2017 Orange County Congestion Management Program

Orange County Transportation Authority

October 2017

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Chapter 1: Introduction

Purpose & Need

In June 1990, the passage of the Proposition 111 gas tax increase required California's urbanized areas – areas with populations of 50,000 or more – to adopt a Congestion Management Program (CMP). The following year, Orange County's local governments designated the Orange County Transportation Authority (OCTA) as the Congestion Management Agency (CMA) for the County. As a result, OCTA is responsible for the development, monitoring, and biennial updating of Orange County's CMP.

The passage of Assembly Bill 2419, in July 1996, provided local agencies the option to elect out of the CMP process without the risk of losing state transportation funding. However, local jurisdictions in Orange County expressed a desire to continue the existing CMP process, because the requirements were similar to those of the Orange County Measure M Growth Management Program (GMP), and because it contributes to fulfilling federal requirements for the Congestion Management Process (23 CFR 450.320), which is prepared by the Southern California Association of Governments (SCAG). The OCTA Board of Directors affirmed the decision to continue with the existing CMP process on January 13, 1997. Although the GMP ended with the sunset of Measure M, the CMP remains necessary as an eligibility requirement under Measure M2.

As mentioned above, the CMP contributes to federal Congestion Management Process requirements, which is a systematic and regionally-accepted approach for managing congestion. The federal Congestion Management Process provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs.

The Congestion Management Process is also intended to serve as a systematic process that provides for consistent and effective integrated monitoring and management of the multimodal transportation system.

The process includes:

- Development of congestion management objectives;
- Establishment of measures of multimodal transportation system performance;
- Collection of data and system performance monitoring to define the extent and duration of congestion and determine the causes of congestion;
- Identification of congestion management strategies;
- Implementation activities, including identification of an implementation schedule and possible funding sources for each strategy; and
- Evaluation of the effectiveness of implemented strategies.

A federal Congestion Management Process is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements also state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process.

CMP Goals

The goals of Orange County's CMP are to support regional mobility objectives by reducing traffic congestion, to provide a mechanism for coordinating land use and development decisions that support the regional economy, and to support gas tax funding eligibility.

To meet these goals, the CMP contains a number of policies designed to monitor and address system performance issues. OCTA developed the policies that makeup Orange County’s CMP in coordination with local jurisdictions, the California Department of Transportation (Caltrans), and the South Coast Air Quality Management District (SCAQMD).

State Legislation

Required Elements

California Government Code Section 65089(b) requires the CMP to include specific elements, as summarized below. The full text of the Government Code can be viewed at www.leginfo.ca.gov/calaw.html, sections 65088-65089.10.

Traffic Level of Service Standards – §65089(b)(1)(A) & (B)

Traffic level of service (LOS) standards shall be established for a system of highways and roadways. The highways and roadway system shall be designated by OCTA and shall include, at minimum, all state highways and principal arterials. None of the designated facilities may be removed, and new state highways and principal arterials must be added, except if they are within an infill opportunity zone. The LOS must be measured using a method that is consistent with the Highway Capacity Manual. The LOS standards must not be below level of service "E", unless the levels of service from the baseline CMP dataset were lower. If a CMPHS segment or intersection does not meet the minimum LOS standard outside an infill opportunity zone, a deficiency plan must be adopted (subject to exclusions).

Chapter 2 specifically addresses this element.

Performance Measures – §65089(b)(2)

Performance measures shall be established to evaluate the current and future performance of the transportation system. At a minimum, measures must be established for the highway and roadway system, frequency and routing of public transit, and for the coordination of transit service by separate operators. These measures will be used to support improvements to mobility, air quality, land use, and economic objectives and shall be incorporated into the Capital Improvement Program, the Land Use Analysis Program, and any required deficiency plans.

Chapter 3 specifically address this element.

Travel Demand – §65089(b)(3)

A travel demand element shall be established to promote alternative transportation methods, improve the balance between jobs and housing, and other trip reduction strategies. These methods and strategies may include, but are not limited to, carpools, vanpools, transit, bicycles, park-and-ride lots, flexible work hours, telecommuting, parking management programs, and parking cash-out programs.

Chapter 4 specifically addresses this element.

Land Use Analysis Program – §65089(b)(4)

A program shall be established to analyze the impacts of land use decisions on the transportation system, using the previously described performance measures. The analysis must also include cost estimates associated with mitigating those impacts. To avoid duplication, this program may require implementation through the requirements and analysis of the California Environmental Quality Act.

Chapter 5 specifically addresses this element.

Capital Improvement Program – §65089(b)(5)

The CMP shall use the performance measures described above to determine effective projects that mitigate impacts identified in the land use analysis program, through an adopted seven-year capital improvement program. This seven-year program will conform to transportation-related air quality mitigation measures and will include any projects that increase the capacity of the transportation system. Furthermore, consideration will be given to maintaining or improving bicycle access and safety within the project areas. Projects necessary for preserving investments in existing facilities may also be included.

Chapter 6 specifically addresses this element.

CMA Requirements

As Orange County's CMA, OCTA is responsible for the administration of the CMP, as well as providing data and models that are consistent with those used by the Southern California Association of Governments (SCAG). OCTA is also responsible for developing the deficiency plan processes. These requirements are described in the legislation, and are summarized below.

Modeling and Data Consistency – §65089(c)

In consultation with SCAG and local jurisdictions, OCTA shall develop a uniform database on traffic impacts for use in a countywide transportation computer model. Moreover, OCTA shall approve transportation models that will be used by local jurisdictions to determine the quantitative impacts of development on the circulation system. Every local jurisdiction's traffic model must be based on the countywide model and standardized modeling assumptions and conventions. All models and databases shall be consistent with the modeling methodology and databases used by SCAG.

Appendix F addresses this requirement.

Deficiency Plan Procedures – §65089.4

OCTA is responsible for preparing and adopting procedures for local deficiency plan development and implementation. OCTA's deficiency plan procedures incorporate a methodology for determining if deficiency impacts are caused by more than one local jurisdiction within Orange County. If required, a multi-jurisdictional deficiency plan must be adopted by all participating local jurisdictions. The procedures also provide for a conflict resolution process for addressing conflicts or disputes between local jurisdictions in meeting the multi-jurisdictional deficiency plan responsibilities.

