehouse has been used to derive site specific trip generation estimates for up to 804,692 sf (50% of the total building square footage). The ITE Trip Generation Manual Supplement (February 2020) has trip generation rates for high-cube fulfillment center use for both non-sort and sort facilities (ITE land use code 155). While there is sufficient data to support use of the trip generation rates for non-sort facilities, the sort facility rate appears to be unreliable because they are based on limited data (i.e., one to two surveyed sites). The proposed Project is speculative and whether a non-sort or sort facility end-user would occupy the buildings is not known at this time. Lastly, the ITE Trip Generation Manual recommends the use of local data sources where available. Although not specific to Orange County, the best available source for high-cube fulfilment center use would be the trip-generation statistics published in the High-Cube Warehouse Trip Generation Study (WSP, January 29, 2019) which was commissioned by the Western Riverside Council of Governments (WRCOG) in support of the Transportation Uniform Mitigation Fee (TUMF) update in the County of Riverside. The WSP trip generation rates were published in January 2019 and are based on data collected at 11 local high-cube fulfillment center sites located throughout Southern California (specifically Riverside County and San Bernardino County). However, the WSP study does not include a split for inbound and outbound vehicles, as such, the inbound and outbound splits per the ITE Trip Generation Manual for ITE Land Use Code 154 have been utilized. The truck percentages were further broken down by axle type per the WSP Study: 2-4 Axle = 42.1% AM, 52.4% PM, 42.7% Daily and 5+-Axle = 57.9% AM, 47.6% PM, and 57.3% Daily.

As noted on Table 4-2, refinements to the raw trip generation estimates have been made to provide a more detailed breakdown of trips between passenger cars and trucks. Trip generation for heavy trucks was further broken down by truck type (or axle type). The total truck percentage is comprised of 3 different truck types: 2-axle, 3-axle, and 4+-axle trucks.

Table 4-2

Trip Generation Rates

Land Use[1]	Units[2]	ITE LU Code	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily
Actual Vehicle Trip Generation Rates									
High-Cube Fulfillment Center Warehouse[3]	TSF	--	0.094	0.028	0.122	0.046	0.119	0.165	2.129
Passenger Cars			0.079	0.024	0.103	0.040	0.104	0.144	1.750
2-4 Axle Trucks			0.006	0.002	0.008	0.003	0.008	0.011	0.162
5+-Axle Trucks			0.008	0.003	0.011	0.003	0.007	0.010	0.217
High-Cube Cold Storage Warehouse[4]	TSF	157	0.085	0.025	0.110	0.032	0.088	0.120	2.120
Passenger Cars (AM-73.0%; PM-77.0%; Daily-65.0%)			0.062	0.018	0.080	0.025	0.067	0.092	1.378
2-Axle Trucks (AM-9.37%; PM-7.98%; Daily-12.15%)			0.008	0.002	0.010	0.003	0.007	0.010	0.257
3-Axle Trucks (AM-2.97%; PM-2.53%; Daily-3.85%)			0.003	0.001	0.003	0.001	0.002	0.003	0.082
4-Axle+ Trucks (AM-14.66%; PM-12.49%; Daily-19.01%)			0.012	0.004	0.016	0.004	0.011	0.015	0.403
Passenger Car Equivalent (PCE) Trip Generation Rates[5]									
High-Cube Fulfillment Center Warehouse[3]	TSF	--	0.094	0.028	0.122	0.046	0.119	0.165	2.129
Passenger Cars			0.079	0.024	0.103	0.040	0.104	0.144	1.750
2-4 Axle Trucks (PCE = 2.0)			0.012	0.004	0.016	0.006	0.016	0.022	0.324
5+-Axle Trucks (PCE = 3.0)			0.025	0.008	0.033	0.008	0.022	0.030	0.651
High-Cube Cold Storage Warehouse[4]	TSF	157	0.085	0.025	0.110	0.032	0.088	0.120	2.120
Passenger Cars			0.062	0.018	0.080	0.025	0.067	0.092	1.378
2-Axle Trucks (PCE = 1.5)			0.012	0.004	0.015	0.004	0.010	0.014	0.386
3-Axle Trucks (PCE = 2.0)			0.005	0.002	0.007	0.002	0.004	0.006	0.163
4-Axle+ Trucks (PCE = 3.0)			0.037	0.011	0.048	0.012	0.033	0.045	1.209

[1] Trip Generation Source: Institute of Transportation Engineers (ITE), Trip Generation Manual, Tenth Edition (2017).
High Cube Warehouse Trip Generation Study, WSP, January 29, 2019.

[2] TSF = thousand square feet

[3] Vehicle Mix Source: High Cube Warehouse Trip Generation Study, WSP, January 29, 2019.
Inbound and outbound split source: ITE Trip Generation Manual, Tenth Edition (2017) for ITE Land Use Code 154.

[4] Vehicle Mix Source: ITE Trip Generation Handbook Supplement (2020), Appendix C.
Truck Mix: South Coast Air Quality Management District's (SCAQMD) recommended truck mix, by axle type.
Normalized % - With Cold Storage: 34.7% 2-Axle trucks, 11.0% 3-Axle trucks, 54.3% 4-Axle trucks.

[5] PCE factors are: 1.5 for 2-axle, 2.0 for 3-axle, and 3.0 for 4+-Axle.

PCE factors have been applied to the trip generation rates for heavy trucks (large 2-axles, 3-axles, 4+-axles). Consistent with standard traffic engineering practice in Southern California, PCE factors have been utilized due to the expected heavy truck component for the proposed Project land use. PCE factors allow the typical “real-world” mix of vehicle types to be represented as a single, standardized unit, such as the passenger car, for the purposes of capacity and level of service analyses. PCE factors are applied to large truck types such as large two-axles, three-axles, 4+-axles. A PCE factor of 1.5 has been applied to large 2-axle trucks, a factor of 2.0 for 3-axle trucks and a factor of 3.0 for 4+-axle trucks.

The Project is estimated to generate a total of 3,422 trip-ends per day with 187 AM peak hour trips and 228 PM peak hour trips as shown on Table 4-3. Considering the trips associated with the existing use, the net new trips are 2,692 trip-ends per day with 185 AM peak hour trips and 226 PM peak hour trips. The net new trips will be evaluated for the purposes of this TA as the existing trips are reflect in the ground counts.

4.2 PROJECT TRIP DISTRIBUTION

Trip distribution is the process of identifying the probable destinations, directions or traffic routes that will be utilized by Project traffic. The potential interaction between the planned land use and surrounding regional access routes are considered to identify the route where the Project traffic would distribute. The Project trip distribution was developed based on anticipated travel patterns to and from the Project site. The existing roadway network and location of regional destinations have been reviewed to develop the Project trip distribution pattern. Exhibit 4-1 illustrates the truck trip distribution patterns for the Project and Exhibit 4-2 illustrates the passenger trip distribution patterns for the Project.

4.3 MODAL SPLIT

The traffic reducing potential of public transit, walking or bicycling have not been considered in this TA, in an effort to conduct a conservative analysis.

4.4 PROJECT TRIP ASSIGNMENT

The assignment of traffic from the Project area to the adjoining roadway system is based upon the Project trip generation, trip distribution, and the arterial highway and local street system improvements that would be in place by the time of initial occupancy of the Project. Based on the identified Project traffic generation and trip distribution patterns, Project AM and PM peak hour traffic volumes are shown on Exhibit 4-3.

Table 4-3

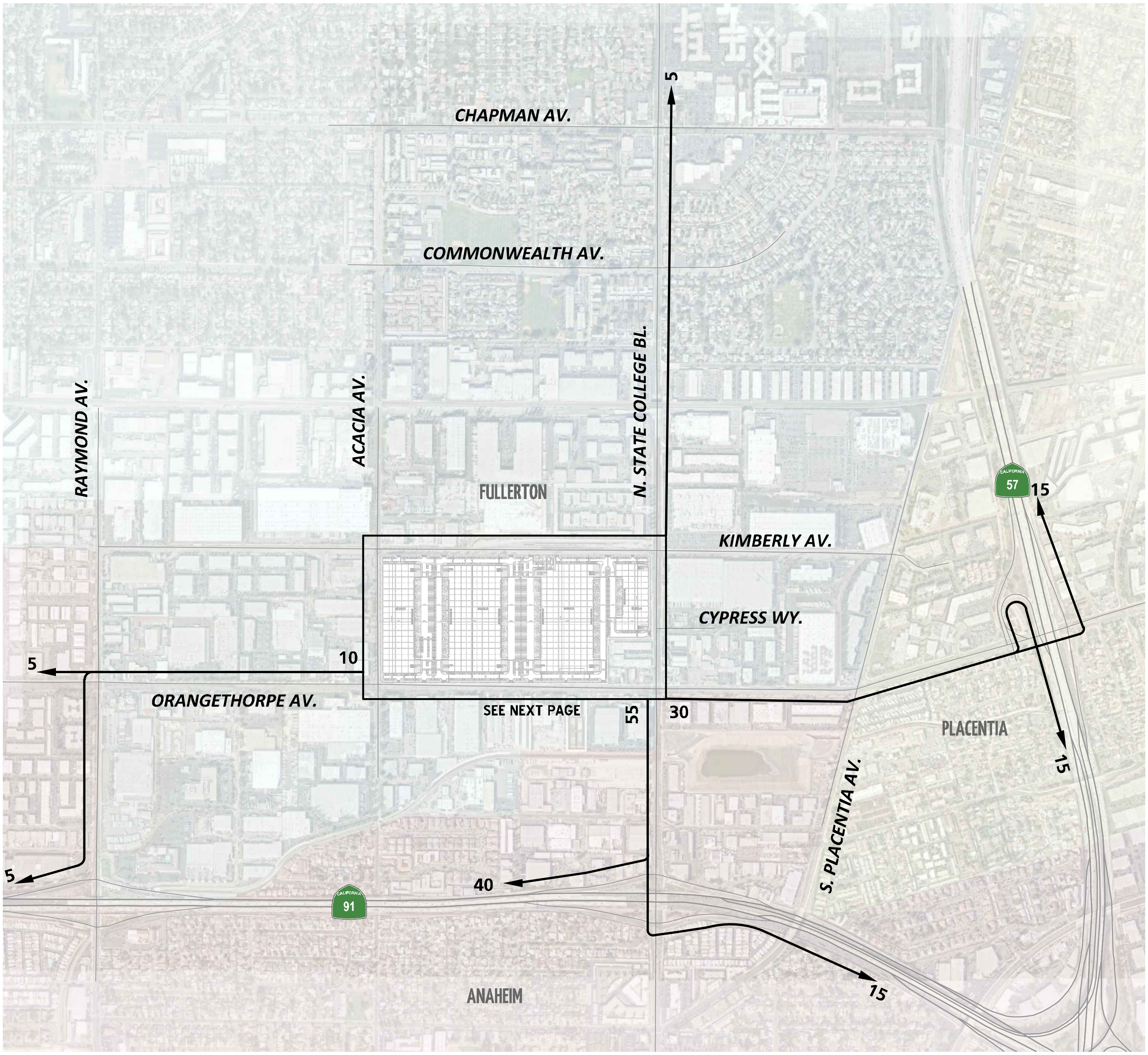
Project Trip Generation Summary

Land Use	Quantity	Units[1]	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total	Daily
Project Trip Generation Summary (Actual Vehicles)									
High-Cube Cold Storage	804.692	TSF							
Passenger Cars:			50	15	65	20	54	74	1,110
Truck Trips:									
2-axle:			6	2	8	2	6	8	208
3-axle:			2	1	3	1	2	3	66
4+-axle:			10	3	13	3	9	12	324
- Truck Trips			18	6	24	6	17	23	598
SUBTOTAL TRIPS (Actual) [2]			68	21	89	26	71	97	1,708
High-Cube Fulfillment	804.692	TSF							
Passenger Cars:			64	19	83	32	83	115	1,408
Truck Trips:									
2-4 axle:			5	1	6	2	6	8	130
5+-axle:			7	2	9	2	6	8	176
- Truck Trips			12	3	15	4	12	16	306
SUBTOTAL TRIPS (Actual) [2]			76	22	98	36	95	131	1,714
Passenger Cars			114	34	148	52	137	189	2,518
Trucks (Actual)			30	9	39	10	29	39	904
Subtotal Trips (Actual) [2]			**144**	**43**	**187**	**62**	**166**	**228**	**3,422**
Existing Trips (See Table 4-1)			**1**	**1**	**2**	**1**	**1**	**2**	**730**
NET NEW TRIPS (Actual) [2]			**143**	**42**	**185**	**61**	**165**	**226**	**2,692**
Project Trip Generation Summary (PCE)									
High-Cube Cold Storage	804.692	TSF							
Passenger Cars:			50	15	65	20	54	74	1,110
Truck Trips:									
2-axle:			10	3	13	3	8	11	311
3-axle:			4	1	5	1	4	5	132
4+-axle:			30	9	39	10	26	36	973
- Truck Trips			44	13	57	14	38	52	1,416
SUBTOTAL TRIPS (PCE) [2]			94	28	122	34	92	126	2,526
High-Cube Fulfillment	804.692	TSF							
Passenger Cars:			64	19	83	32	83	115	1,408
Truck Trips:									
2-4 axle:			10	3	13	5	13	18	262
5+-axle:			20	6	26	7	17	24	524
- Truck Trips			30	9	39	12	30	42	786
SUBTOTAL TRIPS (PCE) [2]			94	28	122	44	113	157	2,194
Passenger Cars			114	34	148	52	137	189	2,518
Trucks (PCE)			74	22	96	26	68	94	2,202
Subtotal Trips (PCE) [2]			**188**	**56**	**244**	**78**	**205**	**283**	**4,720**
Existing Trips (See Table 4-1)			**1**	**1**	**2**	**1**	**1**	**2**	**890**
NET NEW TRIPS (PCE) [2]			**187**	**55**	**242**	**77**	**204**	**281**	**3,830**

[1] TSF = thousand square feet

[2] TOTAL TRIPS = Passenger Cars + Truck Trips.

EXHIBIT 4-1 (1OF2): PROJECT (TRUCK) INBOUND AND OUTBOUND TRIP DISTRIBUTION

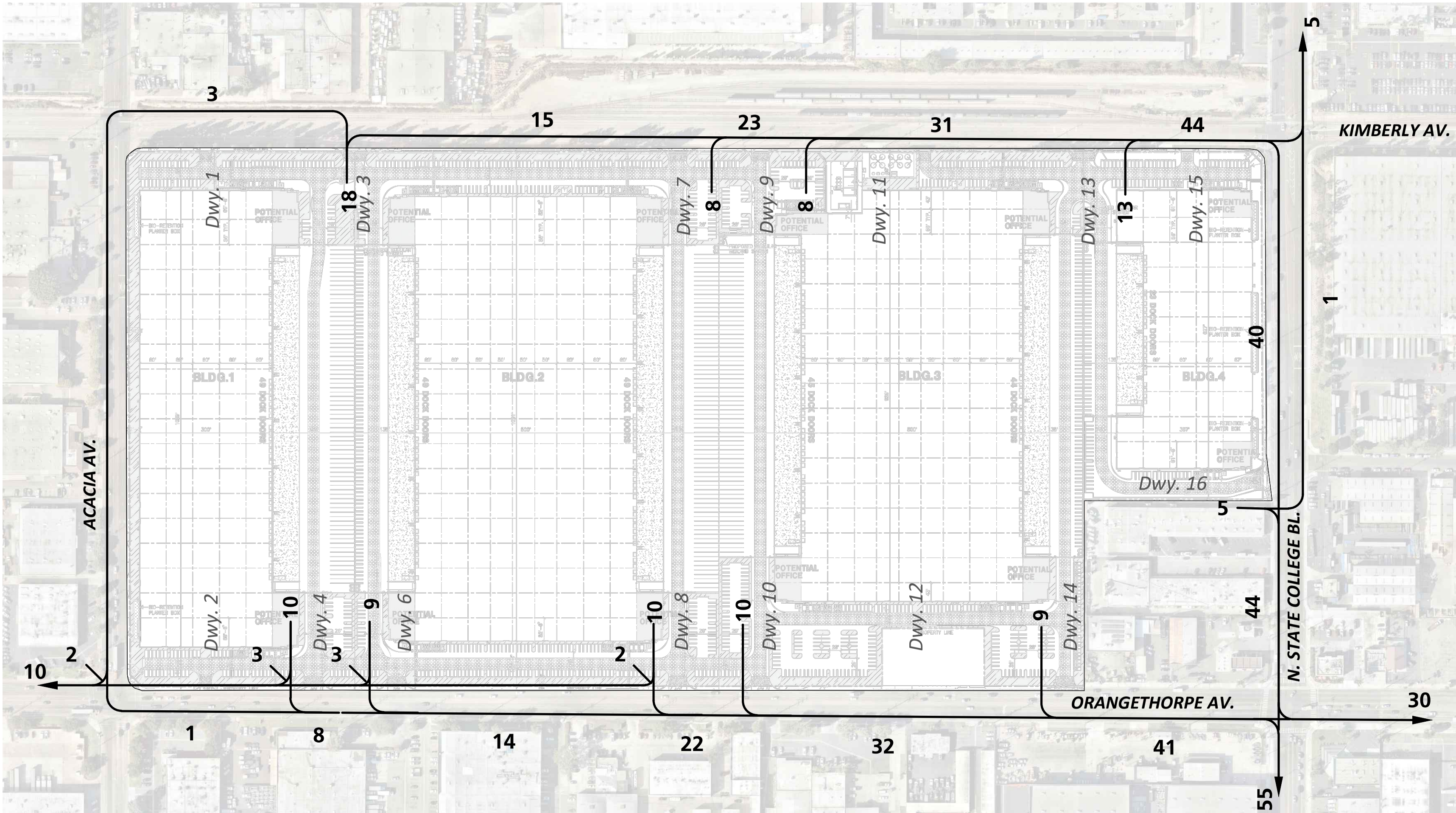


LEGEND:

10 = PERCENT TO/FROM PROJECT

N

EXHIBIT 4-1 (2OF2): PROJECT (TRUCK) INBOUND AND OUTBOUND TRIP DISTRIBUTION



LEGEND:

10 = PERCENT TO/FROM PROJECT

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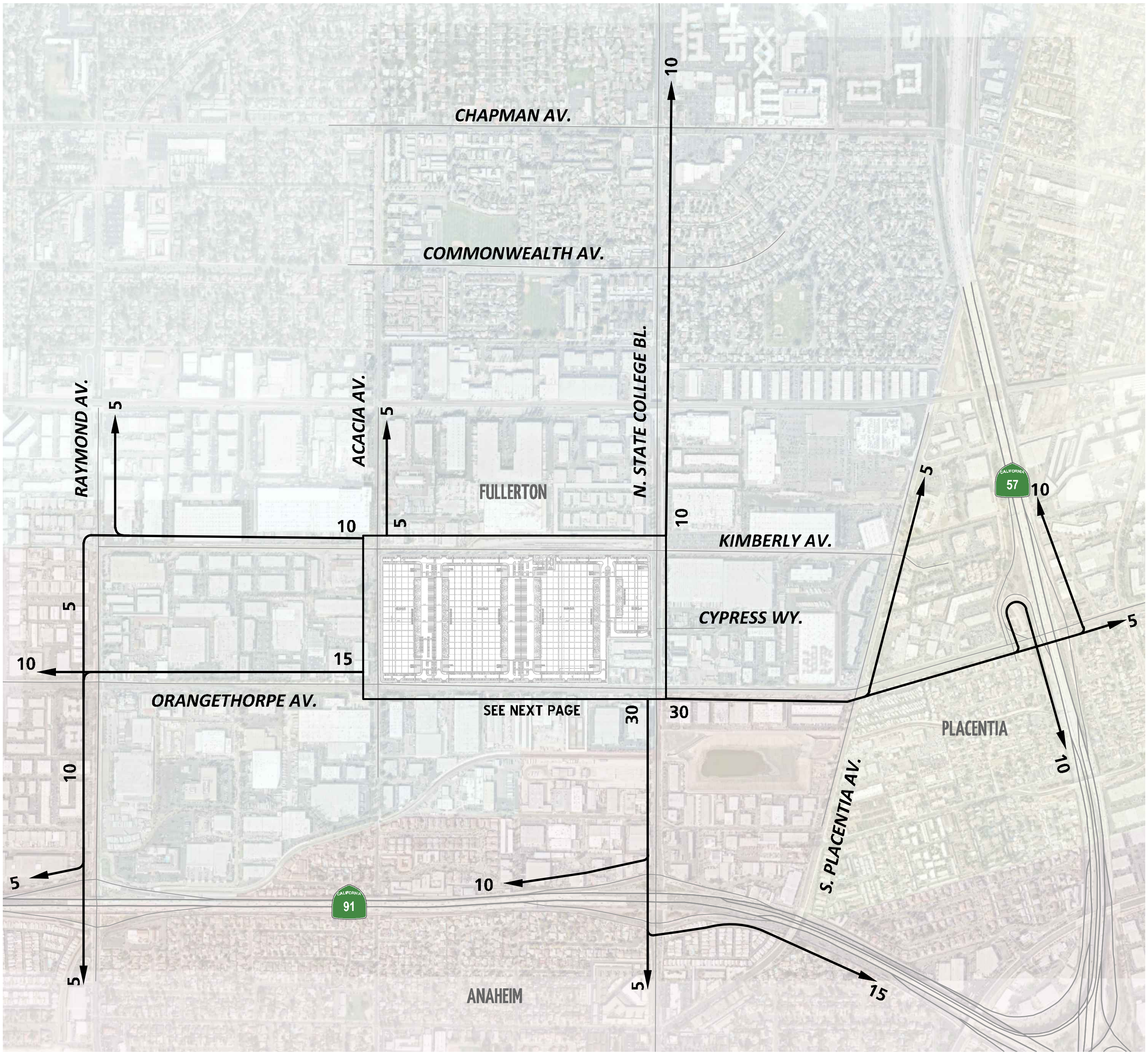
EXHIBIT 4-2 (1OF3): PROJECT (PASSENGER CAR) INBOUND AND OUTBOUND TRIP DISTRIBUTION