Chapter 3 and Appendix C discuss this requirement in more detail.

Chapter 2: Traffic Level of Service Standards

In 1991, the OCTA implemented an Intersection Capacity Utilization (ICU) monitoring method, developed with technical staff members from local and State agencies, for measuring the Level of Service (LOS) at CMP Highway System (CMPHS) intersections. The CMP LOS grade chart is illustrated in Figure 1.

FIGURE 1: LOS Grade Chart

Level of Service	ICU Rating
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

The first CMP LOS measurement recorded, which was in 1992 for most CMP intersections, established the baseline for comparing future measurements. During subsequent LOS monitoring, CMP statute requires that CMPHS intersections maintain a LOS grade of 'E' or better, unless the baseline is lower than 'E'; in which case, the ICU rating cannot increase by more than 0.10. Chapter 3 discusses the ICU method in more detail.

OCTA has an established CMPHS, consisting of Orange County's State highways and the arterials included in OCTA's Smart Street network (Figure 2). If, during any monitoring period, a CMPHS intersection is determined to be performing below the LOS standards the responsible agency must identify improvements necessary to meet the LOS standards. This is accomplished either through existing plans or capital improvement programs, or through the development of a deficiency plan. This is described in more detail in Chapter 3.

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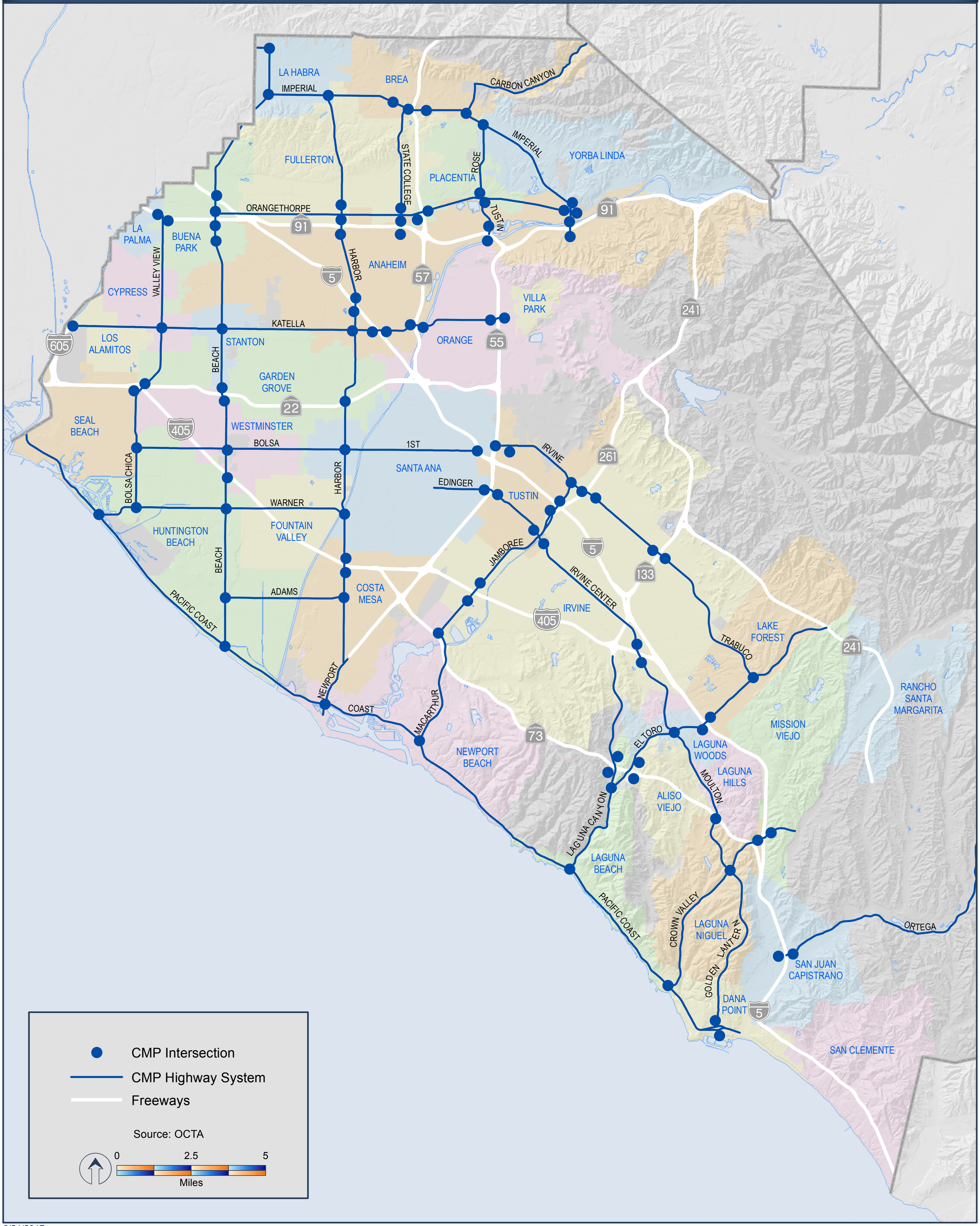
Figure 2: 2017 Congestion Management Program Highway System



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The 2017 freeway monitoring results, provided by Caltrans District 12, are located in Appendix A. Caltrans is responsible for monitoring freeway performance and addressing any deficiencies on State-operated facilities. Caltrans' responsibilities include, but are not limited to:

A. Evaluating current conditions and identifying deficiencies.

B. Developing plans and strategies to address deficiencies.

C. Evaluating development projects of local and regional significance to determine whether they will impact the State transportation system and, if so, working with lead agencies to develop potential mitigation measures.

For the State transportation system, Caltrans does not use CMP thresholds and analysis methodologies to determine if significant impacts occur under CEQA. Their specific focus is on maintaining the safety of State highways. As such, their performance measures tend to focus upon freeway segment/ramps, ramp metering operations, queue lengths, and signal operations (timing, phasing, and system/series progression) metrics.

Local agencies are encouraged to coordinate with the Caltrans Local Development/ Intergovernmental Review Branch early in the development process to determine what methodologies and thresholds of significance should be used to identify impacts to the State transportation system. During the development of the Orange County CMP, OCTA works with Caltrans to obtain necessary freeway and State controlled intersection data, as well as notifying Caltrans of any deficiencies on State facilities.

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Chapter 3: System Performance

Highway & Roadway System Performance Measures

This section discusses the process for determining ICU ratings, as well as how ICU ratings determine the LOS at CMPHS intersections. This method is generally consistent with the Highway Capacity Manual.

Overview of Intersection Capacity Utilization (ICU) Methodology

Traffic counts are manually collected at CMPHS intersections to initiate the ICU calculation process. The counts monitor the traffic flow, including the approach (northbound, eastbound, southbound, or westbound) and movement (left turn, through, or right turn) for each vehicle.

Each intersection has counts conducted in 15-minute increments, during peak periods in the AM (6:00-9:00) and PM (3:00-7:00) on three separate mid-week days (Tuesday, Wednesday, and Thursday). Counts are not taken during periods when irregular conditions exist (inclement weather, holidays, construction, etc.).

The highest count total during any four consecutive 15-minute count intervals within a peak period represents the peak-hour count set. For each intersection, a peak-hour count set is determined for each day's AM and PM peak period, resulting in a group of three AM peak-hour count sets and a group of three PM peak-hour count sets (one for each midweek count day).

The group of AM peak-hour count sets is averaged, as is the group of PM peak-hour count sets. The results are the volumes used to determine AM and PM volume-to-capacity (V/C) ratios for each movement through the intersection. A number of assumptions determine the capacities for each movement.

An example of an assumption used to determine capacity is the saturation flow-rate, which represents the theoretical maximum number of vehicles that are able to move through an intersection in a single lane during a green light phase. In 1991, OCTA and the technical staff members from local and State agencies agreed upon a saturation flow-rate of 1,700 vehicles per lane per hour. However, other factors can adjust this assumption.

Such factors include right turn lanes, which can increase the saturation flow-rate by 15% in specific circumstances. Right turn overlaps (signalized right turn lanes that are green during the cross traffic's left turn movements) and free right turns (lanes in which vehicles are allowed to turn right without stopping, even when the through signal is red) are some of the circumstances that will increase the saturation flow-rate. If right turns on red are permitted, a *de facto* right turn lane (approaches that do not have designated right turn lanes, but which are at least 19 feet wide and prohibit on-street parking during peak hours) may also increase the saturation flow rate.

Roadway capacity can also be reduced under certain conditions. For example, if a lane is shared for through and turn movements, the saturation flow-rate of 1,700 could be reduced. This occurs only when the turn movement volumes reach a certain threshold that is calculated for each intersection with shared lanes. The reduction represents the slower turning movements interfering with through movements.

Finally, bicycle and pedestrian counts are conducted simultaneously with vehicle counts. Saturation flow-rate calculations to factor in bicycle and pedestrian activity for effected lanes using standard reductions in accordance with Chapter 18 of the Highway Capacity Manual 2010, may be requested. Reductions are only considered when field observations indicate the presence of more than 100 pedestrians per hour on one leg of an intersection.

Once the V/C ratios are determined for each movement, critical V/C ratios are calculated. Conflicting movements determine which V/C ratios are included in the calculation of the critical V/C ratios. Conflicting movements represent a situation where a movement from one approach prevents a movement from the opposite approach. For example, if through movements are being made from the southbound approach, left turn movements cannot simultaneously be made from the northbound approach. For each set of opposing approaches (north/south and east/west), the two conflicting movements with the greatest summed V/C ratios are identified. These summed V/C ratios then become known as the critical V/C ratios.

OCTA and technical staff members from local and State agencies also agreed upon a lost time factor of 0.05 in 1991. The lost time factor represents the assumed amount of time it takes for a vehicle to travel through an intersection. For each intersection, the critical V/C ratios are summed (north/south + east/west), and the lost time factor is added to the sum, producing the ICU rating for the intersection.

Based on a set of ICU rating ranges, which were agreed upon by OCTA and technical staff members from local and State agencies, grades are assigned to each intersection. The grades indicate the LOS for intersections, and are used to determine whether the intersections meet the performance standards described at the beginning of the chapter.

The 2017 LOS ratings for the CMP intersections have been mapped in Figure 3. A spreadsheet of the baseline and 2017 LOS ratings for the CMP intersections, and corresponding ICU measurements, is located in Figure 4.

Note that in Figure 4, Orange County's average ICU rating has improved over the baseline. Between 1991 and 2017, the average AM ICU improved from 0.67 to 0.61 (about a 9 percent improvement), and the PM ICU improved from 0.72 to 0.64 (about an 11 percent improvement). The ICU improvements indicate that Orange County agencies are effectively operating, maintaining, and improving the CMP Highway System.

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Figure 3: 2017 CMP Intersection Level of Service