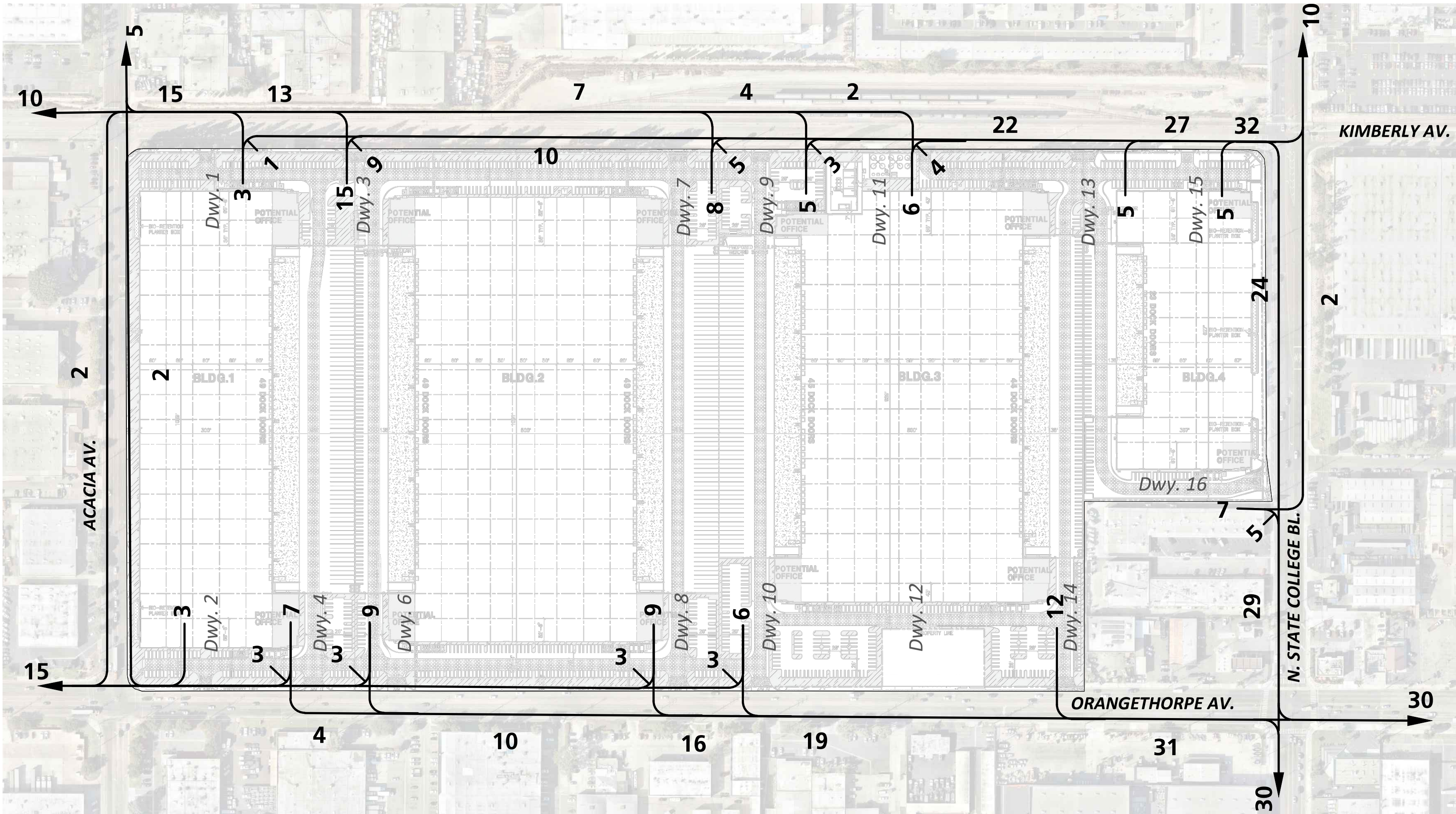


LEGEND:

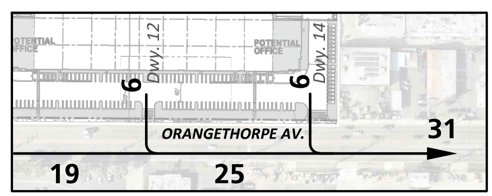
10 *= PERCENT TO/FROM PROJECT*

N

Exhibit 4-2 (2of3): Project (Passenger Car) Outbound Trip Distribution



OPTIONAL SITE PLAN



LEGEND:

10 = PERCENT FROM PROJECT

N

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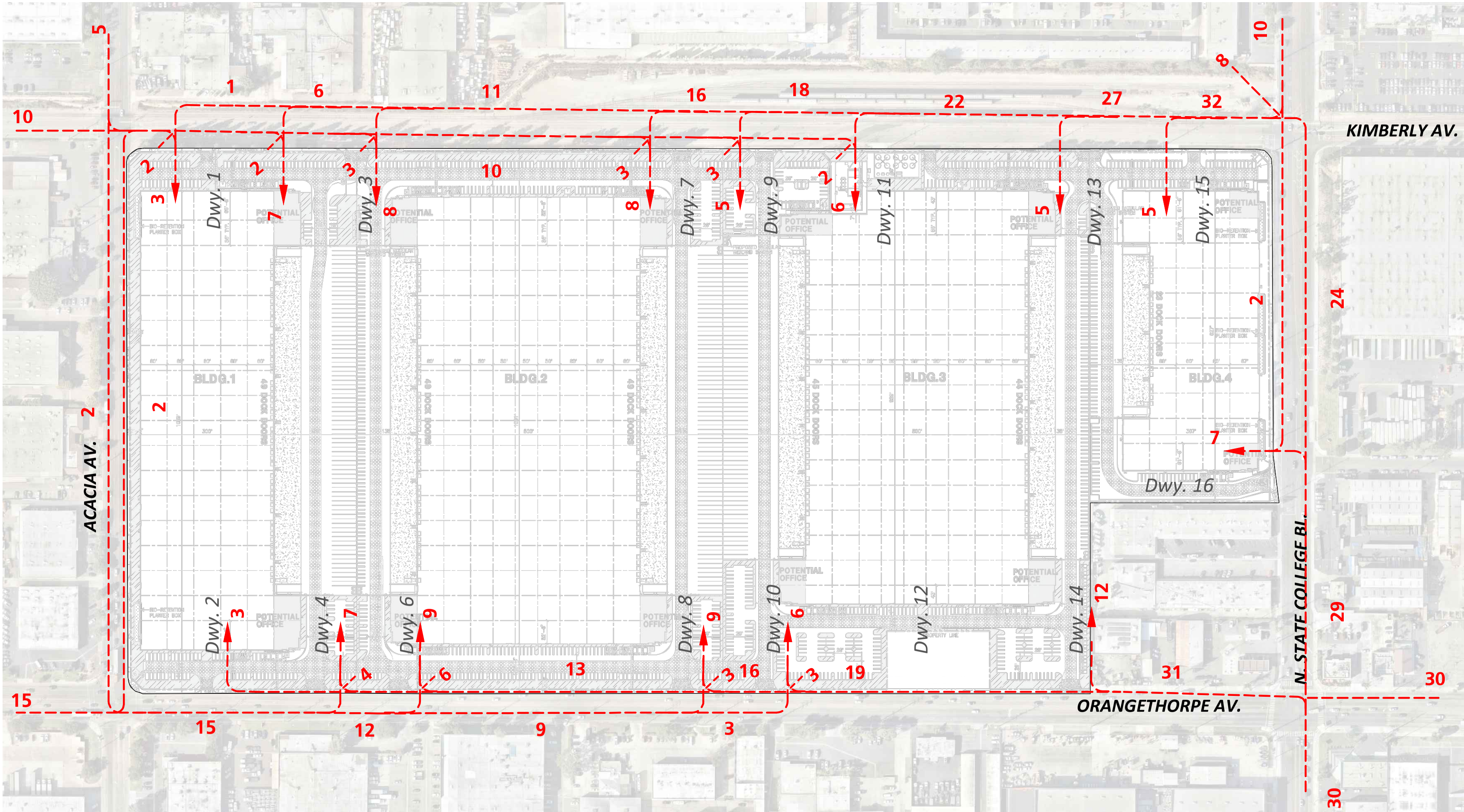
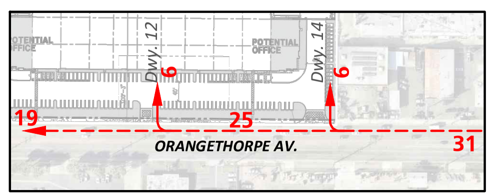
EXHIBIT 4-2 (3OF3): PROJECT (PASSENGER CAR) INBOUND TRIP DISTRIBUTION



OPTIONAL SITE PLAN



LEGEND:

10 = PERCENT TO PROJECT

N

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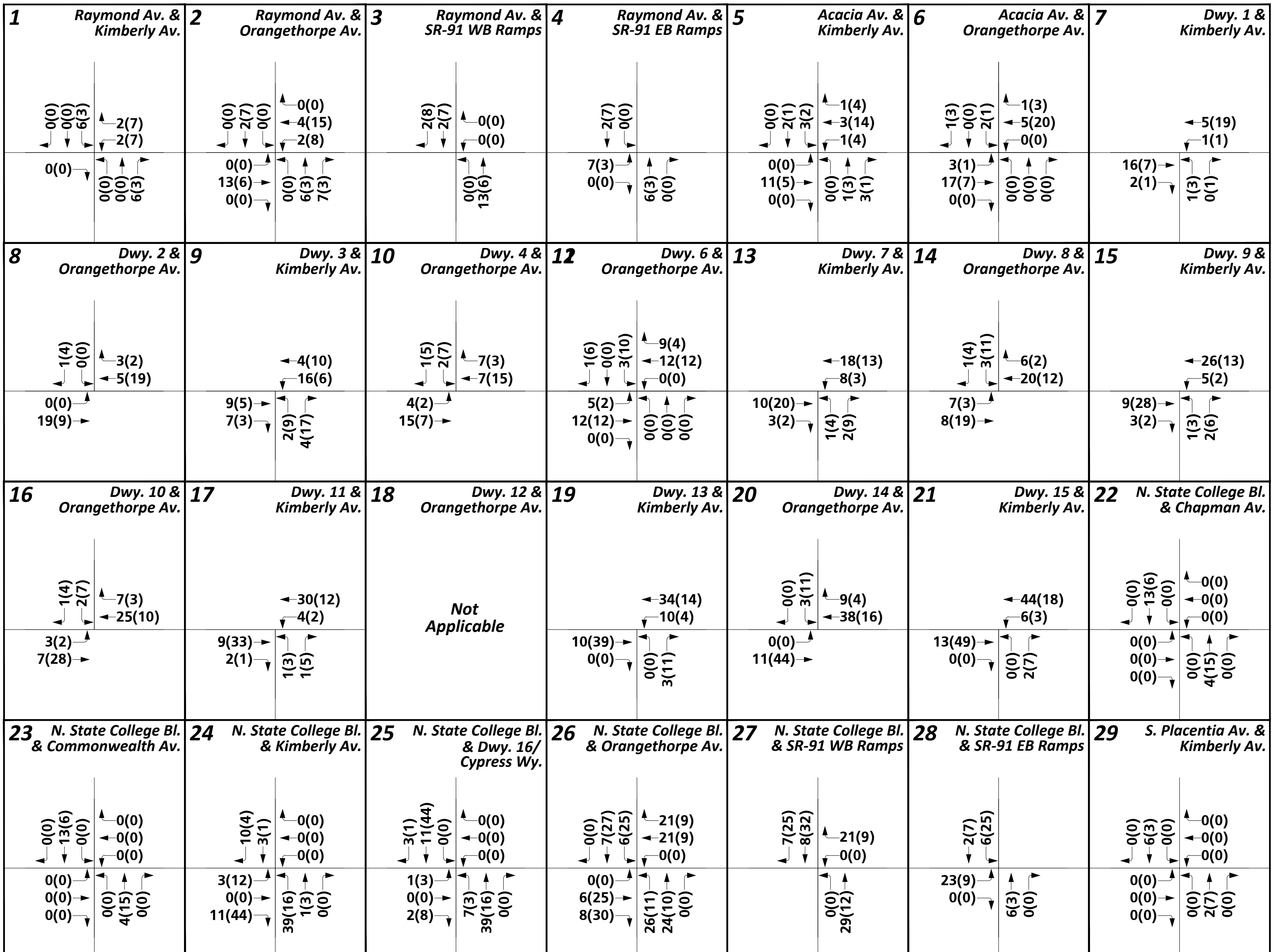
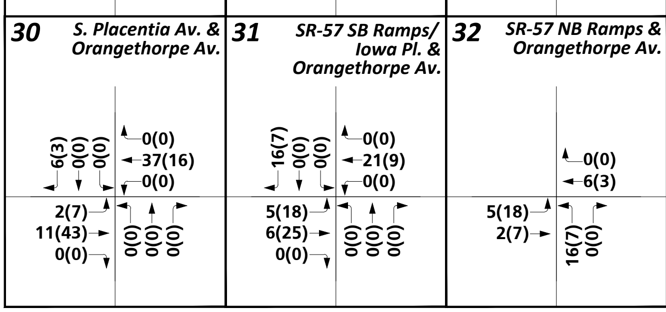
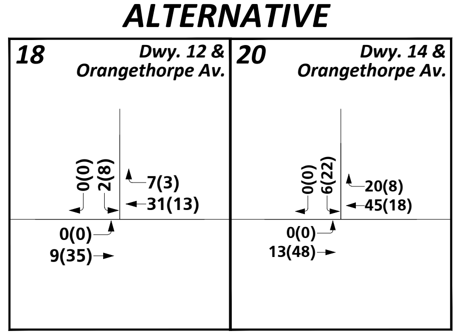
EXHIBIT 4-3: PROJECT ONLY TRAFFIC VOLUMES





ALTERNATIVE



LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

N

4.5 BACKGROUND TRAFFIC

The Opening Year Cumulative conditions analysis determines the Project's contribution to near-term traffic deficiencies based on a comparison of the "With Project" traffic scenario to the "Without Project" traffic scenario. To account for background traffic growth, traffic associated with other known cumulative development projects in conjunction with an ambient growth from Existing (2020) conditions of 2.01% (1.0% per year over two years) is included for Opening Year Cumulative, as well as traffic generated by cumulative projects that could affect the study intersections.

The Southern California Association of Governments (SCAG) 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) growth forecasts for the City of Fullerton identifies projected growth in population of 141,900 in 2016 to 158,300 in 2045, or a 11.56% increase over the 29-year period. The change in population equates to roughly a 0.38 percent growth rate compounded annually. Similarly, growth over the same 29-year period in households is projected to increase by 14.0 percent, or 0.45 percent growth rate, compounded annually. Finally, growth in employment over the same 29-year period is projected to increase by 35.1 percent, or a 1.04 percent annual growth rate. The average annual growth rate between population, households, and employment is 0.62 percent per year. The Draft 2020-2045 RTP/SCS is anticipated to be adopted by the Regional Council in September 2020. As such, the 1.0 percent per year ambient growth rate is more conservative than both the current and proposed RTP/SCS data for the City.

4.6 CUMULATIVE DEVELOPMENT TRAFFIC

Exhibit 4-4 illustrates the cumulative development location map. A summary of cumulative development projects and their proposed land uses are shown in Table 4-4. The list of cumulative projects has been developed based on information provided by the Planning Departments for the City of Fullerton, City of Placentia, and City of Anaheim. If applicable (i.e. if the cumulative projects would contribute trips to study area intersections), the traffic generated by individual cumulative projects was manually added to the Opening Year Cumulative forecasts to ensure that traffic generated by the listed cumulative development projects in Table 4-3 are reflected as part of the background traffic. Cumulative AM and PM peak hour traffic volumes are shown on Exhibit 4-5. Some cumulative projects shown may not have an active application but have been included for disclosure purposes if traffic from the known project is anticipated to contribute traffic to a study area intersection.

EXHIBIT 4-4: CUMULATIVE DEVELOPMENT LOCATION MAP

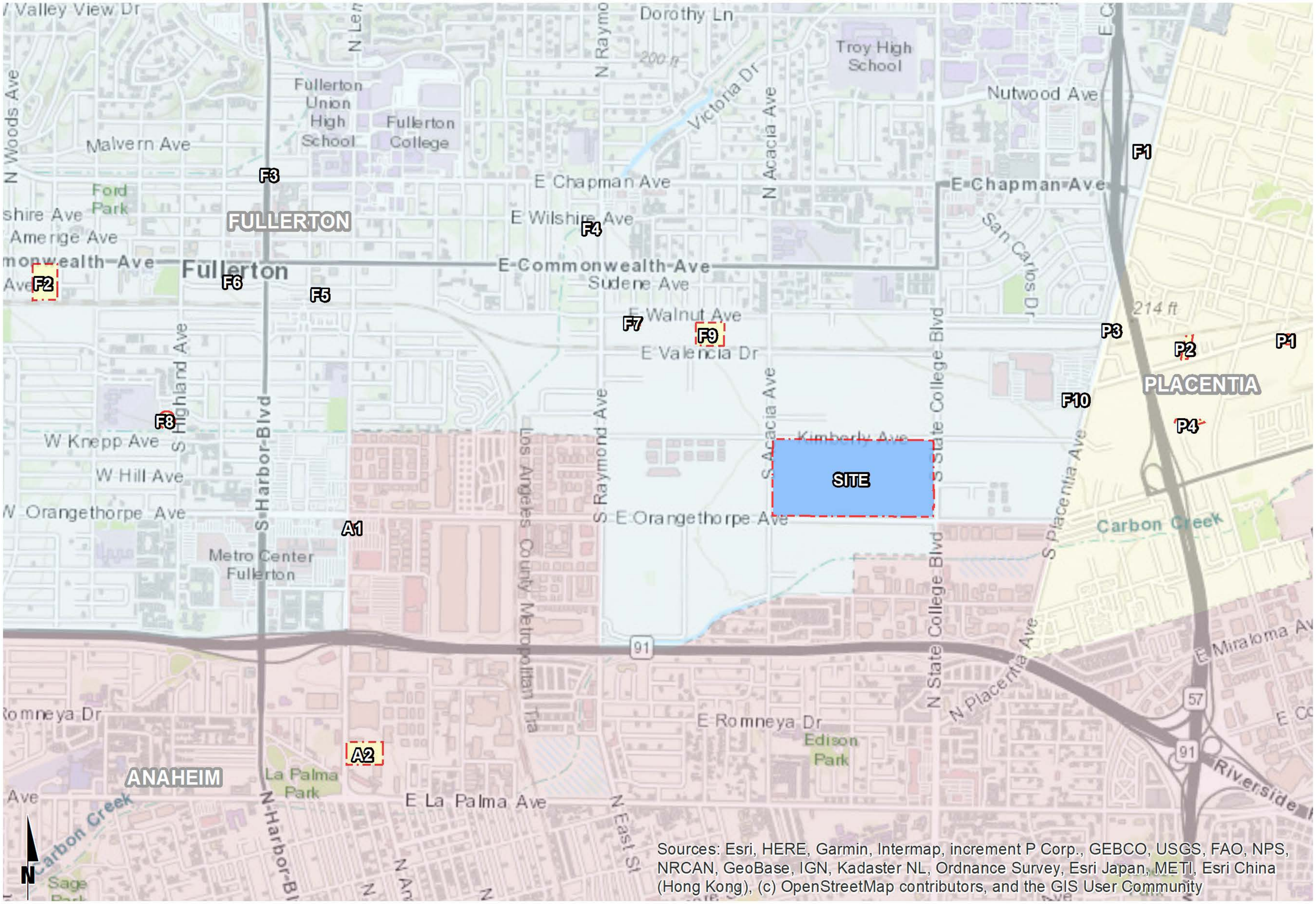


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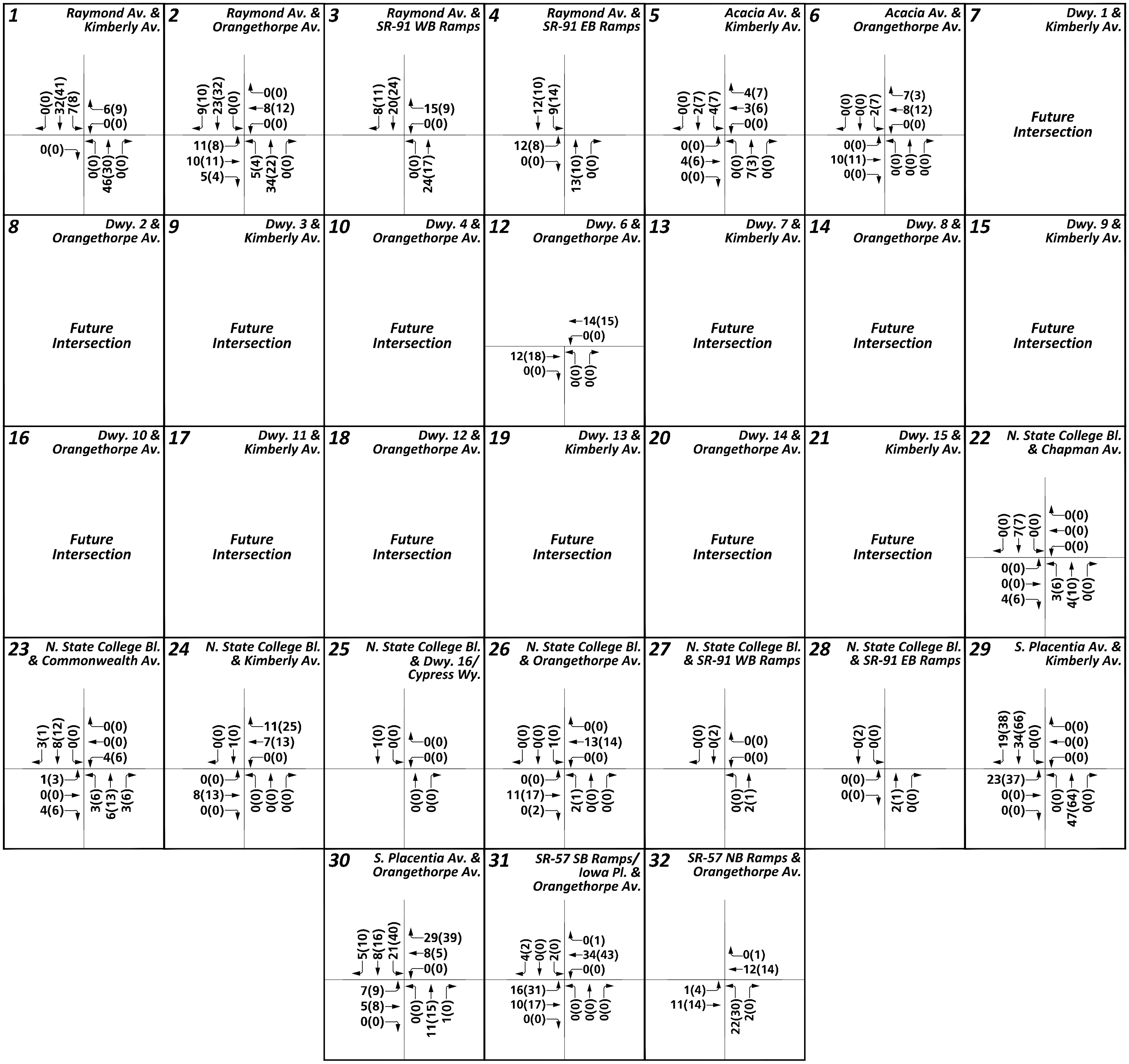
EXHIBIT 4-5: CUMULATIVE ONLY TRAFFIC VOLUMES



LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

N

Table 4-4

Cumulative Development Land Use Summary

#	Project/Location	Land Use	Quantity	Units[1]
City of Fullerton				
F1	Fullerton Crossings: 601-629 S. Placentia Av.	Major Retail & Shops	85.758	TSF
F2	Amplifi Apartments: 600 W. Commonwealth Av.	Multifamily (Mid-Rise) Residential	290	DU
F3	Fox Block Mixed-Use: N Harbor Bl. & W. Chapman Av.	Fox Tea Room Retail, Alley, Mixed-Use (office, residential), Public Parking	4.440	Acres
F4	Convenience Store: 181 N. Raymond Av.	Convenience Store	4.060	TSF
F5	Parkwest Hotel: 212 E. Santa Fe Av.	Hotel	125	Rooms
F6	139-147 W. Santa Fe Av.	Restaurant	20.938	TSF
F7	1250 E. Walnut Av.	Warehouse	36.750	TSF
F8	Melia Homes: 805-807 S. Highland Av.	Multifamily (Low-Rise) Residential	19	DU
F9	1500 E. Walnut Av.	Warehouse	79.800	TSF
		Manufacturing	40.000	TSF
F10	Farmer Boys: 663 S. Placentia Av.	Fast-Food Restaurant w/ Drive-Thru	3.207	TSF
City of Placentia				
P1	VTM 18118: 110-132 E. Crowther Av.	Multifamily (Mid-Rise) Residential	215	DU
P2	DPR 2018-04: 505 W. Crowther Av.	Multifamily (Mid-Rise) Residential	418	DU
P3	DPR 2018-06: 380 S. Placentia Av.	Hotel	116	Rooms
P4	DPR 2019-01: 719 1/2 Monroe Wy.	General Light Industrial	7.600	TSF
City of Anaheim				
A1	7-11 (DEV 2020-00081): 30 E. Orangethorpe Av.	Convenience Store	3.060	TSF
A2	The Renaissance: 1122 N. Anaheim Bl.	Multifamily (Mid-Rise) Residential	269	DU

[1] TSF = Thousand Square Feet; DU = Dwelling Units

5 OPENING YEAR CUMULATIVE (2022) TRAFFIC CONDITIONS

This section discusses the methods used to develop Opening Year Cumulative Without and With Project traffic forecasts, and the resulting intersection operations, traffic signal warrant, off-ramp queuing, and freeway facility analyses.

5.1 ROADWAY IMPROVEMENTS

The lane configurations and traffic controls assumed to be in place for Opening Year Cumulative conditions are consistent with those shown previously on Exhibit 3-1, with the exception of the Project driveway and those facilities that will be constructed by the Project to provide site access (as noted in Section 1.1 and Section 1.2), which would be in place for Opening Year Cumulative traffic conditions.

5.2 OPENING YEAR CUMULATIVE WITHOUT PROJECT TRAFFIC VOLUME FORECASTS

The weekday AM and PM peak hour volumes which can be expected for Opening Year Cumulative (2022) Without Project traffic conditions are shown on Exhibit 5-1.

5.3 OPENING YEAR CUMULATIVE WITH PROJECT TRAFFIC VOLUME FORECASTS

The weekday AM and PM peak hour volumes which can be expected for Opening Year Cumulative (2022) With Project traffic conditions are shown on Exhibit 5-2.

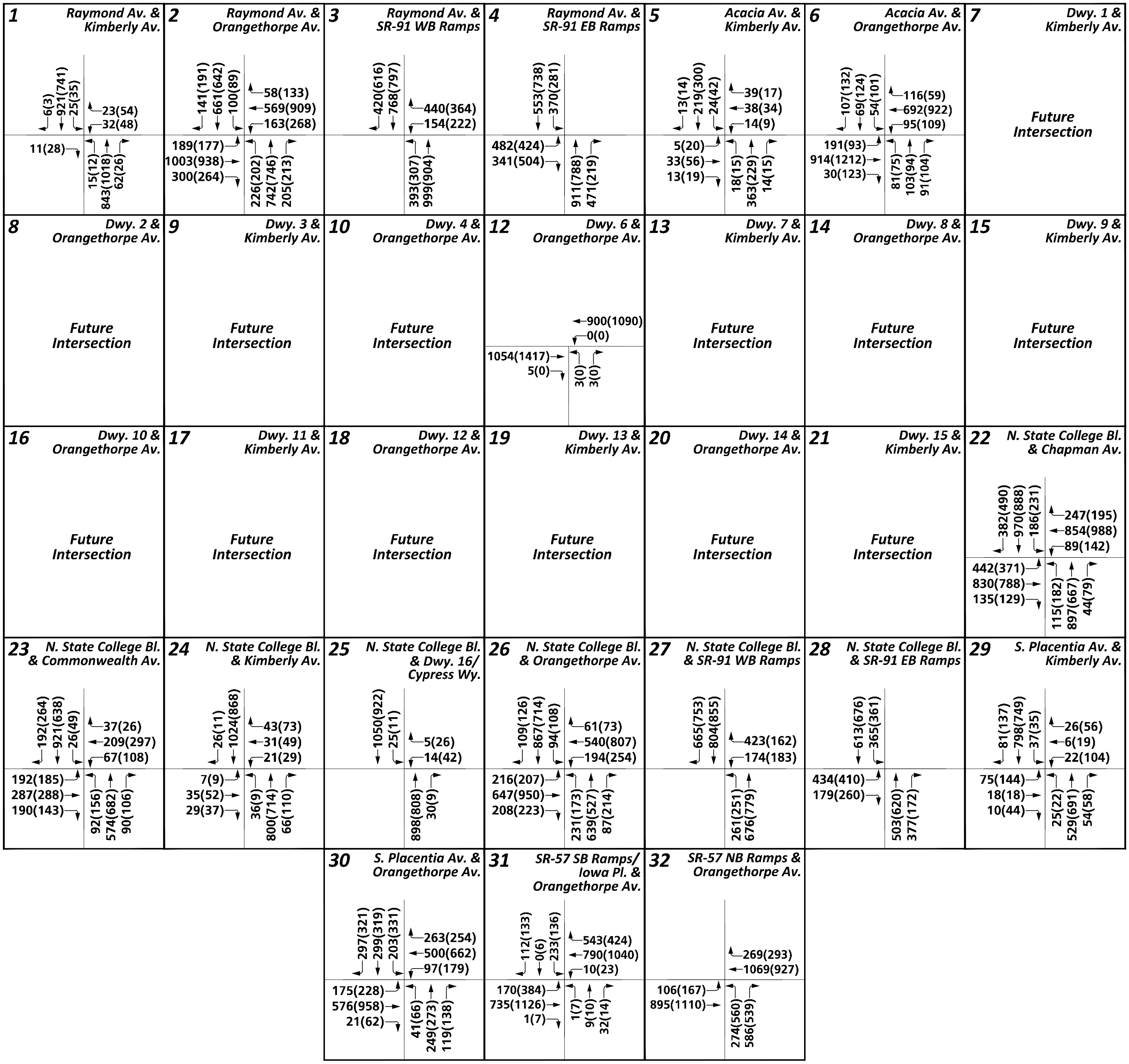
5.4 INTERSECTION OPERATIONS ANALYSIS

LOS calculations were conducted for the study intersections to evaluate their operations under Opening Year Cumulative Without Project conditions, with roadway and intersection geometrics consistent with Section 5.1 *Roadway Improvements*. As shown in Table 5-1, the study area intersections are anticipated to continue to operate at an acceptable LOS during the peak hours for Opening Year Cumulative (2022) Without Project traffic conditions. The addition of Project traffic is anticipated to result in a deficiency at the following intersection:

- N. State College Bl. & Kimberly Av. (#24) – LOS F AM peak hour; LOS E PM peak hour

In other words, the intersection of N. State College Boulevard and Kimberly Avenue is anticipated to operate at acceptable LOS without the Project and would result in deficient peak hour operations with the addition of Project traffic. The deficiency is related to high delays for the eastbound left turn lane, which is occurring from the side-street with a stop-control. A summary of the peak hour intersection LOS for Opening Year Cumulative Without and With Project conditions are shown on Exhibits 5-3 and 5-4, respectively. The intersection operations analysis worksheets for Opening Year Cumulative Without and With Project traffic conditions are included in Appendix 5.1 and Appendix 5.2 of this TA, respectively.

EXHIBIT 5-1: OPENING YEAR CUMULATIVE (2022) WITHOUT PROJECT TRAFFIC VOLUMES



LEGEND:

10(10) *= AM(PM) PEAK HOUR INTERSECTION VOLUMES*

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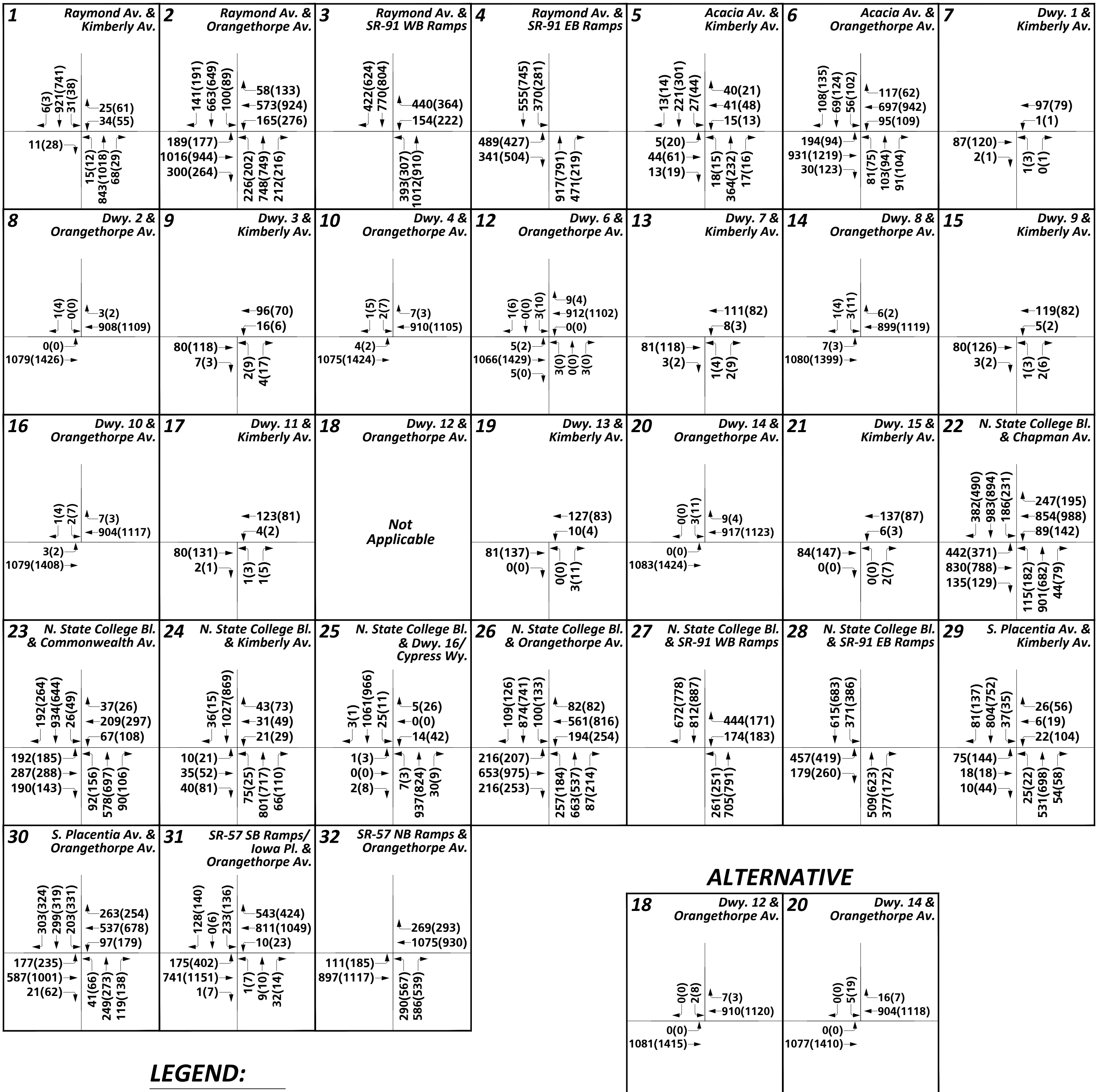
EXHIBIT 5-2: OPENING YEAR CUMULATIVE (2022) WITH PROJECT TRAFFIC VOLUMES



LEGEND:

10(10) = AM(PM) PEAK HOUR INTERSECTION VOLUMES

N

EXHIBIT 5-3: OPENING YEAR CUMULATIVE (2022) WITHOUT PROJECT SUMMARY OF LOS

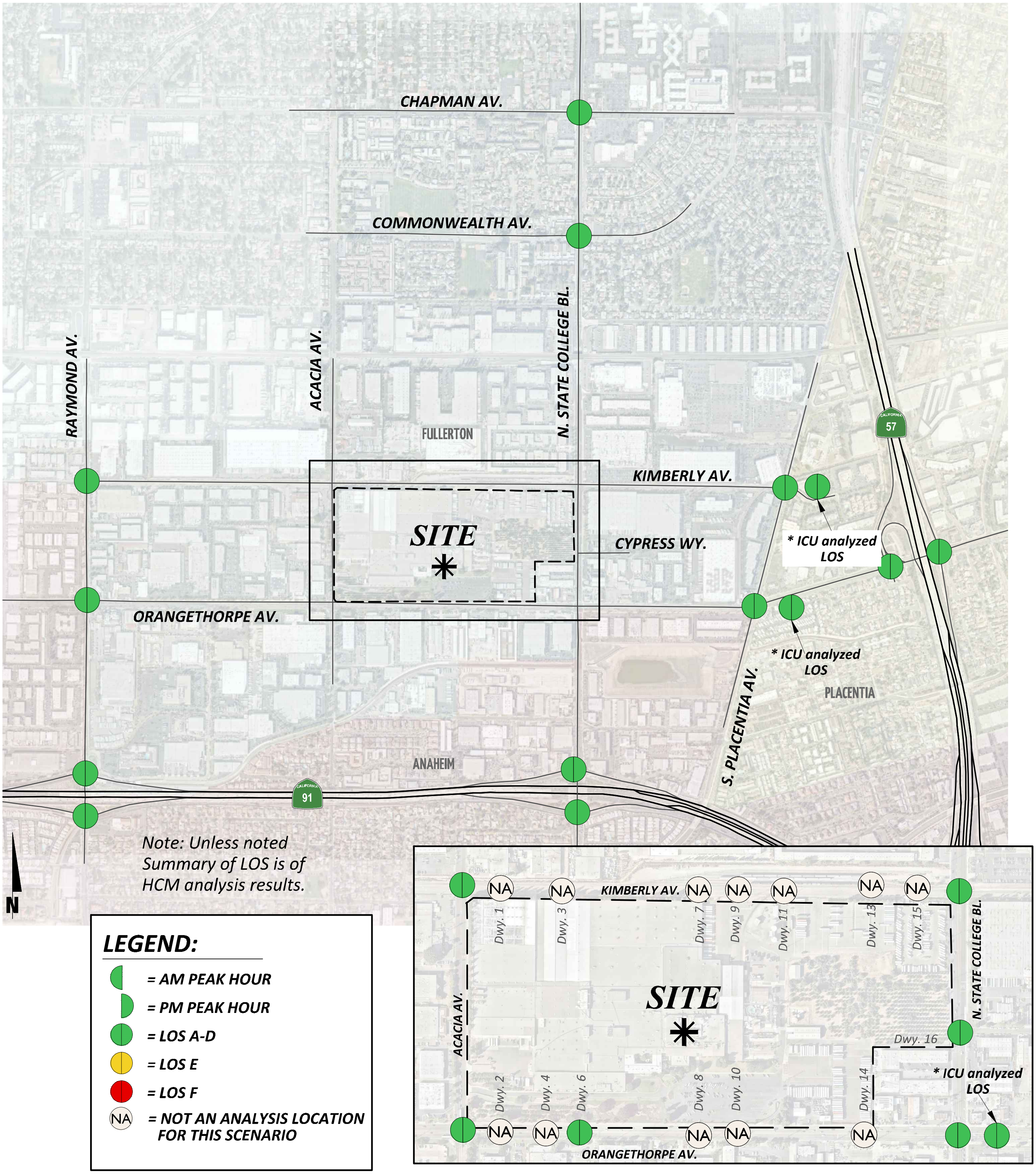


EXHIBIT 5-4: OPENING YEAR CUMULATIVE (2022) WITH PROJECT SUMMARY OF LOS

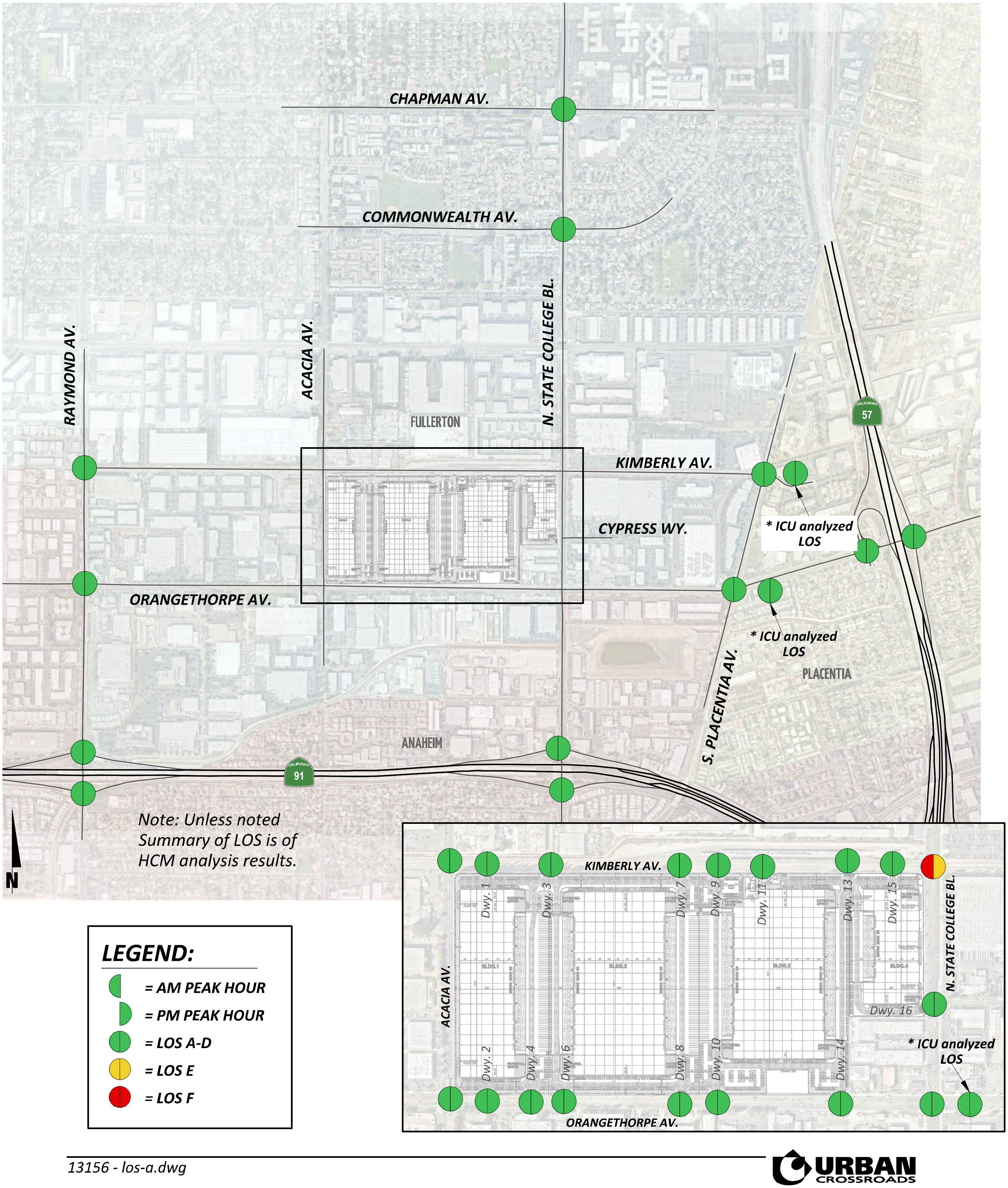


Table 5-1

Intersection Analysis for Opening Year Cumulative (2022) Conditions

			2022 Without Project								2022 With Project							
		Traffic	HCM Delay[1] (secs.)		Level of Service		ICU[2] (v/c)		Level of Service		HCM Delay[1] (secs.)		Level of Service		ICU[2] (v/c)		Level of Service	
#	Intersection	Control[3]	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	Raymond Av. & Kimberly Av.	CSS	19.2	19.7	C	C	Not Applicable[4]				19.9	20.4	C	C	Not Applicable[4]			
2	Raymond Av. & Orangethorpe Av.	TS	46.6	40.8	D	D	Not Applicable[4]				47.6	41.1	D	D	Not Applicable[4]			
3	Raymond Av. & SR-91 WB Ramps	TS	18.5	15.4	B	B	Not Applicable[4]				18.5	15.4	B	B	Not Applicable[4]			
4	Raymond Av. & SR-91 EB Ramps	TS	30.8	29.5	C	C	Not Applicable[4]				31.3	29.5	C	C	Not Applicable[4]			
5	Acacia Av. & Kimberly Av.	CSS	15.3	17.3	C	C	Not Applicable[4]				16.6	17.3	C	C	Not Applicable[4]			
6	Acacia Av. & Orangethorpe Av.	TS	9.5	11.3	A	B	Not Applicable[4]				9.5	11.3	A	B	Not Applicable[4]			
7	Driveway 1 & Kimberly Av.	**CSS**	Future Intersection								9.4	9.3	A	A	Not Applicable[4]			
8	Driveway 2 & Orangethorpe Av.	**CSS**	Future Intersection								10.2	10.5	B	B	Not Applicable[4]			
9	Driveway 3 & Kimberly Av.	**CSS**	Future Intersection								9.0	9.3	A	A	Not Applicable[4]			
10	Driveway 4 & Orangethorpe Av.	**CSS**	Future Intersection								10.7	11.4	B	B	Not Applicable[4]			
12	Driveway 6 & Orangethorpe Av.	CSS	10.0	0.0	B	A	Not Applicable[4]				11.0	11.8	B	B	Not Applicable[4]			
13	Driveway 7 & Kimberly Av.	**CSS**	Future Intersection								9.0	9.2	A	A	Not Applicable[4]			
14	Driveway 8 & Orangethorpe Av.	**CSS**	Future Intersection								11.1	12.0	B	B	Not Applicable[4]			
15	Driveway 9 & Kimberly Av.	**CSS**	Future Intersection								9.0	9.2	A	A	Not Applicable[4]			
16	Driveway 10 & Orangethorpe Av.	**CSS**	Future Intersection								11.1	12.1	B	B	Not Applicable[4]			
17	Driveway 11 & Kimberly Av.	**CSS**	Future Intersection								9.2	9.3	A	A	Not Applicable[4]			
18	Driveway 12 & Orangethorpe Av.		Future Intersection								Does Not Exist							
19	Driveway 13 & Kimberly Av.	**CSS**	Future Intersection								8.8	9.2	A	A	Not Applicable[4]			
20	Driveway 14 & Orangethorpe Av.	**CSS**	Future Intersection								11.0	12.1	B	B	Not Applicable[4]			
21	Driveway 15 & Kimberly Av.	**CSS**	Future Intersection								8.8	9.2	A	A	Not Applicable[4]			
22	N. State College Bl. & Chapman Av.	TS	45.6	49.8	D	D	Not Applicable[4]				46.0	49.9	D	D	Not Applicable[4]			
23	N. State College Bl. & Commonwealth Av.	TS	26.0	26.4	C	C	Not Applicable[4]				26.0	26.4	C	C	Not Applicable[4]			
24	N. State College Bl. & Kimberly Av.	CSS	20.8	20.9	C	C	Not Applicable[4]				**68.1**	**37.1**	**F**	**E**	Not Applicable[4]			
25	N. State College Bl. & Dwy. 16/Cypress Wy.	CSS	11.1	11.2	B	B	Not Applicable[4]				15.6	15.2	C	C	Not Applicable[4]			
26	N. State College Bl. & Orangethorpe Av.	TS	34.7	38.6	C	D	0.692	0.727	B	C	36.0	40.5	C	D	0.720	0.757	C	C
27	N. State College Bl. & SR-91 WB Ramps	TS	22.7	15.5	C	B	Not Applicable[4]				23.2	15.7	C	B	Not Applicable[4]			
28	N. State College Bl. & SR-91 EB Ramps	TS	20.1	19.1	C	B	Not Applicable[4]				20.6	19.5	C	B	Not Applicable[4]			
29	S. Placentia Av. & Kimberly Av.	TS	11.2	14.9	B	B	0.397	0.462	A	A	11.2	14.9	B	B	0.399	0.463	A	A
30	S. Placentia Av. & Orangethorpe Av.	TS	28.1	30.9	C	C	0.519	0.602	A	B	28.2	31.1	C	C	0.520	0.614	A	A
31	SR-57 SB Ramps/Iowa Pl. & Orangethorpe Av.	TS	24.7	18.3	C	B	Not Applicable[4]				25.3	18.9	C	B	Not Applicable[4]			
32	SR-57 NB Ramps & Orangethorpe Av.	TS	33.0	19.7	C	B	Not Applicable[4]				33.2	20.3	C	C	Not Applicable[4]			

Note: Intersection #11 no longer exists based on the latest site plan.

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

2 Intersection capacity utilization (ICU) methodology results are presented as a volume-to-capacity ratio.

3 AWS = All Way Stop; CSS = Cross-street Stop; TS = Traffic Signal; **CSS** = Improvement

4 ICU reported for CMP or City of Placentia intersection only.

An alternative analysis is included on Table 5-2 that evaluates the driveway locations that would be affected by the inclusion of Driveway 12 on Orangethorpe Avenue if the Optional Site Plan were to be developed. As shown on Table 5-2, no changes are anticipated with the reallocation of Project traffic with the development of the Optional Site Plan. In other words, only the intersection of N. State College Boulevard and Kimberly Avenue would continue to operate at a deficient LOS.

5.5 TRAFFIC SIGNAL WARRANTS ANALYSIS

There are no additional study area intersections anticipated to meet peak hour or ADT volume-based traffic signal warrants for Opening Year Cumulative (2022) Without and With Project traffic conditions (see Appendix 5.3 and Appendix 5.4), in addition to the locations previously warranted under Existing traffic conditions (Raymond Avenue at Kimberly Avenue and N. State College Boulevard at Kimberly Avenue).

5.6 OFF-RAMP QUEUING ANALYSIS

A queuing analysis was performed for the off-ramps at the SR-91 Freeway/Raymond Avenue, SR-91 Freeway/N. State College Boulevard, and SR-57 Freeway/Orangethorpe Avenue interchanges to assess vehicle queues for the off ramps that may potentially result in deficient peak hour operations at the ramp-to-arterial intersections and may potentially "spill back" onto the SR-91 Freeway or SR-57 Freeway mainline. Queuing analysis findings are presented in Table 5-3 for Opening Year Cumulative (2022) traffic conditions. It is important to note that off-ramp lengths are consistent with the measured distance between the intersection and the freeway mainline. As shown in Table 5-3, there are no movements that are anticipated to experience queuing issues during the weekday AM or weekday PM peak 95th percentile traffic flows. Worksheets for Opening Year Cumulative (2022) Without and With Project traffic conditions off-ramp queuing analysis are provided in Appendix 5.5 and Appendix 5.6, respectively.

5.7 FREEWAY FACILITY ANALYSIS

Opening Year Cumulative (2022) Without and With Project mainline directional volumes for the AM and PM peak hours are provided on Exhibits 5-5 and 5-6, respectively. As shown in Table 5-4, the following freeway facilities evaluated as part of this study are anticipated to operate at an unacceptable LOS (i.e., LOS E or worse) during the peak hours for Opening Year Cumulative (2022) Without and With Project traffic conditions:

- SR-91 Eastbound, West of State College Bl. (#5) – LOS E AM and PM peak hours
- SR-91 Eastbound Off-Ramp at N. State College Bl. (#6) – LOS E AM and PM peak hours
- SR-57 Southbound, North of Orangethorpe Av. (#9) – LOS E AM and PM peak hours
- SR-57 Southbound Off-Ramp at Orangethorpe Av. (#10) – LOS E AM and PM peak hours
- SR-57 Northbound Off-Ramp at Orangethorpe Av. (#15) – LOS E AM and PM peak hours
- SR-57 Northbound, South of Orangethorpe Av. (#16) – LOS E PM peak hour only

Opening Year Cumulative (2022) Without and With Project freeway facility analysis worksheets are provided in Appendices 5.7 and 5.8, respectively.

Table 5-2

Intersection Analysis for Opening Year Cumulative (2022) Conditions - Optional Site Plan

			2022 Without Project								2022 With Project							
		Traffic	HCM Delay[1] (secs.)		Level of Service		ICU[2] (v/c)		Level of Service		HCM Delay[1] (secs.)		Level of Service		ICU[2] (v/c)		Level of Service	
#	Intersection	Control[3]	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
18	Driveway 12 & Orangethorpe Av.	**CSS**	Future Intersection								11.1	11.8	B	B	Not Applicable[4]			
20	Driveway 14 & Orangethorpe Av.	**CSS**	Future Intersection								11.0	12.7	B	B	Not Applicable[4]			

[1] Per the Highway Capacity Manual (6th Edition), overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

[2] Intersection capacity utilization (ICU) methodology results are presented as a volume-to-capacity ratio.

[3] CSS = Cross-street Stop; **CSS** = Improvement

[4] ICU reported for CMP or City of Placentia intersection only.

Table 5-3

Peak Hour Queuing Summary for Opening Year Cumulative (2022) Conditions

Intersection	Movement	Available Stacking Distance (Feet)	2022 Without Project				2022 With Project			
			95th Percentile Queue (Feet)		Acceptable?[1]		95th Percentile Queue (Feet)		Acceptable?[1]	
			AM Peak Hour	PM Peak Hour	AM	PM	AM Peak Hour	PM Peak Hour	AM	PM
Raymond Av. & SR-91 WB Ramps	WBL	940	62	84	Yes	Yes	62	84	Yes	Yes
	WBR	270	418 [2,3]	313 [2,3]	Yes	Yes	421 [2,3]	315 [2,3]	Yes	Yes
Raymond Av. & SR-91 EB Ramps	EBL	170	466 [2,3]	274 [3]	Yes	Yes	475 [2,3]	277 [3]	Yes	Yes
	EBR	1,060	180	424 [2]	Yes	Yes	182	426 [2]	Yes	Yes
N. State College Bl. & SR-91 WB Ramps	WBL	280	162	136	Yes	Yes	162	140	Yes	Yes
	WBL/R	760	81	93	Yes	Yes	95	98	Yes	Yes
	WBR	280	63	48	Yes	Yes	90	49	Yes	Yes
N. State College Bl. & SR-91 EB Ramps	EBL	1,000	217	220	Yes	Yes	236	223	Yes	Yes
	EBL/R	430	187	223	Yes	Yes	205	230	Yes	Yes
	EBR	350	49	60	Yes	Yes	49	65	Yes	Yes
SR-57 SB Ramps & Orangethorpe Av.	SBL	500	233	173	Yes	Yes	244	173	Yes	Yes
	SBL/T/R	1,350	97	78	Yes	Yes	89	81	Yes	Yes
SR-57 NB Ramps & Orangethorpe Av.	NBL	885	93	189	Yes	Yes	100	192	Yes	Yes
	NBR	350	771 [2,3]	527 [3]	Yes	Yes	771 [2,3]	527 [3]	Yes	Yes

[1] Stacking Distance is acceptable if the required stacking distance is less than or equal to the stacking distance provided.

[2] 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

[3] Although 95th percentile queue is anticipated to exceed the available storage for the turn lane, the adjacent through lane has sufficient storage to accommodate any spillover without spilling back and affecting the SR-91 or SR-57 Freeway mainline.

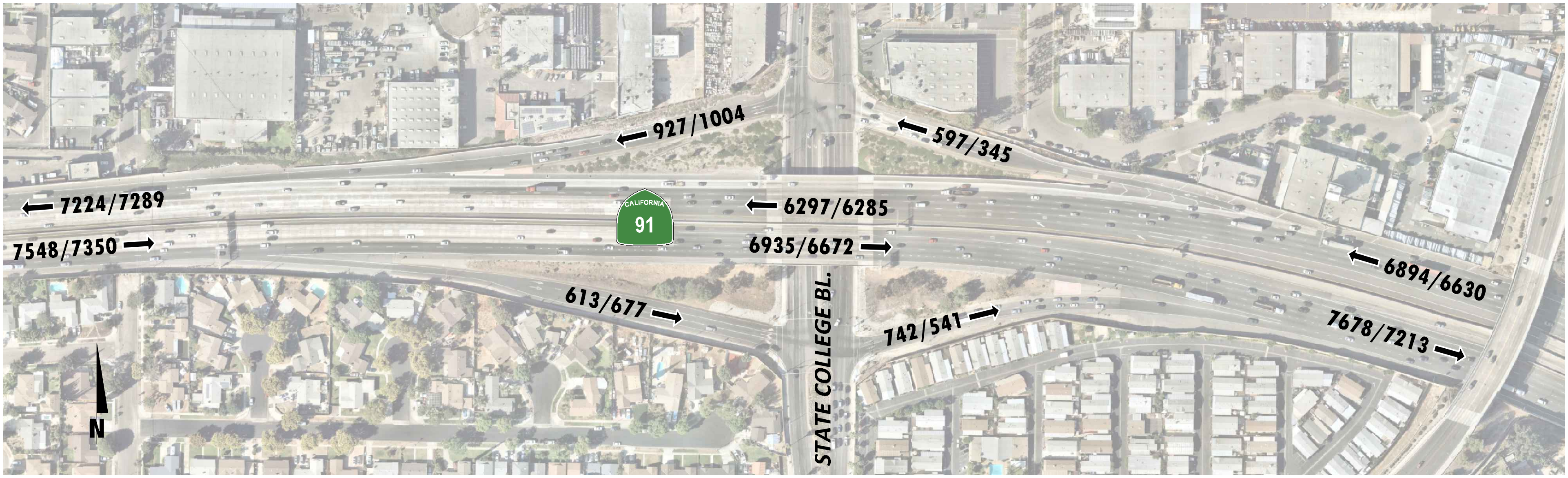
Table 5-4

Freeway Facility Analysis for Opening Year Cumulative (2022) Conditions

Freeway	Direction	Mainline Segment	Lanes[1]	Ramp Lane(s)	2022 Without Project				2022 With Project			
					Density[2]		LOS[3]		Density[2]		LOS[3]	
					AM	PM	AM	PM	AM	PM	AM	PM
SR-91 Freeway	Westbound	West of N. State College Bl.	5	--	25.0	24.4	C	C	25.0	24.5	C	C
		Westbound On-Ramp at N. State College Bl.	4	1	21.0	20.2	C	C	21.0	20.2	C	C
		Westbound Off-Ramp at N. State College Bl.	4	1	33.8	30.5	D	D	34.0	30.6	D	D
		East of N. State College Bl.	4	--	31.9	28.9	D	D	32.1	28.9	D	D
	Eastbound	West of N. State College Bl.	4	--	**38.6**	**40.0**	**E**	**E**	**38.8**	**40.1**	**E**	**E**
		Eastbound Off-Ramp at N. State College Bl.	4	1	**37.8**	**38.6**	**E**	**E**	**38.0**	**38.8**	**E**	**E**
		Eastbound On-Ramp at N. State College Bl.	4	1	24.0	24.5	C	C	24.0	24.5	C	C
		East of N. State College Bl.	5	--	27.4	27.1	D	D	27.4	27.2	D	C
SR-57 Freeway	Southbound	North of Orangethorpe Av.	4	--	**44.6**	**40.2**	**E**	**E**	**44.9**	**40.2**	**E**	**E**
		Southbound Off-Ramp at Orangethorpe Av.	4	1	**38.1**	**35.9**	**E**	**E**	**38.3**	**35.9**	**E**	**E**
		Southbound Loop On-Ramp at Orangethorpe Av.	5	1	22.1	20.8	C	C	22.1	20.8	C	C
		South of Orangethorpe Av.	6	--	24.9	23.7	C	C	24.9	23.8	C	C
	Northbound	North of Orangethorpe Av.	6	--	32.5	32.5	D	D	32.6	32.6	D	D
		Northbound On-Ramp at Orangethorpe Av.	6	1	31.6	31.9	D	D	31.7	32.1	D	D
		Northbound Off-Ramp at Orangethorpe Av.	6	1	**40.7**	**42.4**	**E**	**E**	**40.8**	**42.4**	**E**	**E**
		South of Orangethorpe Av.	6	--	34.8	**35.6**	D	**E**	34.9	**35.6**	D	**E**