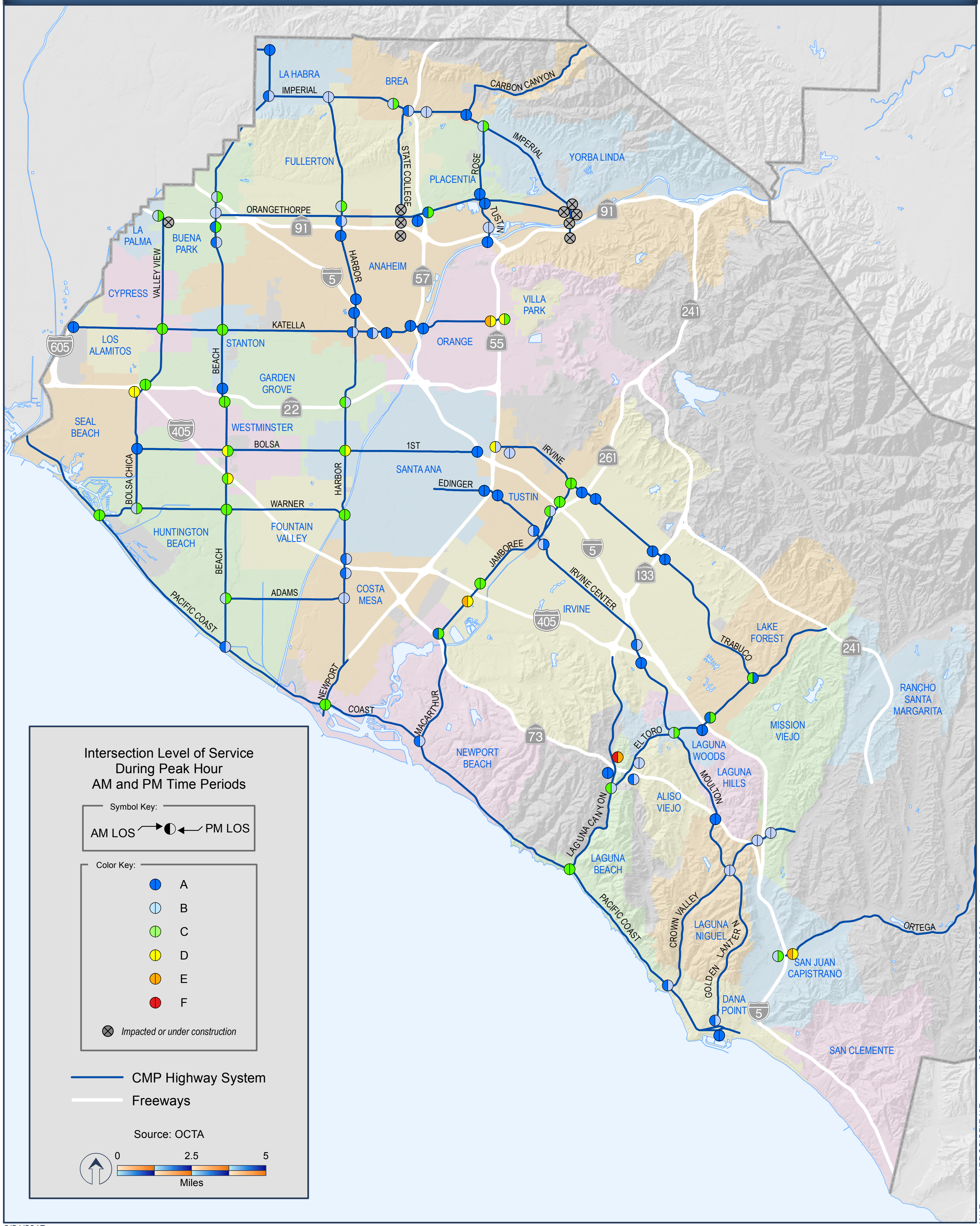

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FIGURE 4: 2017 CMP Level of Service Chart

Jurisdiction	Intersection/Interchange	Baseline AM LOS	Baseline AM ICU	2017 AM LOS	2017 AM ICU	Baseline PM LOS	Baseline PM ICU	2017 PM LOS	2017 PM ICU
Anaheim	Anaheim Blvd-I-5 NB Ramp/Katella Avenue	A	0.49	A	0.4	D	0.82	A	0.56
Anaheim	Harbor Blvd./Katella Avenue	A	0.53	A	0.53	B	0.67	B	0.61
Anaheim	Harbor Boulevard/I-5 SB Ramps	A	0.29	A	0.3	A	0.31	A	0.33
Anaheim	Harbor Boulevard/SR-91 EB Ramps	A	0.46	A	0.47	A	0.52	A	0.57
Anaheim	I-5 NB Ramp/Harbor Boulevard	A	0.52	A	0.49	A	0.54	A	0.5
Anaheim	I-5 SB Ramps/Katella Avenue	A	0.48	A	0.57	A	0.41	B	0.66
Anaheim	SR-57 NB Ramps/Katella Avenue	A	0.51	A	0.41	A	0.41	A	0.44
Anaheim	SR-57 SB Ramps/Katella Avenue	A	0.52	A	0.41	A	0.51	A	0.43
Anaheim	SR-91 EB Ramp/Imperial Highway	C	0.73	Impacted by Construction		C	0.79	Impacted by Construction	
Anaheim	SR-91 EB Ramps/State College Boulevard	B	0.69	Impacted by Construction		D	0.82	Impacted by Construction	
Anaheim	SR-91 EB Ramps/Tustin Avenue	B	0.66	A	0.57	D	0.84	A	0.48
Anaheim	SR-91 WB Ramp/Harbor Boulevard	B	0.61	A	0.59	C	0.77	B	0.64
Anaheim	SR-91 WB Ramp/Imperial Highway	C	0.71	Impacted by Construction		B	0.63	Impacted by Construction	
Anaheim	SR-91 WB Ramp/State College Boulevard	A	0.55	Impacted by Construction		B	0.63	Impacted by Construction	
Anaheim	SR-91 WB Ramps/Tustin Avenue	B	0.64	B	0.68	A	0.6	B	0.69
Anaheim	Imperial Hwy Off/SB On/Orangethorpe Ave	A	0.32	Impacted by Construction		A	0.39	Impacted by Construction	
Anaheim	Imperial Hwy NB On/Orangethorpe Ave	A	0.26	Impacted by Construction		A	0.3	Impacted by Construction	
Anaheim	Imperial Hwy/Orangethorpe Ave Ramps	A	0.41	Impacted by Construction		A	0.42	Impacted by Construction	
Brea	SR-57 SB Ramps/Imperial Highway	B	0.68	A	0.57	B	0.7	B	0.69
Brea	State College Boulevard/Imperial Highway	C	0.73	B	0.69	E	0.93	C	0.71
Brea	Valencia Avenue/Imperial Highway	A	0.56	A	0.49	A	0.59	A	0.53
Brea	SR-57 NB Ramp/Imperial Highway	C	0.78	B	0.66	E	0.91	B	0.69
Buena Park	Beach Boulevard/Orangethorpe Avenue	C	0.76	B	0.67	D	0.87	B	0.64
Buena Park	I-5 SB Ramps/Beach Boulevard	C	0.72	B	0.68	C	0.78	C	0.7
Buena Park	SR-91 EB Ramp/Beach Boulevard	C	0.74	A	0.59	D	0.84	B	0.65
Buena Park	SR-91 EB Ramp/Valley View Street	A	0.58	Under Construction		D	0.86	Under Construction	
Buena Park	SR-91 WB Ramp/Beach Boulevard	A	0.58	A	0.59	A	0.59	C	0.7
Buena Park	SR-91 WB Ramp/Valley View Street	C	0.8	B	0.66	E	0.94	C	0.77
Costa Mesa	Harbor Boulevard/Adams Avenue	E	0.99	B	0.65	F	1.09	B	0.7
Costa Mesa	I-405 SB Ramps/Harbor Boulevard	A	0.53	A	0.5	B	0.63	B	0.62
Costa Mesa	I-405 NB Ramps/Harbor Boulevard	E	0.95	A	0.49	F	1.07	B	0.6
Cypress	Valley View Street/Katella Avenue	B	0.63	C	0.72	D	0.87	C	0.76
Dana Point	Crown Valley Parkway/Bay Drive/PCH	F	1.41	A	0.57	F	1.62	B	0.6
Dana Point	Street of the Golden Lantern/Del Prado Avenue	A	0.32	A	0.23	A	0.53	A	0.4
Dana Point	Street of the Golden Lantern/PCH	A	0.42	A	0.55	A	0.55	B	0.69
Fullerton	Harbor Boulevard/Orangethorpe Avenue	A	0.6	B	0.67	E	0.94	C	0.77
Fullerton	State College Boulevard/Orangethorpe Avenue	C	0.8	Impacted by Construction		D	0.86	Impacted by Construction	
Garden Grove	SR-22 WB/Beach Boulevard	C	0.73	C	0.71	C	0.73	C	0.71
Garden Grove	SR-22 WB Ramp/Valley View Street	C	0.76	C	0.71	D	0.87	C	0.71
Garden Grove	SR-22 WB Ramps/Harbor Boulevard	F	1.1	C	0.72	F	1.16	B	0.69
Huntington Beach	Beach Boulevard/405 SB Ramp/Edinger Avenue	B	0.63	C	0.7	E	1.03	D	0.81
Huntington Beach	Beach Boulevard/Adams Avenue	A	0.55	B	0.61	C	0.67	C	0.74
Huntington Beach	Beach Boulevard/Pacific Coast Highway	A	0.45	A	0.59	A	0.47	B	0.66
Huntington Beach	Beach Boulevard/Warner Avenue	C	0.78	C	0.75	E	0.93	C	0.8
Huntington Beach	Bolsa Chica Street/Bolsa Avenue	B	0.66	A	0.55	A	0.53	A	0.59
Huntington Beach	Bolsa Chica Street/Warner Avenue	A	0.57	B	0.67	D	0.81	C	0.71