BOLD = LOS does not meet Caltrans requirements (i.e., unacceptable LOS or LOS E/F).
[1] Number of lanes are in the specified direction and is based on existing conditions.
[2] Density is measured by passenger cars per mile per lane (pc/mi/ln).
[3] LOS = Level of Service

Exhibit 5-5: Opening Year Cumulative (2022) Without Project Freeway Mainline Volumes



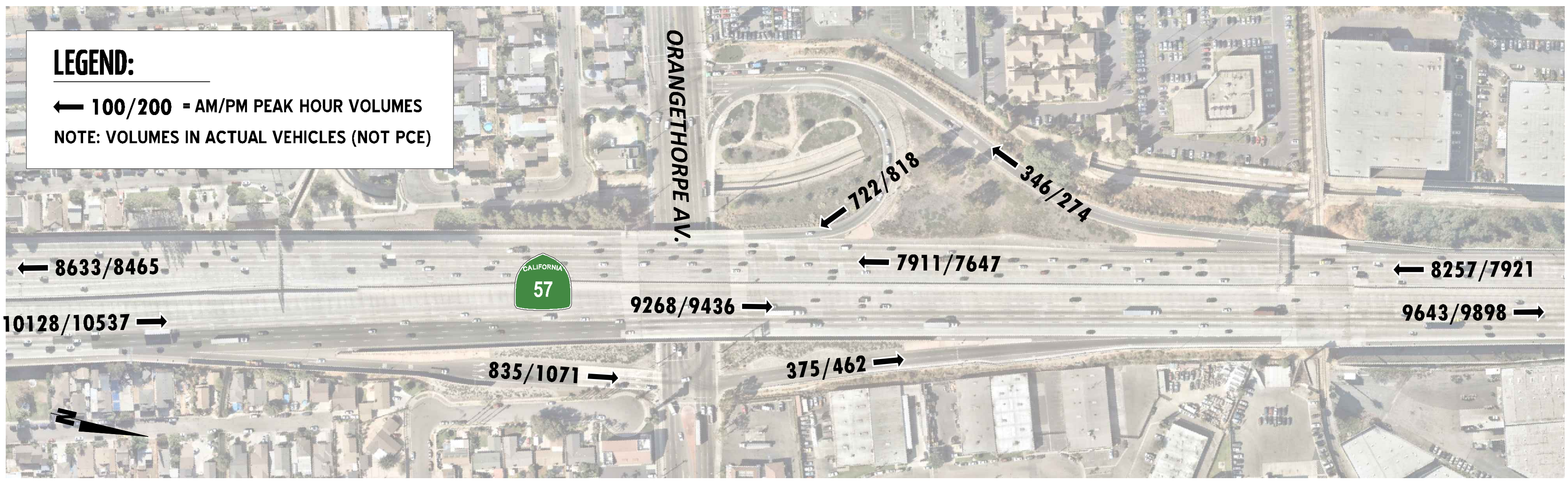


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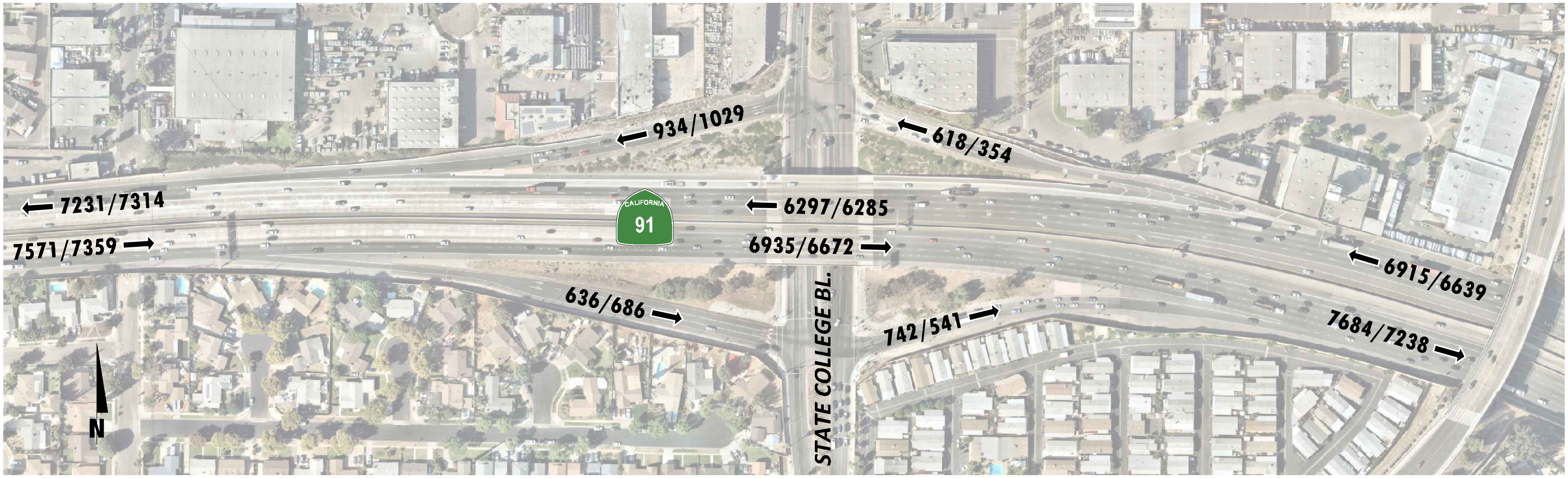
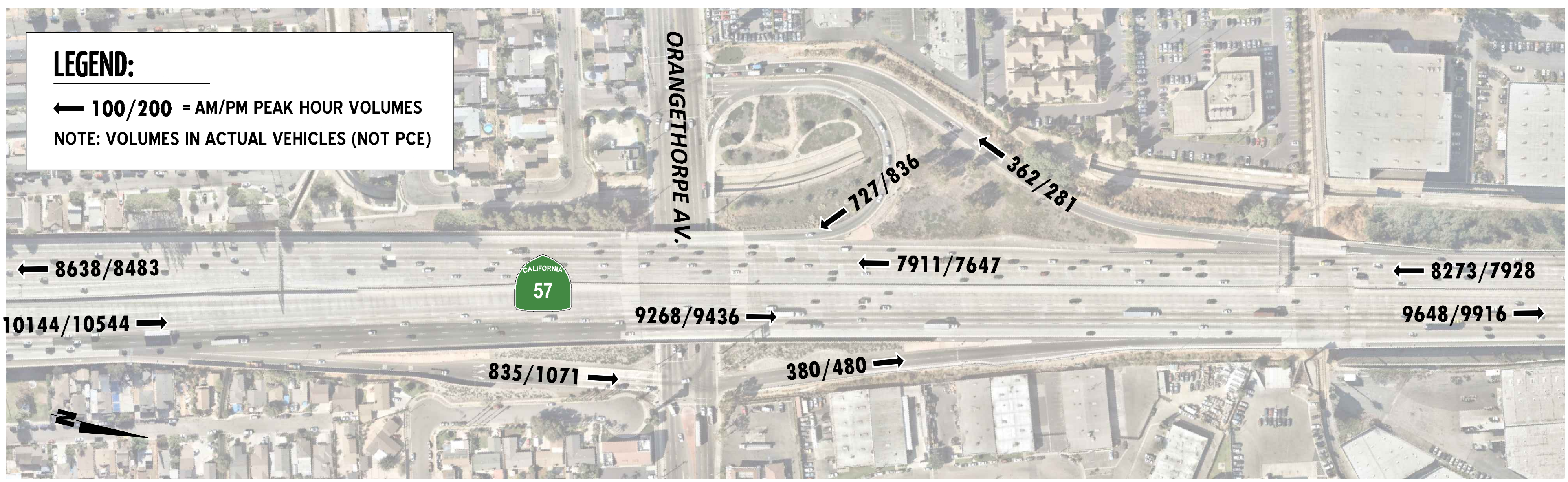
Exhibit 5-6: Opening Year Cumulative (2022) With Project Freeway Mainline Volumes





5.8 RECOMMENDED IMPROVEMENTS

5.8.1 IMPROVEMENTS TO ADDRESS DEFICIENCIES AT INTERSECTIONS

Based on the City's TAPP guidelines as discussed in Section 2.7 *Threshold Criteria*, the following study area intersection is anticipated to result in a deficiency with the addition of Project traffic for Opening Year Cumulative (2022) With Project traffic conditions:

- N. State College Bl. & Kimberly Av. (#24): Installation of the traffic signal will include accommodating a protected left turn arrow for the northbound approach, pedestrian facilities, coordination with the PUC during the design phase. The new traffic signal will need to be integrated with the train control system and the PUC will likely require safety upgrades at the crossing across N. State College Boulevard immediately north of Kimberly Avenue.

The effectiveness of this recommended improvement strategy to address the Opening Year Cumulative (2022) traffic deficiency is presented in Table 5-5.

5.8.2 IMPROVEMENTS TO ADDRESS OFF-RAMP QUEUES

As shown previously in Table 5-3, there are no peak hour queuing issues anticipated at the SR-91 Freeway/Raymond Avenue, SR-91 Freeway/N. State College Boulevard, and SR-57 Freeway/Orangethorpe Avenue interchanges. As such, no improvements have been recommended.

5.8.3 IMPROVEMENTS TO ADDRESS DEFICIENCIES ON FREEWAY FACILITIES

At this time, the Caltrans does not have any near-term plans to make capacity enhancements to the SR-91 Freeway or SR-57 Freeway within the study area. As such, no improvements have been recommended to address the Opening Year Cumulative (2022) deficiencies on the SHS, because improvements to the SR-91 Freeway and SR-57 Freeway are assumed to be completed after the Project buildout year of 2022.

Based on information provided by Caltrans District 12, the following improvements projects are proposed along the SR-91 and SR-57 Freeways that would improve capacity, however, these projects are anticipated to be completed after the Project's opening year and, therefore, have not been considered for the purposes of this TA:

- SR-91 Freeway (EA 0K983), Post Mile 4.7-6.5: Mainline widening, modification to interchange, connector, ramps and intersections in Anaheim and Fullerton from Acacia Street undercrossing to 0.1 mile east of La Palma Avenue overcrossing (to be completed February 2028)
- SR-57 Freeway (EA 0M970), Post Mile 11.5-12.5: Geometric improvements to increase capacity and reduce congestion in Anaheim from Orangewood Avenue to Katella Avenue (to be completed March 2027)

Table 5-5

Intersection Analysis for Opening Year Cumulative (2022) Conditions With Improvements

#	Intersection	Traffic Control[3]	Intersection Approach Lanes[1]												Delay[2] (secs.)		Level of Service	
			Northbound			Southbound			Eastbound			Westbound						
			L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM
5	Acacia Av. & Kimberly Av.																	
	- Without Improvements	CSS	1	2	0	1	2	0	1	1	0	1	1	0	16.6	17.3	C	C
	- With Improvements[4]	**AWS**	1	2	0	1	2	0	1	1	0	1	1	0	12.9	12.5	B	B
6	Acacia Av. & Orangethorpe Av.																	
	- Without Improvements	TS	1	1	1	1	1	1	1	3	0	1	3	0	9.5	11.3	A	B
	- With Improvements[5]	TS	1	1	1	1	1	1	1	3	0	1	3	0	12.8	14.8	B	B
24	N. State College Bl. & Kimberly Av.																	
	- Without Improvements	CSS	1	2	0	0	3	0	1	1	0	1	1	0	**68.1**	**37.1**	**F**	**E**
	- With Improvements[6]	**TS**	1	2	0	0	3	0	**0**	1	0	1	1	0	21.9	23.2	C	C

* **BOLD** = LOS does not meet the applicable jurisdictional requirements (i.e., unacceptable LOS).

1 When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.

L = Left; T = Through; R = Right

2 Per the Highway Capacity Manual 6th Edition, overall average intersection delay and level of service are shown for intersections with a traffic signal or all way stop control. For intersections with cross street stop control, the delay and level of service for the worst individual movement (or movements sharing a single lane) are shown.

3 CSS = Cross-street Stop; TS = Traffic Signal; **TS** = Traffic Signal

4 Improvements not required for peak hour operations, but to accommodate truck turns at the intersection. Northbound lanes should be setback 15-feet in conjunction with restriping the westbound approach.

5 Improvement includes installation of equipment and modification to the signal operations to accommodate protected left turn arrows for all approaches.

6 Proposed lane geometrics require split phase signal operation for eastbound and westbound approaches. No pedestrian crossings assumed.

6 ADDITIONAL ANALYSIS

6.1 SITE DRIVEWAY/ACCESS

On-site roadway improvements necessary to provide site access and on-site circulation will be constructed in conjunction with site development and are described below for the Project and with the Optional Site Plan. These improvements shall be implemented as part of the Project and shall be in place prior to Project building occupancy. Exhibit 6-1 illustrates the recommended site access and site adjacent roadway improvements. The recommendations shown on Exhibit 6-1 are necessary to accommodate 95th percentile peak hour queues and also truck turns to and from the Project.

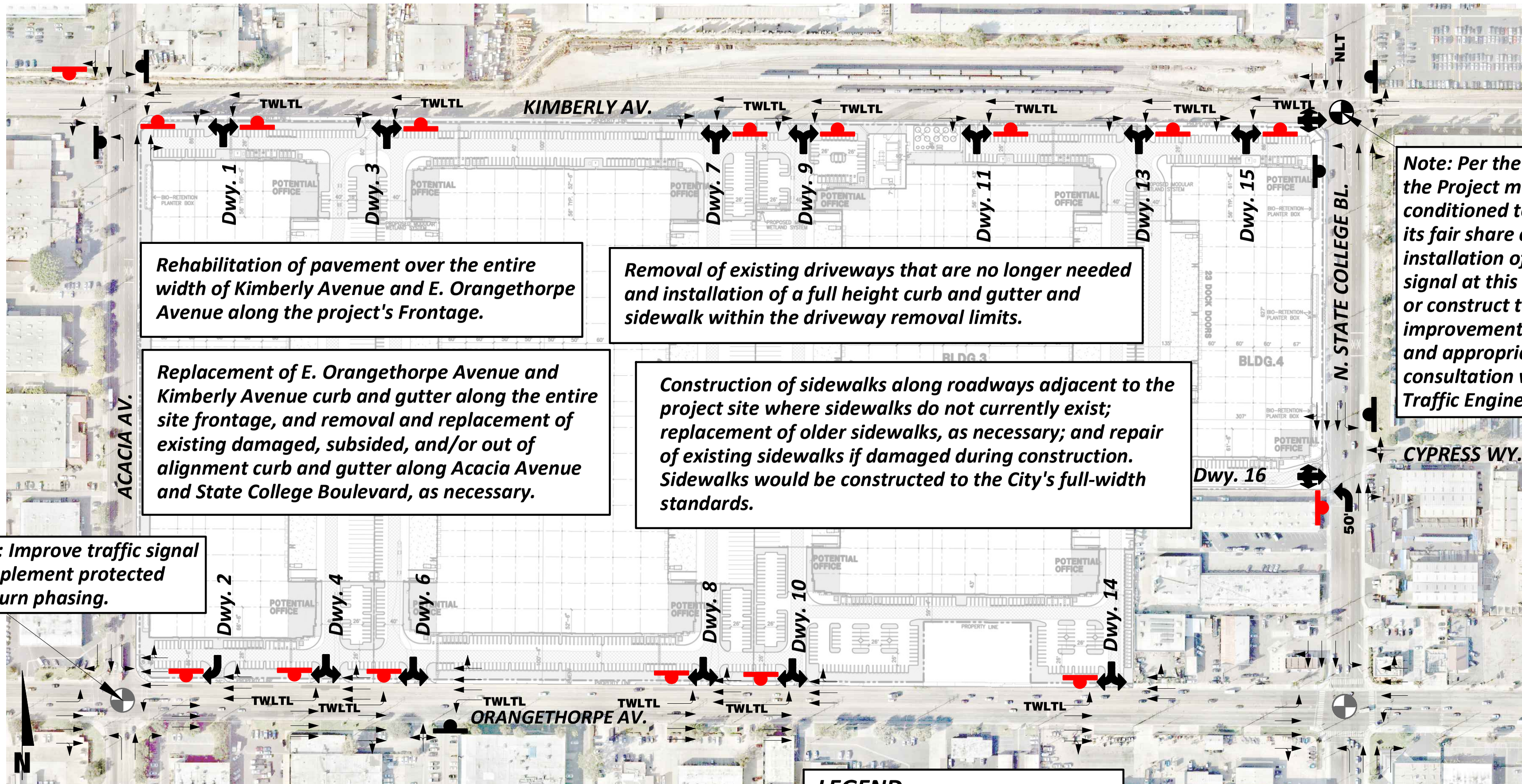
- Driveways 1, 3, 7, 9, 11, 13 and 15 & Kimberly Av.: Install a stop control for the northbound approach and construct a northbound shared left-right turn lane to facilitate site access. The existing painted median will be utilized by left-turning vehicles on Kimberly Avenue to access the site.
- Driveway 2 & Orangethorpe Av.: Install a stop control for the southbound approach and construct a pork-chop island to prohibit left turns in conjunction with constructing a southbound right turn lane.
- Driveways 4, 8, 10, 12 (Optional Site Plan Only) and 14 & Orangethorpe Av.: Install a stop control for the southbound approach and construct a southbound shared left-right turn lane. The existing painted median will be utilized by left-turning vehicles on Orangethorpe Avenue to access the site.
- Driveway 6 & Orangethorpe Av.: Install a stop control for the southbound approach and construct a southbound shared left-through-right turn lane. The existing painted median will be utilized by left-turning vehicles on Orangethorpe Avenue to access the site.
- N. State College Bl. & Driveway 16/Cypress Way: Install a stop control for the eastbound approach and one eastbound shared left-through-right turn lane.

Due to the typical wide turning radius of large trucks, a truck turning template has been overlaid on the site plan at the Project driveways in order to determine appropriate curb radii and to verify that trucks will have sufficient space to execute turning maneuvers. The proposed site plan includes sufficient curb radii at the Project driveways and no modifications are required.

In compliance with Section 15.40.070 of the City's Municipal Code, which identifies required transportation demand strategies to reduce single occupancy vehicles, interior bicycle storage would be provided within Buildings 1 through 4 to encourage bicycle travel to the Project site. Additionally, exterior bicycle racks would be provided at each building.

On-site traffic signing and striping would be implemented as part of the Project.

EXHIBIT 6-1: SITE ADJACENT ROADWAY AND SITE ACCESS RECOMMENDATIONS



Reconstruction of substandard ramps at corners of the site-adjacent intersections, if necessary, based on existing conditions, and as feasible.

Construction of a bus stop on the north side of E. Orangethorpe Avenue. The bus stop is expected to be located south of Building 2, but the final location of the bus stop would be determined in coordination with the OCTA.

Project to install bike racks consistent with the City's Municipal Code.

LEGEND:

- = TRAFFIC SIGNAL
- = NEW TRAFFIC SIGNAL
- = STOP SIGN
- = STOP SIGN IMPROVEMENT
- = EXISTING LANE
- = LANE IMPROVEMENT
- 150' = MINIMUM TURN POCKET LENGTH
- NLT = NO LEFT TURN
- TWLTL = TWO WAY LEFT TURN LANE

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URBAN CROSSROADS

6.2 MULTI-WAY STOP WARRANT ANALYSIS

The City of Fullerton has requested the intersection of Acacia Avenue and Kimberly Avenue be evaluated for the installation of a multi-way stop to facilitate Project truck access to the site. While a traffic signal is not warranted at the intersection of Acacia Avenue and Kimberly Avenue, it is the only unsignalized intersection of the four project-adjacent intersections following the recommendation to signalize State College and Kimberly to address the LOS deficiency caused by the Project.