FIGURE 4: 2017 CMP Level of Service Chart

Jurisdiction	Intersection/Interchange	Baseline AM LOS	Baseline AM ICU	2017 AM LOS	2017 AM ICU	Baseline PM LOS	Baseline PM ICU	2017 PM LOS	2017 PM ICU
Huntington Beach	Pacific Coast Highway/Warner Avenue	D	0.81	C	0.73	B	0.72	C	0.79
Irvine	SR-133 NB Ramps/Irvine Boulevard	A	0.37	A	0.47	A	0.33	A	0.58
Irvine	SR-133 SB Ramps/Irvine Boulevard	A	0.37	A	0.4	A	0.29	A	0.41
Irvine	SR-261 NB Ramps/Irvine Boulevard	A	0.38	A	0.41	A	0.53	A	0.51
Irvine	SR-261 SB Ramps/Irvine Boulevard	A	0.42	A	0.41	A	0.4	A	0.43
Irvine	I-405 NB Ramps/Enterprise/Irvine Center Drive	E	0.95	A	0.57	A	0.39	B	0.64
Irvine	I-405 NB Ramps/Jamboree Road	F	1.03	C	0.71	C	0.78	C	0.78
Irvine	I-405 SB Ramps/Irvine Center Drive	E	1	A	0.51	A	0.57	A	0.59
Irvine	I-405 SB Ramps/Jamboree Road	E	0.92	E	0.9	B	0.66	D	0.89
Irvine	I-5 NB Ramps/Jamboree Road	A	0.54	C	0.8	C	0.75	C	0.74
Irvine	I-5 SB Ramps/Jamboree Road	A	0.4	C	0.71	A	0.35	B	0.6
Irvine	MacArthur Boulevard/Jamboree Road	B	0.61	A	0.59	B	0.69	C	0.79
La Habra	Harbor Boulevard/Imperial Highway	D	0.81	B	0.6	D	0.86	B	0.64
La Habra	Beach Boulevard/Imperial Highway	D	0.85	A	0.57	D	0.87	B	0.67
La Habra	Beach Boulevard/Whittier Boulevard	A	0.33	A	0.47	A	0.29	A	0.49
Laguna Beach	El Toro Road/SR-73 NB Ramps	E	0.91	B	0.66	A	0.59	B	0.69
Laguna Beach	El Toro Road/SR-73 SB Ramps	A	0.41	A	0.47	B	0.67	B	0.65
Laguna Beach	Laguna Canyon Rd/SR-73 NB Ramps	C	0.73	F	1.05	C	0.72	E	0.99
Laguna Beach	Laguna Canyon Rd/SR-73 SB Ramps	A	0.32	A	0.5	A	0.33	A	0.53
Laguna Beach	Laguna Canyon Road/El Toro Road	F	1.54	C	0.7	F	1.16	B	0.65
Laguna Beach	Laguna Canyon Road/Pacific Coast Highway	D	0.84	C	0.75	C	0.74	C	0.7
Laguna Hills	I-5 SB Ramp/Avenida de la Carlotta/El Toro Road	F	1.18	A	0.46	F	1.13	A	0.47
Laguna Niguel	Moulton Parkway/SR-73 SB Ramps	A	0.45	A	0.45	A	0.38	A	0.48
Laguna Niguel	Moulton Parkway/Crown Valley Parkway	A	0.56	B	0.64	B	0.65	B	0.62
Laguna Woods	Moulton Parkway/El Toro Road	E	0.94	B	0.66	F	1.26	C	0.71
Lake Forest	I-5 NB/Bridger/El Toro Road	A	0.56	A	0.58	D	0.81	C	0.73
Lake Forest	Trabuco Road/El Toro Road	F	1.03	C	0.72	C	0.8	A	0.57
Los Alamitos	I-605 NB Ramps/Katella Avenue	B	0.69	A	0.41	B	0.65	A	0.5
Mission Viejo	I-5 NB Ramps/Crown Valley Parkway	B	0.68	B	0.61	B	0.69	B	0.6
Mission Viejo	I-5 SB Ramps/Crown Valley Parkway	D	0.86	B	0.6	F	1.01	B	0.66
Newport Beach	MacArthur Boulevard/Pacific Coast Highway	A	0.51	A	0.53	B	0.7	B	0.63
Newport Beach	Newport Boulevard/Pacific Coast Highway	A	0.56	C	0.76	A	0.49	C	0.7
Orange	SR-55 NB Ramps/Sacramento/Katella Avenue	C	0.75	D	0.82	D	0.85	C	0.77
Orange	SR-55 SB Ramps/Katella Avenue	C	0.73	E	0.93	E	0.95	D	0.82
Placentia	Rose Drive/Imperial Highway	E	0.95	B	0.67	E	0.99	C	0.76
Placentia	SR-57 NB Ramps/Orangethorpe Avenue	B	0.67	A	0.59	C	0.8	C	0.73
Placentia	SR-57 SB Ramps/Iowa Place/Orangethorpe Avenue	C	0.74	A	0.45	B	0.69	A	0.44
Placentia	Del Cerro Dr/Orangethorpe Ave	A	0.29	A	0.29	A	0.27	A	0.27
Placentia	Rose Dr/Del Cerro Dr	A	0.59	A	0.59	A	0.51	A	0.51
San Juan Capistrano	I-5 NB Ramps/Ortega Highway	A	0.52	E	0.99	A	0.58	D	0.89
San Juan Capistrano	I-5 SB Ramps/Ortega Highway	B	0.61	B	0.61	C	0.77	C	0.71
Santa Ana	Harbor Boulevard/1st Street	A	0.48	C	0.7	D	0.81	D	0.81
Santa Ana	Harbor Boulevard/Warner Avenue	E	0.93	C	0.73	E	0.98	C	0.8
Santa Ana	I-5 SB Ramps/1st Street	A	0.29	A	0.46	A	0.46	A	0.58
Santa Ana	SR-55 SB Ramp/Auto Mall/Edinger Avenue	D	0.9	A	0.59	F	1.06	A	0.56
Santa Ana	SR-55 SB Ramps/Irvine Boulevard	B	0.68	D	0.82	D	0.83	B	0.68

FIGURE 4: 2017 CMP Level of Service Chart

Jurisdiction	Intersection/Interchange	Baseline AM LOS	Baseline AM ICU	2017 AM LOS	2017 AM ICU	Baseline PM LOS	Baseline PM ICU	2017 PM LOS	2017 PM ICU
Stanton	Beach Boulevard/Katella Avenue	D	0.89	C	0.72	F	1.02	C	0.7
Tustin	Jamboree Road/Edinger Avenue-NB Ramp	A	0.28	B	0.6	A	0.32	A	0.58
Tustin	Jamboree Road/Edinger Avenue-SB Ramp	D	0.81	B	0.6	A	0.41	A	0.58
Tustin	Jamboree Road/Irvine Boulevard	B	0.65	C	0.8	A	0.59	C	0.74
Tustin	SR-55 NB Ramps/Edinger Avenue	C	0.72	A	0.46	B	0.65	A	0.55
Tustin	SR-55 NB Ramps/Irvine Boulevard	A	0.59	B	0.67	A	0.45	B	0.69
Westminster	SR-22 EB/Beach Boulevard	A	0.53	A	0.58	A	0.54	A	0.56
Westminster	Beach Boulevard/Bolsa Avenue	F	1.09	D	0.82	F	1.11	C	0.79
Westminster	Bolsa Chica Road/Garden Grove Boulevard	E	0.91	D	0.87	E	0.97	D	0.82
	COUNTY AVERAGE		**0.67**		**0.61**		**0.72**		**0.64**

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Deficiency Plans

If an intersection does not meet LOS standards, then a deficiency plan is required, as described under California Government Code Section 65089.4. The deficiency plan identifies the cause of congestion, the improvements needed to solve the problem, and the cost and timing for implementing proposed improvements.

A deficiency plan process was developed by the CMP Technical Advisory Committee to provide local jurisdictions with a framework for maintaining compliance with the CMP when a portion of the CMPHS fails to meet its established LOS standard (Appendix C-1). The Deficiency Plan Decision Flow Chart (Appendix C-2) illustrates the individual steps that must be taken in order for a local jurisdiction to meet CMP deficiency plan requirements.

Deficiency plans are not required if a deficient intersection is brought into compliance within 18 months of its initial detection, using improvements that have been previously planned and programmed in the CMP Capital Improvement Program. In addition, CMP legislation specifies that the following shall be excluded from deficiency determinations:

- Interregional travel (trips with origins outside the Orange County CMPHS)
- Construction, rehabilitation, or maintenance of facilities that impact the system
- Freeway ramp metering
- Traffic signal coordination by the State or multi-jurisdictional agencies
- Traffic generated by the provision of low-income and very low-income housing
- Traffic generated by high-density residential development located within one-quarter mile of a fixed rail passenger station
- Traffic generated by any mixed-use development located within one-quarter mile of a fixed rail passenger station, but only if more than half of the land area, or floor area, of the mixed-use development is used for high-density residential housing.