In order to accommodate truck turns at the intersection of Acacia Avenue and Kimberly Avenue (#5), the implementation of an all-way or multi-way stop control is recommended in conjunction with setback lanes for the northbound approach. The intersection is currently controlled by stop signs on the eastbound and westbound approaches. A multi-way stop warrant has been evaluated for Opening Year Cumulative (2022) Without Project traffic conditions (see Appendix 6.1). The intersection is anticipated to serve passenger cars and heavy trucks. In order to accommodate the turning radii of heavy trucks, a stop control on the northbound approach is preferred to uncontrolled movements with the proposed setback. Based on guidance provided in the CA MUTCD (Section 2B.07), multi-way stop control should be considered if one or more of the following conditions exists:

- Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
  - The intersection of Acacia Avenue and Kimberly Avenue is not anticipated to meet a peak hour traffic signal warrant under Opening Year Cumulative (2022) traffic conditions. As such, this criterion is not met.
- Five or more reported crashed in a 12-month period that are susceptible to correction by implementing a multi-way stop control.
  - Based on collision history provided by City staff, there were 6 collisions in 2018 (no data was available or provided for 2019 and 2020 would not be suitable for use due to the currently ongoing COVID-19 pandemic and changes to travel patterns). This criterion is met based on the 2018 collision history.
- Minimum volumes on the major and minor approaches are met, as defined in Section 2B.07 of the CA MUTCD.
  - Peak hour volumes distributed through a 24-hour period is not available for future forecasts as only daily traffic and peak hour traffic are generated for the purposes of the traffic analyses. In light of the surrounding industrial and commercial uses, the ITE Trip Generation Manual (10th Edition) hourly distribution for inbound traffic for the Warehousing (ITE 150) lane use has been utilized. The distribution of traffic over a 24-hour period has been applied to the daily traffic forecasts for each approach at the intersection of Acacia Avenue and Kimberly Avenue in order to generate approach volumes for the multi-way stop warrant analysis. This criterion is met (see Appendix 6.1).

Based on the two CA MUTCD criteria that have been met (as noted above), it is recommended that an all-way stop controlled intersection control be implemented at Acacia Avenue and Kimberly Avenue, which would also accommodate Project trucks. The effectiveness of this recommended improvement was presented previously in Table 5-5.

- Acacia Av. & Kimberly Av. (#5): The Project shall install stop control on the northbound and southbound approaches at the intersection of Acacia Avenue and Kimberly Avenue to implement an all-way stop control intersection (refer to Exhibit 6-2, page 6 of 7). Flashing red beacons shall be installed in conjunction with signage for the new all-way stop controlled intersection. Advance warning signs for the new all-way stop control shall also be posted in the northbound and southbound directions.

Additionally, the following improvements are recommended to accommodate truck turning movements at this intersection:

- At the intersection of Acacia Avenue and Kimberly Avenue, all lanes in the northbound direction shall be setback 15-feet from the stop bar.
- The southeast corner shall be modified to accommodate a 45-foot curb radius. This improvement will be confirmed by the City during final design taking into consideration feasibility based on existing conditions and constraints.

6.3 EVALUATION OF PROTECTED LEFT-TURN PHASING AT ACACIA AVENUE AND ORANGETHORPE AVENUE

The City of Fullerton has requested that the intersection of Acacia Avenue and Orangethorpe Avenue be evaluated to determine whether protected left-turn phasing (arrow signal head) should be implemented on all approaches. The intersection of Acacia Avenue and Orangethorpe Avenue is currently signalized with permissive left turns (ball signal head, yield) on all approaches. Based on guidance provided in the CA MUTCD (Section 4D.19), protected left-turn phasing should be considered if one or more of the following conditions exists:

- Collisions: 5 or more left-turn collisions for a particular movement during a recent 12-month period.
    - Based on a review of accident history from June 1, 2015 to June 1, 2020, there are 3 or fewer left-turn crashes in either the eastbound or westbound direction only per year. There are fewer than 5 left-turn collisions for any left-turn movement at the intersection of Acacia Avenue and Orangethorpe Avenue. See Appendix 3.6 for accident report. For these reasons, this criterion is not met.
- Delay: left turn delay of one or more vehicles, which were waiting at the beginning of the green interval and are still remaining in the left turn lane after at least 80% of the total number of cycles for one hour.
    - Left turn delays at the intersection of Acacia Avenue and Orangethorpe Avenue is LOS A for the eastbound/westbound approaches and LOS D for the northbound/southbound approaches during the AM and PM peak hours for both Existing and Opening Year Cumulative (2022) With Project traffic conditions. Based on a review of the peak hour operations, the northbound and southbound approaches appear to meet the criteria for protected left-turn phasing.

- Volume: a left turn volume of more than 2 vehicles per approach per cycle for a peak hour (pre-timed/background-cycle-controlled actuated signal) or 50 or more left turning vehicles per hour in one direction (actuated signal) with the product of the turning and conflicting through traffic during the peak hour of 100,000 or more.
    - The eastbound and westbound approaches exceed the 100,000 cross-product thresholds during the PM peak hour for both Existing and Opening Year Cumulative (2022) With Project traffic conditions. The eastbound and westbound approaches meet the criteria for protected left-turn phasing.
- Miscellaneous: other factors that might be considered include but are not limited to impaired sight distance due to horizontal or vertical curvature, or where there are a large percentage of buses and trucks.
    - The grade is level in all approaches and there are no vertical curves that would result in sight distance issues at the existing intersection of Acacia Avenue and Orangethorpe Avenue. For Existing and Opening Year Cumulative (2022) With Project traffic conditions, there are 21-22% trucks for the southbound left turn movement (equating to 12 trucks) during the AM peak hour and 13% trucks for the eastbound left turn movement (equating to 12 trucks). For these reasons, this criterion is not met.

Based on two of the four criteria identified above, there is an existing need to protect the left-turn movements at the intersection of Acacia Avenue and Orangethorpe Avenue on all approaches.

The intersection of Acacia Avenue and Orangethorpe Avenue is anticipated to operate at an acceptable LOS during the peak hours for both without and with the Project under Opening Year Cumulative traffic conditions. However, based on the existing need to protect the left-turn movements at this intersection on all approaches, and with the addition of the project traffic and project truck traffic left-turns, there would be potential increases in left-turn delays at the intersection. Therefore, the following intersection improvement has been recommended; the protected left-turn phase of the signal will allow for Project trucks to turn at this intersection without conflict with on-coming traffic.

- Acacia Av. & Orangethorpe Av. (#6): In order to facilitate Project truck traffic at the intersection of Acacia Avenue and Orangethorpe Avenue, the Project shall implement the protected left-turn movements at the intersection of Acacia Avenue and Orangethorpe Avenue on all approaches (includes installation/modifications required to physically install the appropriate signal head equipment and modification to the signal operations/timing).

6.4 QUEUING ANALYSIS AT THE PROJECT DRIVEWAYS AND ADJACENT INTERSECTIONS

A queuing analysis was conducted for the Project driveways to the site adjacent streets for Opening Year Cumulative (2022) With Project traffic conditions to identify the 95th percentile peak hour queues. The analysis was conducted for both the weekday AM and weekday PM peak hours. The 95th percentile queues for the applicable study area intersections can be found in Appendix 6.2.

The traffic modeling and signal timing optimization software package SimTraffic has been utilized to assess queues at the Project driveways and site adjacent intersections. SimTraffic is designed to model networks of signalized and unsignalized intersections, with the primary purpose of checking and fine-tuning signal operations. SimTraffic uses the input parameters from Synchro (Version 10) to generate random simulations. The 95th percentile queue is not necessarily ever observed; it is simply based on statistical calculations (or Average Queue plus 1.65 standard deviations).

The random simulations generated by SimTraffic have been utilized to determine the 95th percentile queue lengths observed for each turn lane. A SimTraffic simulation has been recorded 5 times, during the weekday AM and weekday PM peak hours, and has been seeded for 30-minute periods with 60-minute recording intervals. 95th queuing analysis results were used to determine whether adequate stacking could be accommodated at each of the project driveways and site adjacent intersections.

The queuing analysis assumes the intersection lane geometrics and intersection controls shown on Exhibit 6-1. The results of the queuing analysis have been utilized to verify that adequate on-street storage can be accommodated at and between the proposed Project driveways. With the exception of the intersection of N. State College Boulevard and Driveway 16/Cypress Way there is sufficient storage for queuing. The following improvement is recommended at the intersection of N. State College Boulevard and Driveway 16/Cypress Way:

- N. State College Bl. & Driveway 16/Cypress Way (#25): Turn pocket recommendations include accommodating a minimum of 50-feet of storage for the northbound left turn lane (see Exhibit 6-1) within the existing painted median.

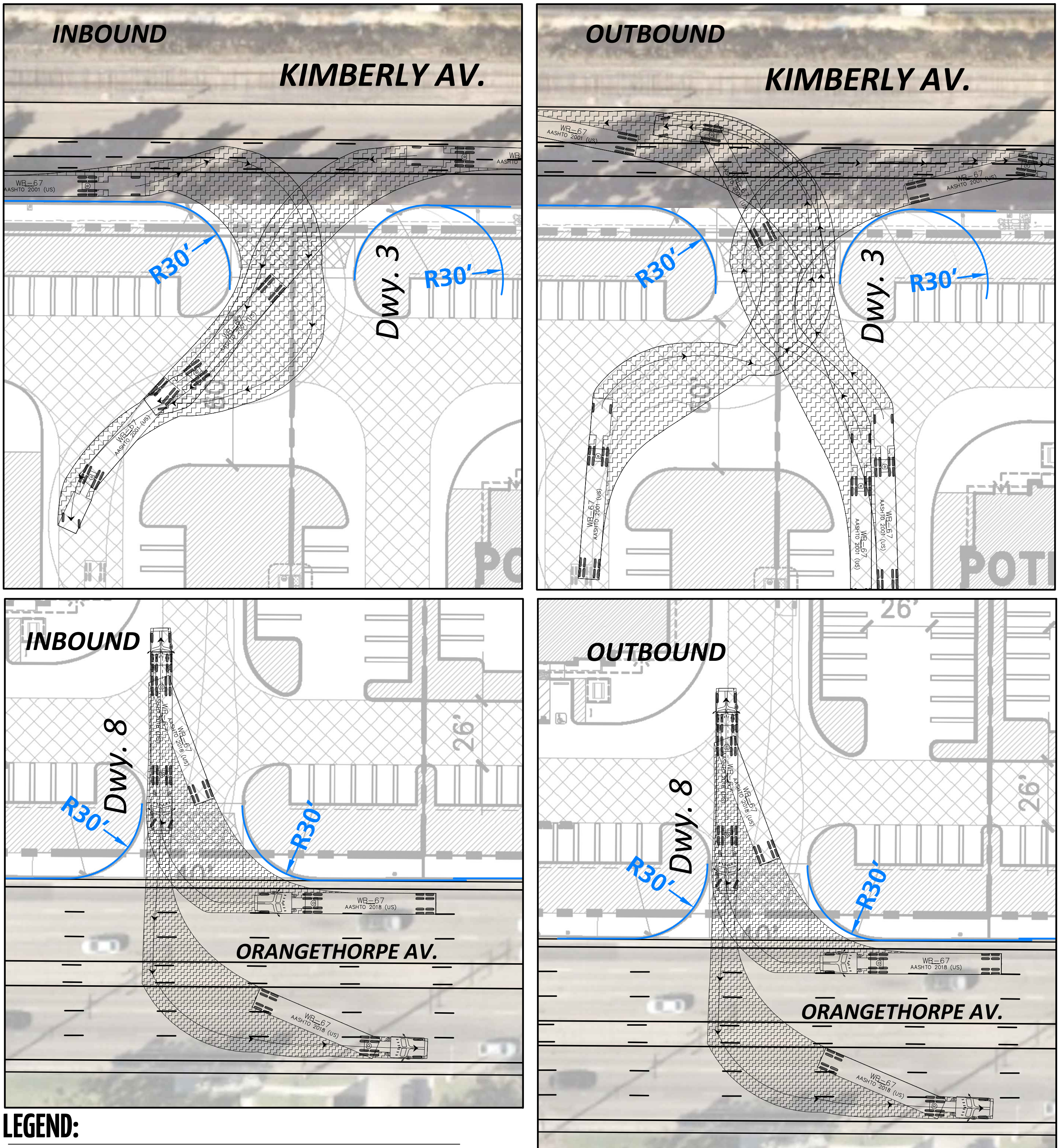
The 95th percentile peak hour queues are not anticipated to result in any blockages of adjacent driveways or spill back to adversely affect the operations at any of the site adjacent intersections.

6.5 TRUCK ACCESS AND CIRCULATION

Due to the typical wide turning radius of large trucks, a truck turning template has been overlaid on the site plan at the Project driveways in order to determine appropriate curb radii and to verify that trucks will have sufficient space to execute turning maneuvers (see Exhibit 6-2). The curb radii proposed by the Project (reflect in blue text in Exhibit 6-2) at each Project driveway is anticipated to accommodate the truck turns. Changes to the proposed curb radii reflected on the Project site plan, existing curb conditions, or existing striping are denoted in red. As shown on Exhibit 6-2, it is recommended that the following improvements be implemented in order to accommodate the wide turning radius of heavy trucks:

- Acacia Av. & Kimberly Av.: Modify the southeast corner to accommodate a 45-foot curb radius.
    - The westbound left turn volume is relatively low (16 or fewer vehicles under Opening Year Cumulative traffic conditions) during the peak hours on Kimberly Avenue. As such, it is anticipated there would be sufficient opportunities for a northbound right-turning truck to find appropriate gaps to turn onto Kimberly Avenue with minimal conflict when crossing over into the westbound left turn lane. It is common practice for truck drivers to drive in this manner when turning onto narrow roadways/streets.
- N. State College Bl. & Kimberly Av.: Restripe the eastbound approach with either a painted median or wider westbound lane with a single shared eastbound left-through-right turn lane. Restripe the northbound left turn pocket with a 3-foot striped area on the west side of the turn lane in order to accommodate turning trucks.

EXHIBIT 6-2 (1OF7): TRUCK ACCESS



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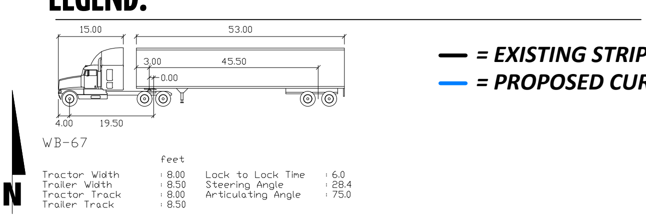