In 2017, one intersection exceeded the CMP level of service standard. However, it is operated and controlled by Caltrans, who is not subject to CMP conformance determinations (§65089(3)).

- *Laguna Canyon Road/State Route 73 northbound ramps (City of Laguna Beach)* – ICU 1.05 (LOS F) in the AM peak hour and ICU 0.99 (LOS E) in the PM peak hour

Caltrans continues to address congestion at CMP intersections and has initiated a project that would add an additional lane to the SR-73 northbound ramps to Laguna Canyon Road. This project will improve the facility's level of service, and is on track to be completed in late 2017.

Transit System Performance Measures

As Orange County's transit provider, OCTA continually monitors the frequency and routing of its transit services. Bus and rail transit are essential components of Orange County's transportation system, and are important tools for achieving a balanced multi-modal transportation system capable of maintaining level of service standards.

The CMP performance measures provide an index of the effectiveness and efficiency of Orange County's fixed-route bus and commuter rail services. ACCESS, OCTA's complementary paratransit service, is not included separately in the CMP analysis because it is an extension of the fixed-route service.

The OCTA Board-approved "Systemwide Bus Service Standards & Policies" are the basis for the performance analysis included in the CMP. The standards and policies allow for identification of areas in need of additional resources in transit service. Furthermore, once adequate transit operating funds are available, the transit performance measures will work to ensure that bus and rail services meet demand and are coordinated between counties.

Fixed-Route Bus Service

OCTA's fixed route bus service includes local routes, express routes, community routes, limited-stop/BRT routes, rail feeder and shuttle routes.

- Local routes (numbered 1 to 99) operate primarily along arterial corridors serving multiple bus stops spaced about 1/4 –mile apart, serving multiple destinations such as residential areas, employment centers, educational institutions and health care facilities. They are the most heavily used bus routes and in many cases require additional trips during peak commute periods. OCTA also provides Xpress service which are local routes with limited-stop trips.
- Express routes (numbered 200 to 299 and 700 to 799) provide higher speed point-to-point service along freeways and HOV facilities providing peak period commuter transportation to employment centers. Relatively few stops are made and service is generally designed to match typical work-time spreads. OCTA's 200-series intracounty express routes operate within Orange County while the 700-series intercounty services connect Orange County with neighboring counties such as Los Angeles and Riverside County.

- Community routes (numbered 100 to 199) are typically shorter distance services that may act as community circulators and are less direct compared to the local routes. They often provide connections to the local and express bus network. Community routes typically operate throughout the service day.
- Limited-stop/BRT routes (numbered 500 to 599) provide trips with higher average speeds and connect with other OCTA bus networks and modes. The speed advantage is realized by making fewer stops which are spaced about ¾-mile to 1 mile apart. Local bus riders making longer distance trips are among the transit users that are attracted to limited-stop/BRT service. Like local and community routes, these services operate throughout the service day.
- Rail feeder/Stationlink routes (numbered 400 to 499) provide first and last mile trips during peak hours to and from employment centers for commuters using Metrolink commuter rail service. Feeder trips are scheduled to match specific train trips and, like express routes, operate only during commute hours.
- Shuttle routes (numbered 600 to 699) serve special event venues or provide additional connections to community points of interest as a traffic mitigation tool. Shuttle routes may be point-to-point and seasonal in nature such as OCTA's Orange County Fair Express network or confined to a single community perhaps using a short distance circular route structure.

As of June 2017, OCTA's fixed route bus service has a total of 65 routes. The network is comprised of 38 local routes, 8 express routes (five intra- and three inter-county routes), 7 community routes, two limited-stop routes, and 10 rail feeder routes. Services changes planned for October 2017 would reduce the number of rail feeder routes to 7.

OC Bus 360

Since the last CMP in 2015, bus ridership had declined by 15%. In late 2015, the OCTA Board of Directors endorsed a comprehensive action plan, known as OC Bus 360 in order to address declining ridership. This effort included a comprehensive review of current and former rider perceptions, a peer review panel that reviewed OCTA's performance and plans, new branding and marketing tactics tied to rider needs, upgraded bus routes and services to better match demand and capacity, technology changes to improve the passenger experience, and pricing and other revenue changes to stimulate ridership and provide new funding. This action plan included the following elements:

- Implementation of new faster bus routes
- Extensive redeployment of services in June and October 2016 to improve efficiencies and build ridership
- Grants to local agencies for transit services tailored to community needs
- A promotional fare

- Rollout of new technologies, including mobile ticketing and real-time bus arrival information
- Extensive marketing, public outreach, and promotional campaigns
- Continued implementation of cost reduction strategies, such as increased contract fixed-route operations.

Recent ridership appears to be declining at a much slower rate after the implementation of OC Bus 360. Upcoming efforts will focus on additional bus service reallocations to improve ridership and productivity.

Target Service Standards and Policies

OCTA target service standards direct the development, implementation, monitoring, and modification of OCTA bus services. These standards are intended to govern the planning and design of bus services. As such, they depict a desirable state against which existing service is assessed. The standards currently in place were adopted by the OCTA Board of Directors in 2012 and are summarized in Figure 5.