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— = PROPOSED CURB RADII

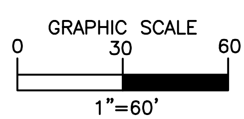


EXHIBIT 6-2 (2OF7): TRUCK ACCESS

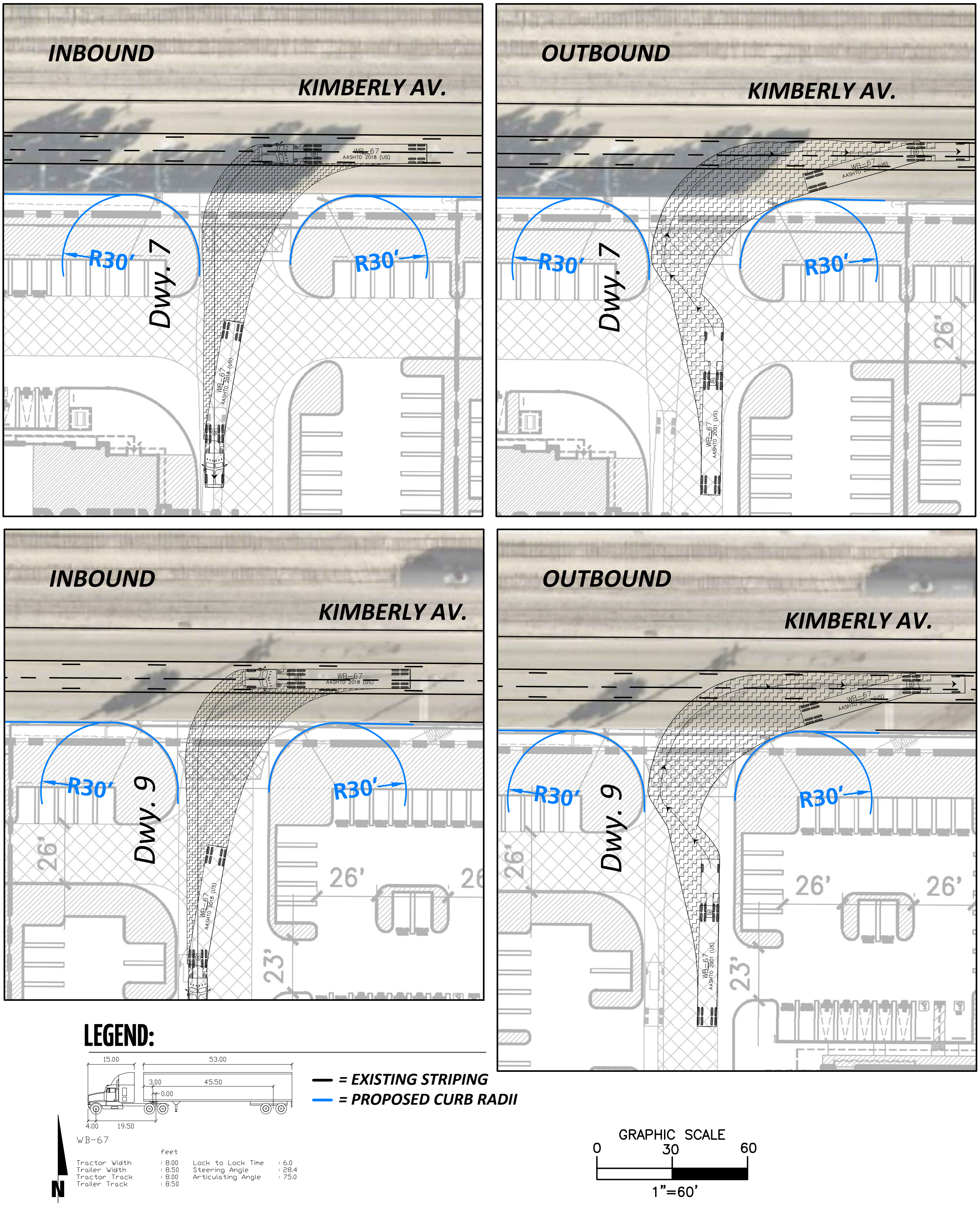


EXHIBIT 6-2 (3OF7): TRUCK ACCESS

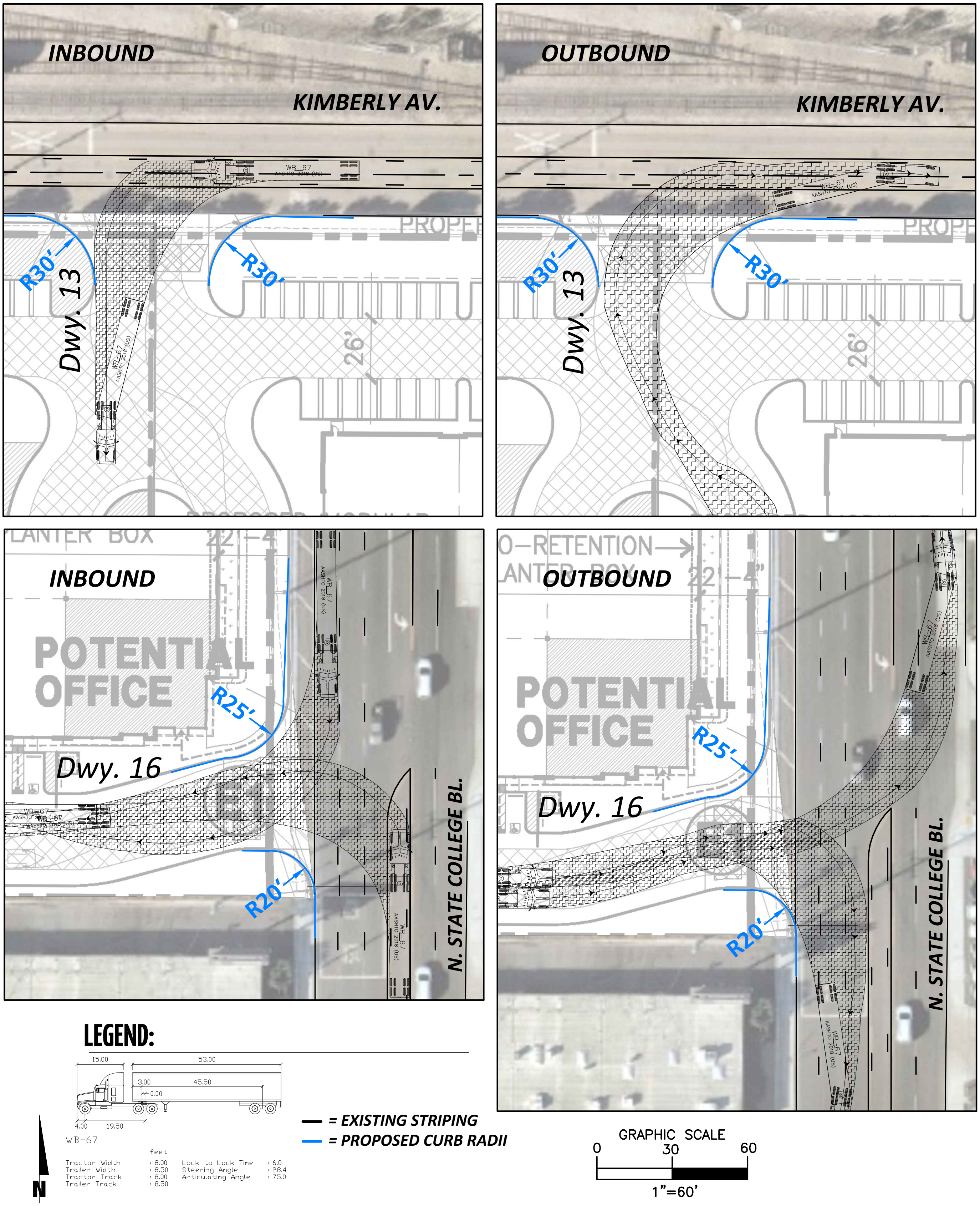


EXHIBIT 6-2 (4OF7): TRUCK ACCESS

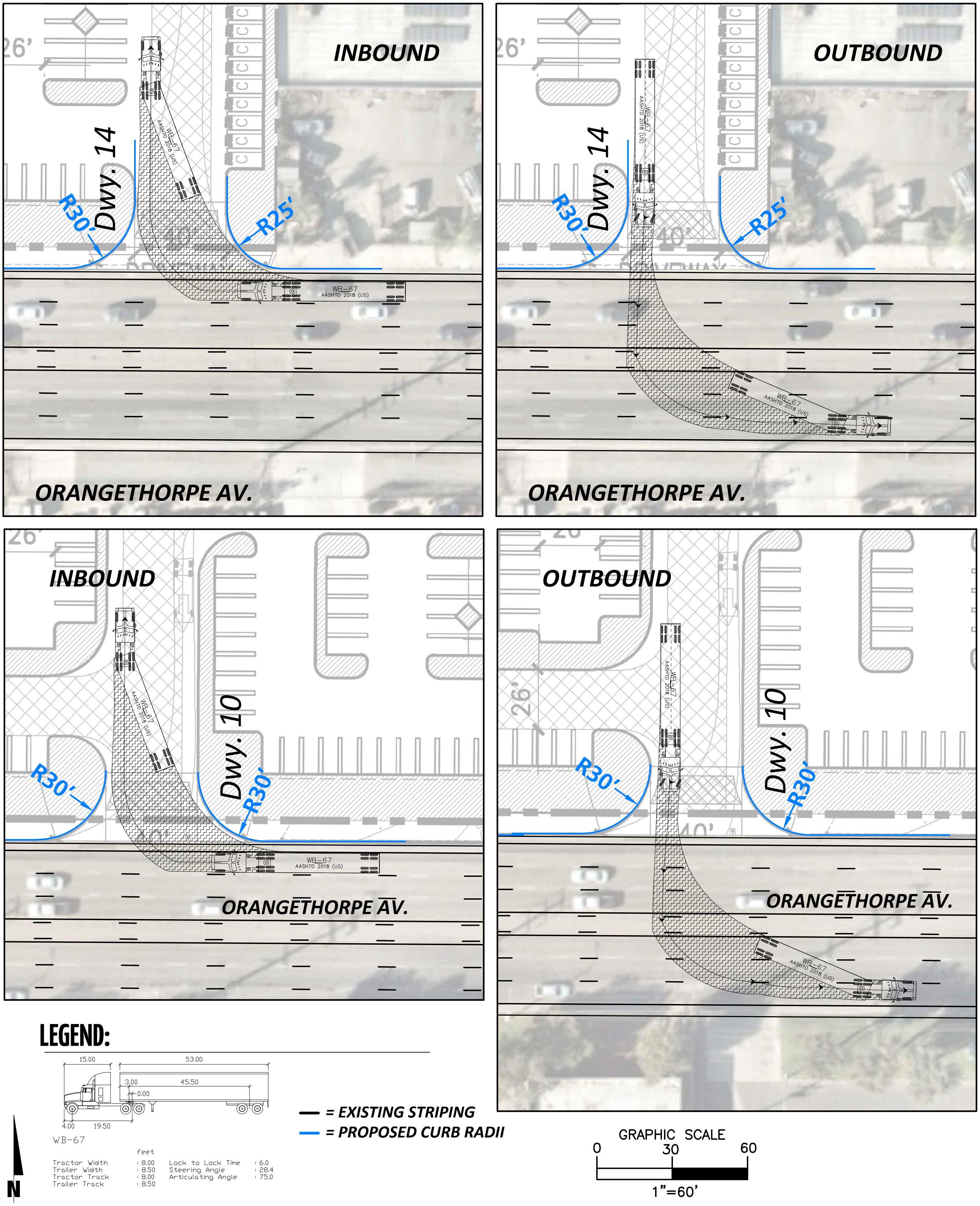
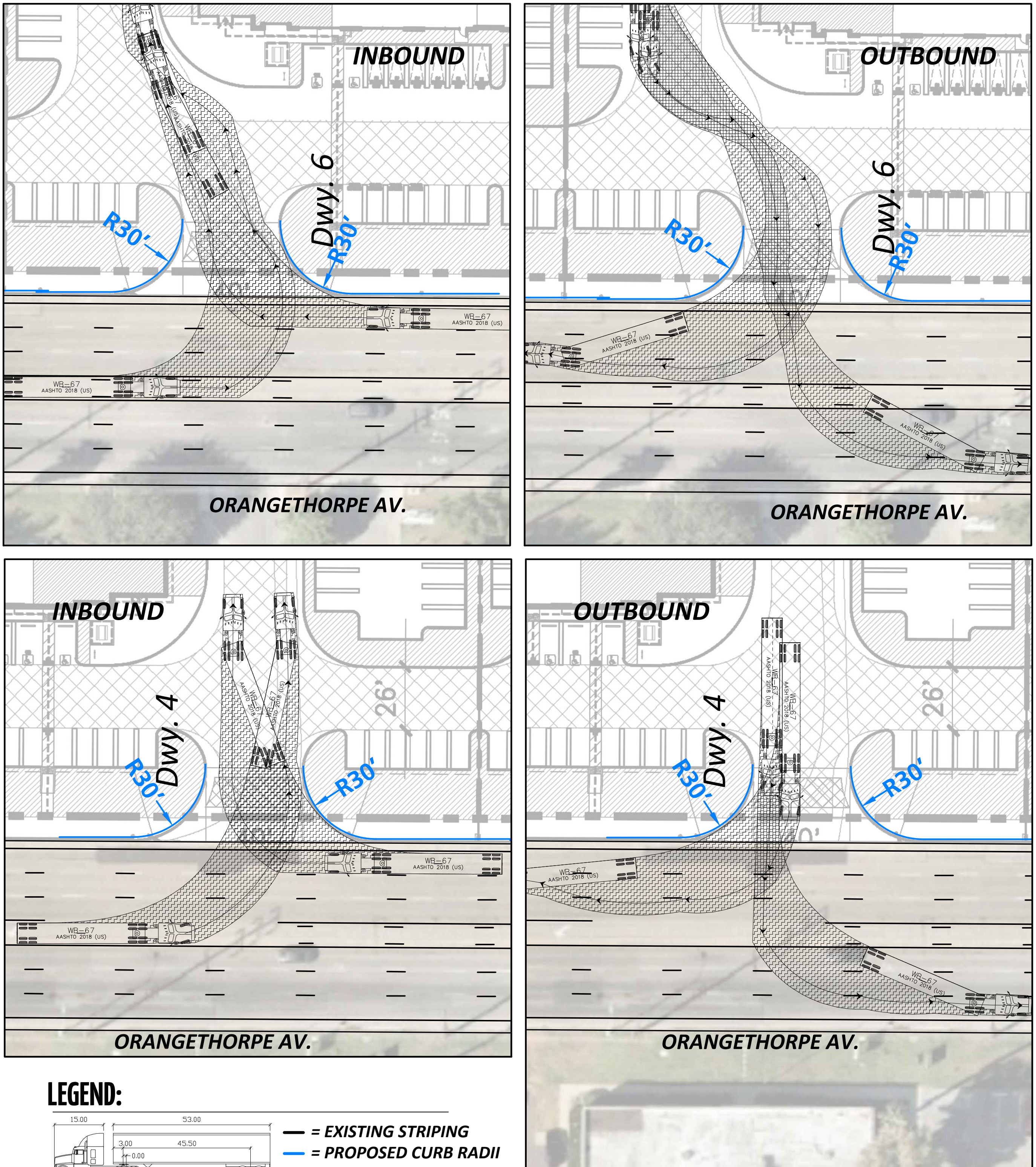


EXHIBIT 6-2 (5OF7): TRUCK ACCESS



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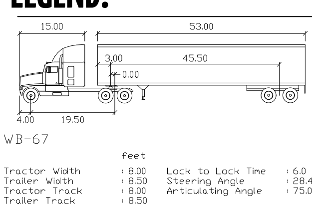

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= PROPOSED CURB RADII

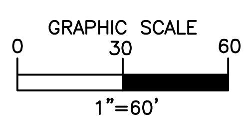

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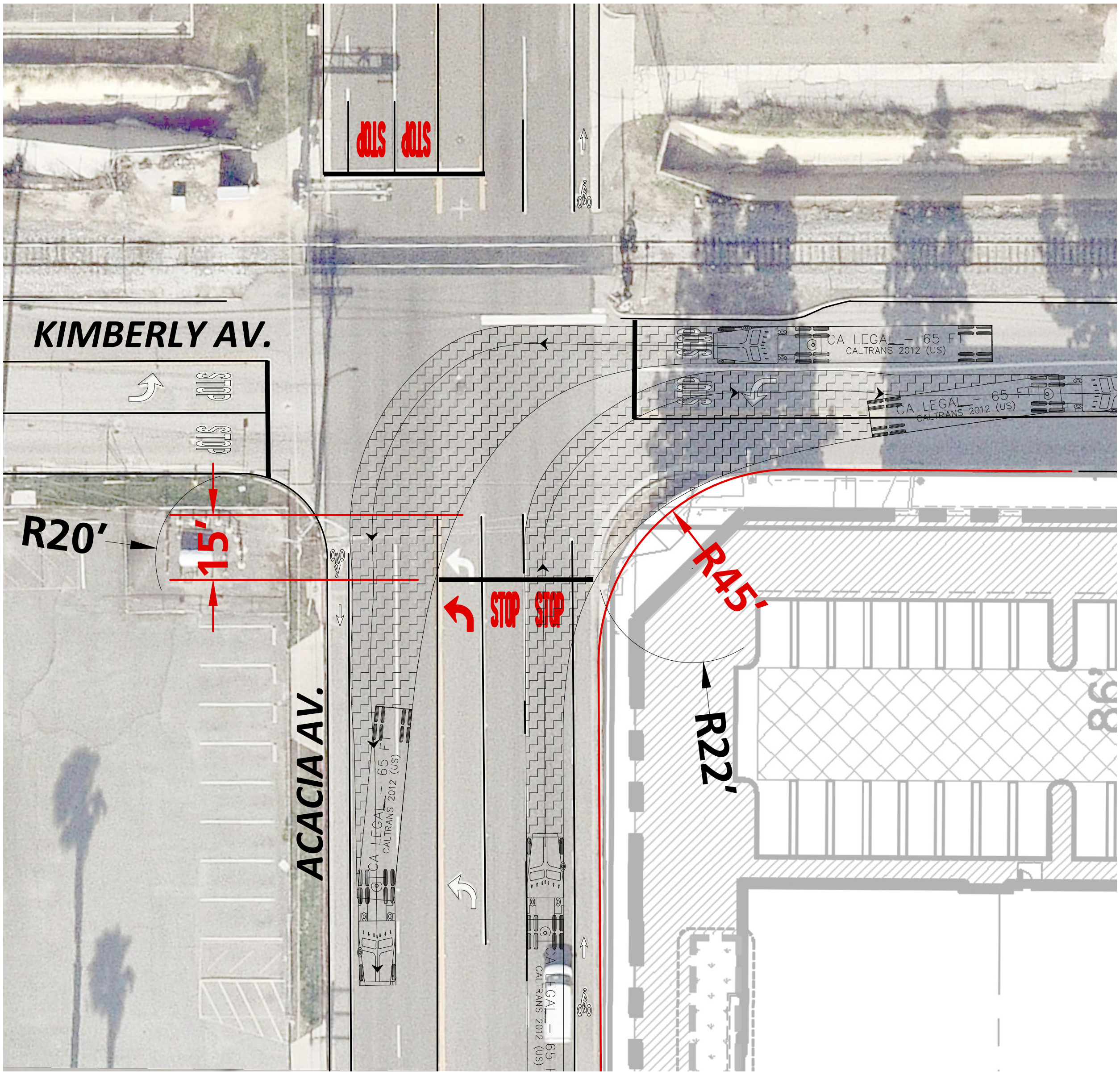
EXHIBIT 6-2 (6 OF 7): TRUCK ACCESS ACACIA AND KIMBERLY



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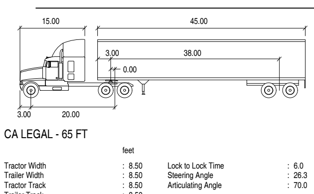
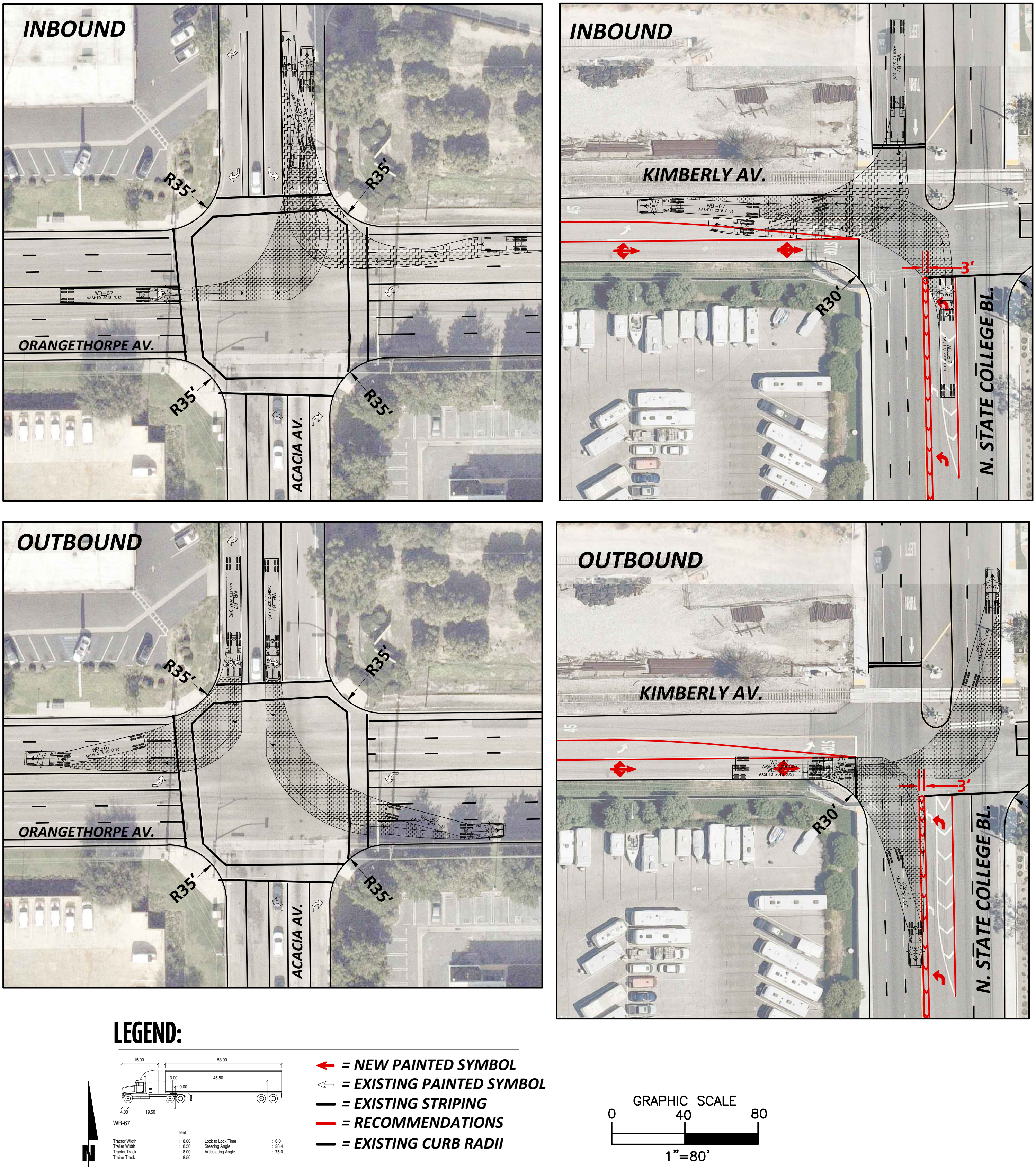


= NEW PAINTED SYMBOL
= EXISTING PAINTED SYMBOL
= EXISTING STRIPING
= RECOMMENDATIONS
= EXISTING CURB RADII

N

GRAPHIC SCALE
0 20 40
1"=40'

EXHIBIT 6-2 (7OF7): TRUCK ACCESS ACACIA AND ORANGETHORPE AND STATE COLLEGE AND KIMBERLY



The following intersection control and lane geometric recommendations addressed previously also accommodate truck turns.

- Acacia Av. & Kimberly Av. (#5): Implement an all-way stop control (warrant met as discussed in Section 6.2).
- Acacia Av. & Orangethorpe Av. (#6): Implementation of protected left-turn movements at the intersection of Acacia Avenue and Orangethorpe Avenue on all approaches (includes installation/modifications required to physically install the appropriate signal head equipment and modification to the signal operations/timing).

6.6 SIGHT DISTANCE ANALYSIS

Horizontal sight distance has been evaluated for all Project driveways along Kimberly Avenue, Orangethorpe Avenue, and N. State College Boulevard based on Orange County Standard Plan 1117. As defined by the Caltrans Highway Design Manual, sight distance is the continuous length of highway ahead visible to the driver.

At unsignalized intersections, sight distance must provide a substantially clear line of sight between the driver of the vehicle waiting on the minor road (driveway) and the driver of an approaching vehicle. For the purposes of this analysis, a 11 ½ second criterion has been applied to the outside travel lanes in either direction to provide the most conservative sight distance (for heavy trucks). The 11 ½ second criterion allows waiting vehicles to either cross all lanes of through traffic by turning left or cross the near lanes by turning right without requiring through traffic to radically alter their speed. Vertical sight distance has been evaluated utilizing a 3.5-foot eye height and a 4.25-foot object height. The sight distance is based on the posted speed limit.

Adequate visibility for vehicular and pedestrian traffic can be provided at each Project driveway by limiting sight obstructions within the limited use area. The limited use area is determined by starting with a point located 15-feet back from the edge of the traveled way which represents the position of the driver in a vehicle waiting to exit the driveway (minor approach) then a line is drawn to the center of the farthest lane (representing the location of an approaching vehicle) at the required distance per the Caltrans Highway Design Manual (HDM) (Section 405.1) along the major roadway in both directions of travel. [12] The distance along the major roadway is based on the posted speed limit and the vehicle time gap using the equation: 1.47 x design speed in miles per hour x time gap in seconds (per Table 405.1A of the HDM).

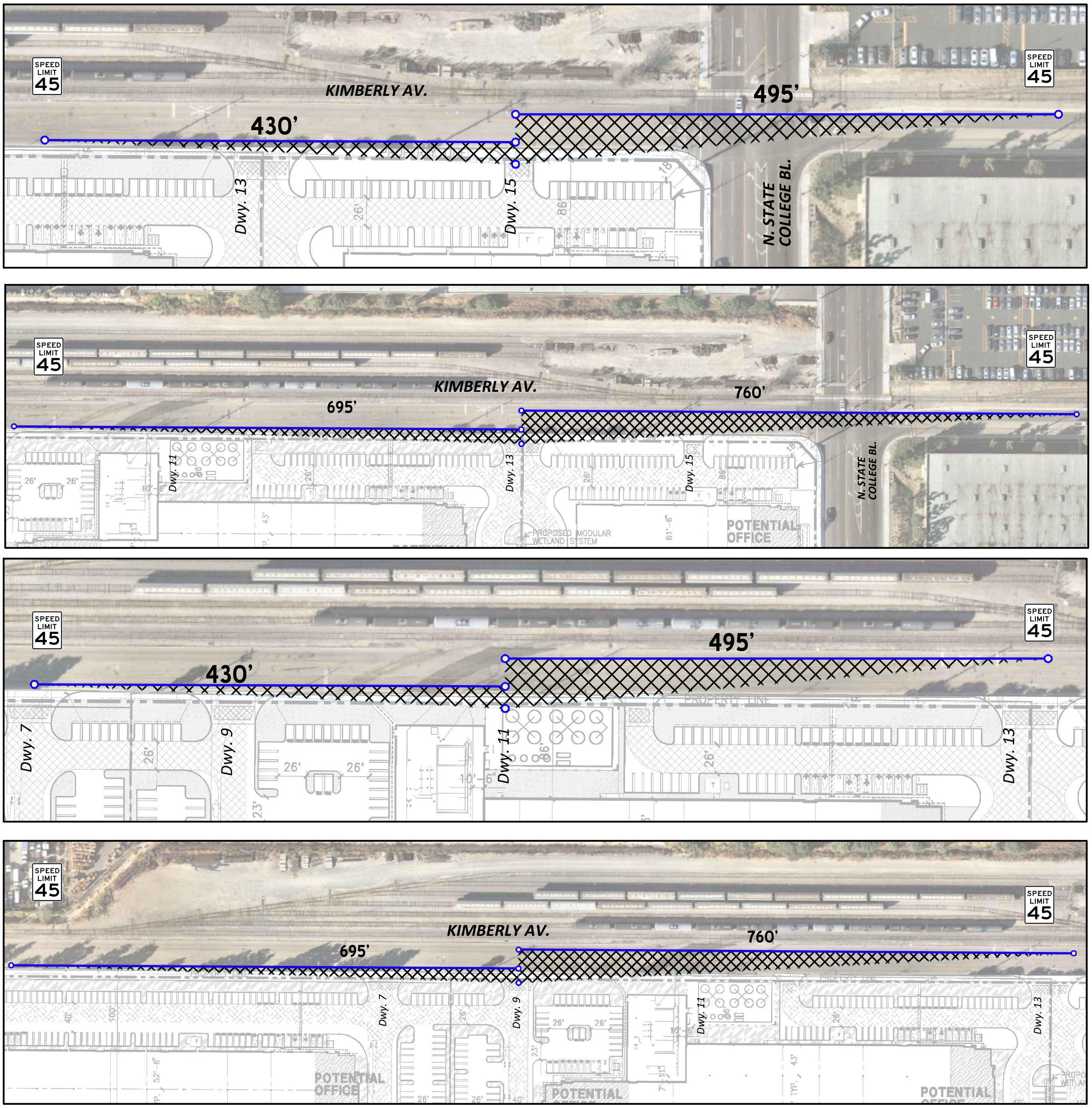
The sight distance at Driveway 12 on Orangethorpe Avenue is applicable to only the Optional Site Plan (see Existing 6-3 page 3 of 5). All other locations are consistent between the proposed Project and Optional Site Plan.

The sight distance has also been evaluated for the existing exit only driveway immediately to the south of Cypress Way/Driveway 16 on N. State College Boulevard (see Exhibit 6-3 (5 of 5)). Based on the setback of Driveway 16 from the existing driveways to the south (approximately 10-feet to the west), the sight distance for a vehicle waiting to exit from existing driveways to the south is not affected by any vehicle waiting to exit from Driveway 16 (see Exhibit 6-3 (5 of 5)). A vehicle waiting to exit the proposed Project at Driveway 16 on N. State College Boulevard does not lie within the limited use area triangle for the southbound approaching vehicles (see Exhibit 6-3).

As such, the Project's proposed driveway does not affect the sight distance for the vehicles waiting to exit the existing driveway immediately to the south of Driveway 16. Note the Project is not anticipated to alter the location of the existing curb along N. State College Boulevard in this area.

It is recommended that any landscaping/hardscape within the limited use area not exceed 3.0-feet in height. The limited use area (as shown on Exhibit 6-3) shall be kept clear of any landscaping or any other obstructions that may impede the visibility of the driver, including on-street parking.

EXHIBIT 6-3 (1OF5): SIGHT DISTANCE



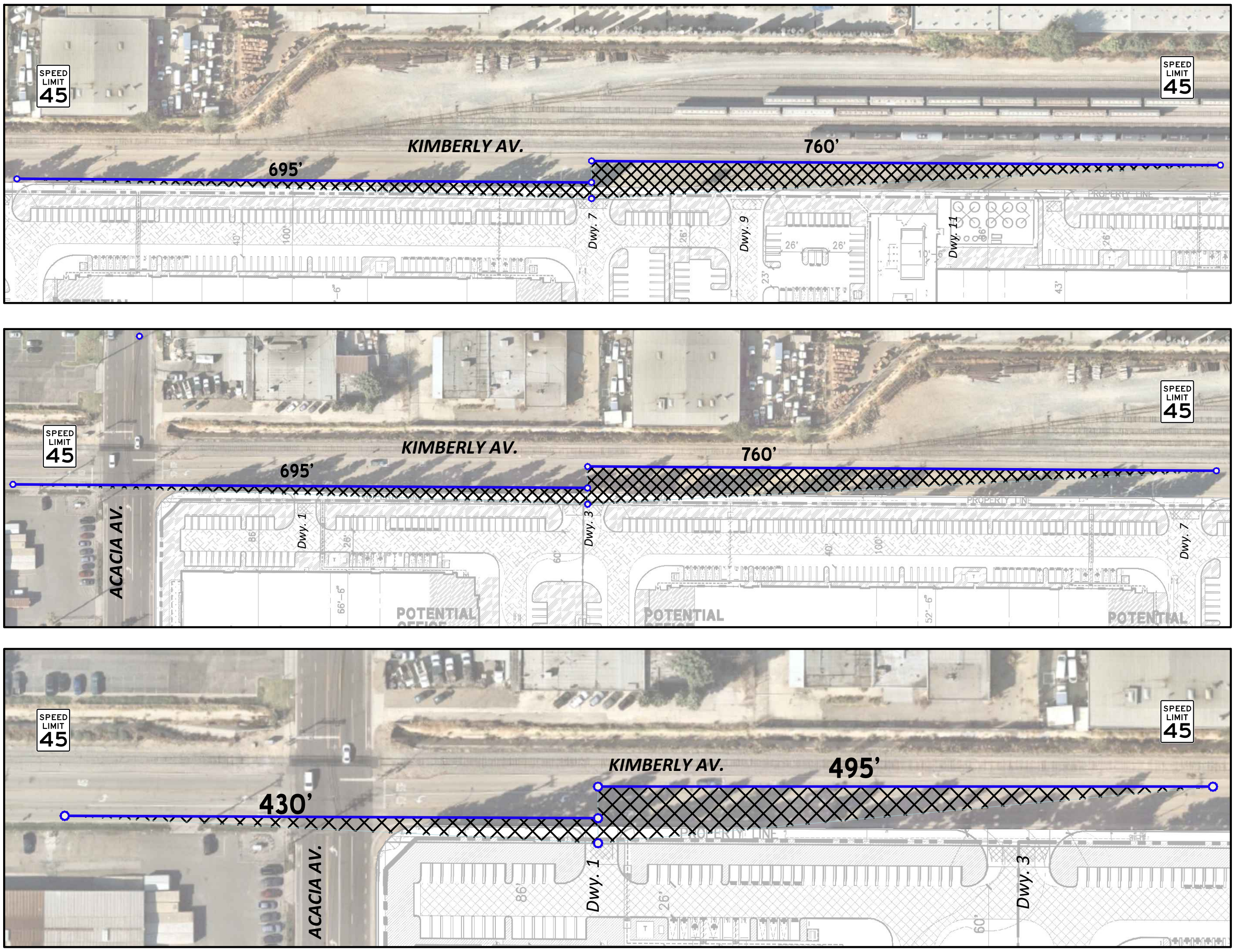
LEGEND:

= MINIMUM SIGHT DISTANCE LINES

= LIMITED USE AREA
(THERE SHALL BE NO OBSTRUCTION WITHIN THE LIMITED USE AREA. OBSTRUCTIONS INCLUDE, BUT NOT LIMITED TO, ANY SIGNS OR OBJECTS HIGHER THAN 3' MEASURED FROM PAVEMENT WITHIN THE AREA OF LIMITED USE.)

N

EXHIBIT 6-3 (2OF5): SIGHT DISTANCE



LEGEND:

= MINIMUM SIGHT DISTANCE LINES

= LIMITED USE AREA
(THERE SHALL BE NO OBSTRUCTION WITHIN THE LIMITED USE AREA. OBSTRUCTIONS INCLUDE, BUT NOT LIMITED TO, ANY SIGNS OR OBJECTS HIGHER THAN 3' MEASURED FROM PAVEMENT WITHIN THE AREA OF LIMITED USE.)

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EXHIBIT 6-3 (3OF5): SIGHT DISTANCE

LEGEND:

= MINIMUM SIGHT DISTANCE LINES

= LIMITED USE AREA
(THERE SHALL BE NO OBSTRUCTION WITHIN THE LIMITED USE AREA. OBSTRUCTIONS INCLUDE, BUT NOT LIMITED TO, ANY SIGNS OR OBJECTS HIGHER THAN 3' MEASURED FROM PAVEMENT WITHIN THE AREA OF LIMITED USE.)

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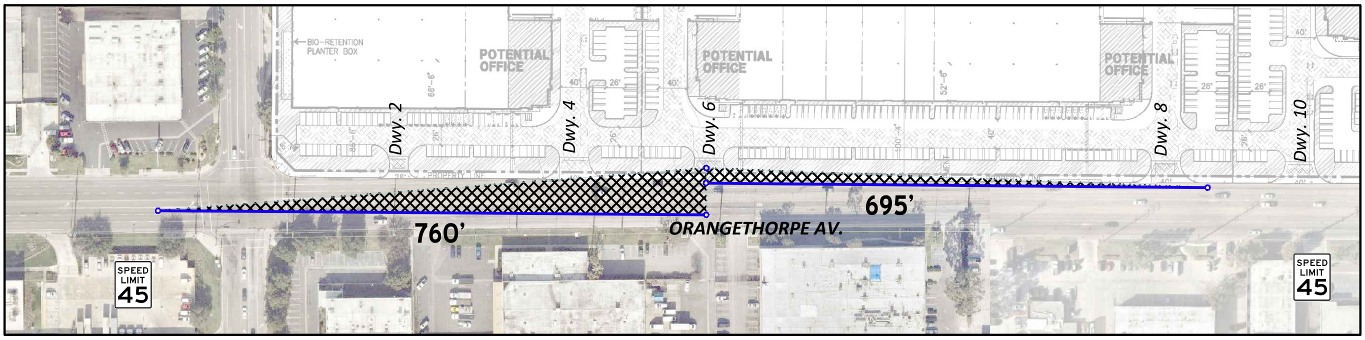
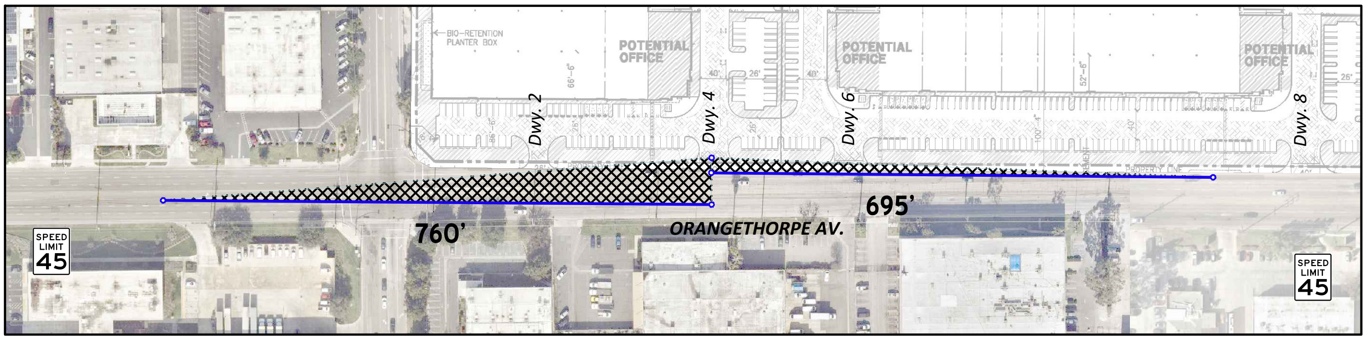
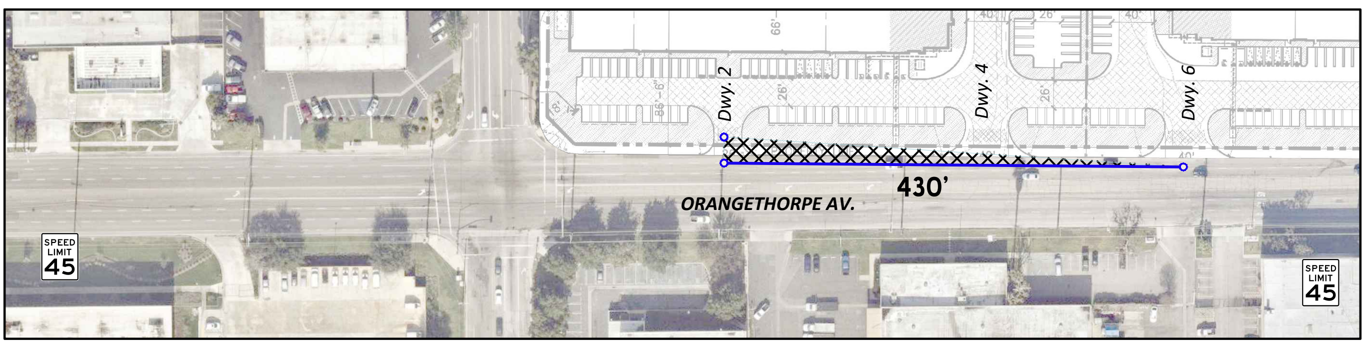
EXHIBIT 6-3 (4OF5): SIGHT DISTANCE







LEGEND:

= MINIMUM SIGHT DISTANCE LINES

= LIMITED USE AREA
(THERE SHALL BE NO OBSTRUCTION WITHIN THE LIMITED USE AREA. OBSTRUCTIONS INCLUDE, BUT NOT LIMITED TO, ANY SIGNS OR OBJECTS HIGHER THAN 3' MEASURED FROM PAVEMENT WITHIN THE AREA OF LIMITED USE.)

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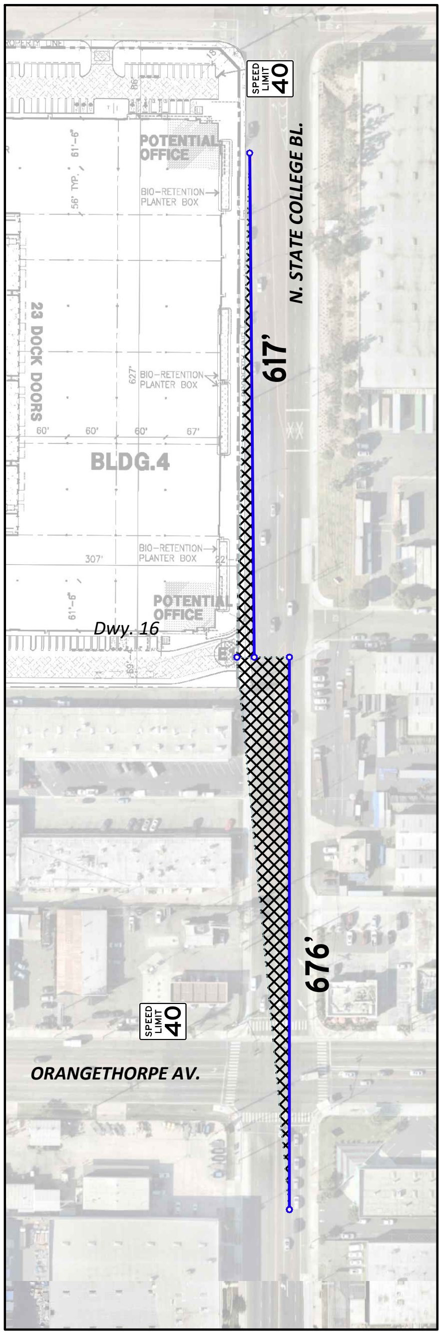
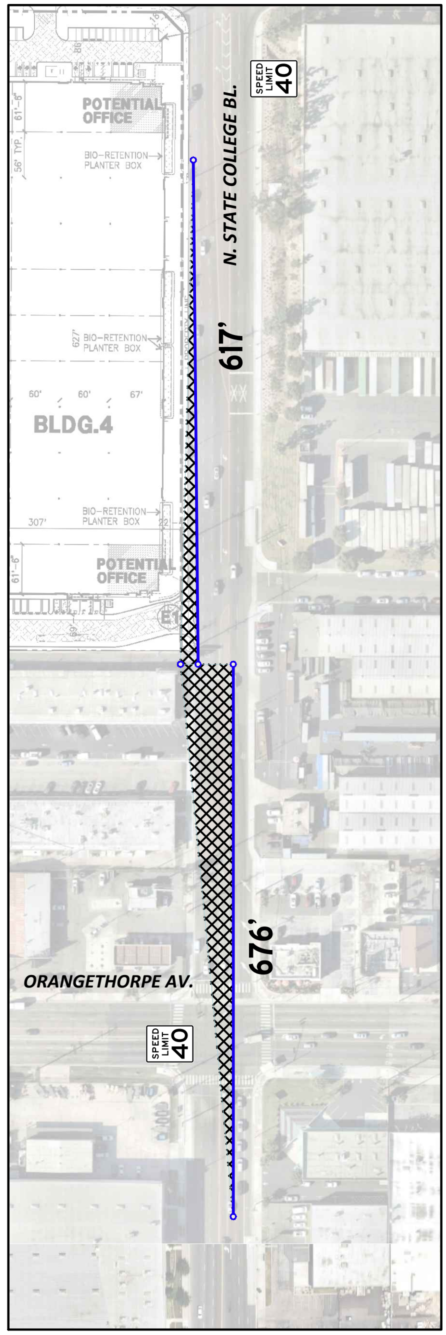
EXHIBIT 6-3 (5OF5): SIGHT DISTANCE





LEGEND:

= MINIMUM SIGHT DISTANCE LINES

= LIMITED USE AREA
(THERE SHALL BE NO OBSTRUCTION WITHIN THE LIMITED USE AREA. OBSTRUCTIONS INCLUDE, BUT NOT LIMITED TO, ANY SIGNS OR OBJECTS HIGHER THAN 3' MEASURED FROM PAVEMENT WITHIN THE AREA OF LIMITED USE.)

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7 REFERENCES

[1] City of Fullerton, "Transportation Assessment Polices and Procedures (TAPP)," City of Fullerton, June 16, 2020.

[2] California Department of Transportation, "Guide for the Preparation of Traffic Impact Studies," December 2002.

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[5] D. a. A. J. Husch, Intersection Capacity Utilization: Evaluation Procedures for Intersections and Interchanges, Albany, California: Trafficware, 2003 Edition.

[6] Transportation Research Board, Highway Capacity Manual (HCM), 6th Edition ed., Washington, D.C.: National Academy of Sciences, 2016.

[7] Orange County Transportation Authority (OCTA), "2019 Orange County Congestion Management Program," Orange County, November 2019.

[8] California Department of Transportation, "California Manual on Uniform Traffic Control Devices (CAMUTCD)," in *California Manual on Uniform Traffic Control Devices (CAMUTCD)*, 2014, Updated March 9, 2018.

[9] California Department of Transportation, "Caltrans Performance Measurement System (PeMS)," Caltrans, 10-12 March 2020. [Online]. Available: http://pems.dot.ca.gov/. [Accessed 12 May 2020].

[10] City of Anaheim, "Criteria for Preparation of Traffic Impact Studies," City of Anaheim, Undated.

[11] City of Fullerton, "The Fullerton Plan," City of Fullerton, Adopted May 1, 2012.

[12] California Department of Transportation, "Highway Design Manual," Caltrans, December 14, 2018.

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