FIGURE 5: System-Wide Bus Service Standards and Policies

TARGET SERVICE STANDARDS & POLICIES						
SPAN OF SERVICE:	LOCAL ROUTES (1-99 series)	BUS RAPID TRANSIT LIMITED (500-series)	COMMUNITY ROUTES (100-199 series)	EXPRESS ROUTES (200, 700-series)	RAIL FEEDER ROUTES (400-series)	SPECIAL EVENTS (600-series)
WEEKDAY:	5:30 A.M. - 8:30 P.M.	5:30 A.M. - 8:30 P.M. (1)	5:30 A.M. - 8:30 P.M. (1)	(1)	(1)	N/A
WEEKENDS & HOLIDAYS	7:00 A.M. - 7:00 P.M.	7:00 A.M. - 7:00 P.M.	7:00 A.M. - 7:00 P.M.	N/A	N/A	N/A

Span is defined as the first and last trips departing the terminal of origin.
(1) Based on Demand

PERFORMANCE STANDARDS:	LOCAL ROUTES (1-99 series)	BUS RAPID TRANSIT LIMITED (500-series)	COMMUNITY ROUTES (100-199 series)	EXPRESS ROUTES (200, 700-series)	RAIL FEEDER ROUTES (400-series)	SPECIAL EVENTS (600-series)
BOARDINGS/REVENUE VEHICLE HOUR:	30	25	10	N/A	N/A	N/A
SEAT OCCUPANCY ROUTE:	N/A	N/A	N/A	50%	N/A	N/A

Target service standards are work-toward goals and contigent on available funding

The current (October 2016) adherence to these standards is detailed below:

Weekday Span[1] of Service Standard Compliance

Service	Yes	No	Partial
Local Routes	27	8	3
Bus Rapid Transit / Limited[2]	0	2	0
Community Routes	2	4	1
Express Routes	Based on Demand		
Rail Feeder Routes	Based on Demand		

[1] Span is defined as the first and last trips departing the terminal of origin. Service span varies by weekday, Saturday, or Sunday.

[2] Bus Rapid Transit/Limited is in partial compliance with AM service starting at 5:00 AM, and not in compliance with the PM standard. The standard is 5:30 AM to 8:30 PM, based on demand.

About 62 percent of routes are in compliance with the Span of Service standard. When schedules are revised for non-complaint routes, staff reviews the service span to see if it can be improved to meet the standards. This review includes looking at ridership on the first and last trips of the day to see if adding service will be cost-effective.

Weekday Boardings/Revenue Vehicle Hour Standard Compliance

Service	Yes	No
Local Routes	7	31
Bus Rapid Transit / Limited	1	1
Community Routes	7	0
Express Routes	N/A	
Rail Feeder Routes	N/A	

Boardings per revenue hour is OCTA's most important measure of service productivity. The effect from the recent decrease in ridership is reflected in this table, as local routes saw an increase of noncompliance by about 30 percent since 2015. Recent efforts through OC Bus 360, while showing some promise on routes that were improved, will require additional time to assess its final outcome as it was recently implemented. Some routes recently improved may need to have service frequencies revisited if they do not meet the standard after three years. Upcoming service planning will look at making adjustments to other route frequencies to improve productivity.

Performance Standards and Policies

The section that follows describes OCTA's Performance Standards & Policies for vehicle load, vehicle headway, on-time performance, and service accessibility. These standards were adopted by the OCTA Board of Directors and are summarized in Figure 6.

While service standards guide the delivery of service, performance measures evaluate the effectiveness of the service.

Performance Measure 1: Vehicle Headway

Vehicle Headway is the time interval between vehicles on a route that allows passengers to gauge how long they will have to wait for the next vehicle. Vehicle headway varies by mode and time of day, and is primarily determined by bus ridership. However, it is also limited by the availability of resources to operate the system.

Peak Weekday Vehicle Headway Standard Compliance

Service	Yes	No	Partial
Local Routes	24	13	1
Bus Rapid Transit / Limited	2	0	0
Community Routes	5	1	1
Express Routes	6	1	1
Rail Feeder Routes	10	0	0

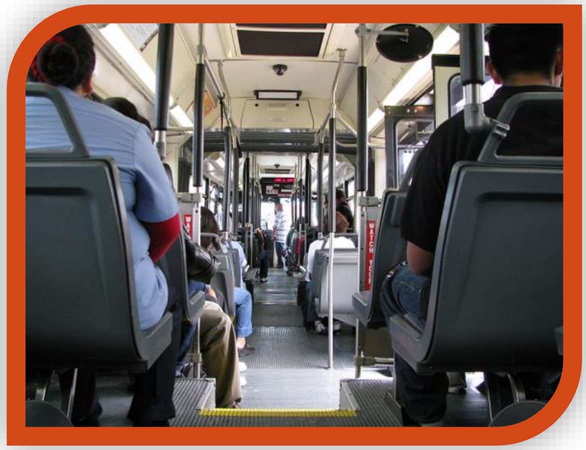
Off Peak Weekday Vehicle Headway Standard Compliance

Service	Yes	No	Partial
Local Routes	20	14	4
Bus Rapid Transit / Limited	1	0	1
Community Routes	3	2	2
Express Routes	N/A		
Rail Feeder Routes	N/A		

Overall, 72 percent and 51 percent of routes system-wide were compliant in the peak and off-peak periods, respectively. Some routes could benefit from a decrease in headways (increases in bus frequency), however, there are some routes which have optimal headways that are below the standard due to existing ridership. With changing conditions, OCTA monitors the ridership and its associated optimal headway laying out a priority for improvement pending funding availability.

Performance Measure 2: Vehicle Load

OCTA's Vehicle Load applies to the maximum number of passengers allowed on a service vehicle in order to ensure the safety and comfort of customers. The load standard is expressed as the ratio of passengers to the number of seats on the vehicle and it varies by mode and by time of day. OCTA passenger loads should not exceed 130 percent of seating capacity during any one-hour peak period on individual local fixed-routes or 100 percent on any express trip. OCTA regularly monitors the system to ensure appropriate allocation of trips on its lines.



Performance Measure 3: On-time Performance (OTP)

OCTA defines On-Time Performance as not more than five minutes late. On-Time Performance is measured at the time-point. A trip is on-time as long as it does not leave the time-point ahead of the scheduled departure time and no more than five minutes later than the scheduled departure time.

The On-Time Performance Service Standard is measured at the system line level, of which 85% of the actual departure times will meet the definition for being on-time. Exclusions from On-Time Performance are early departure times at time-points located within Free Running time route segments and Stationlink routes are measured for trips scheduled to arrive at Metrolink stations in the evening. System-wide On-Time Performance for FY15-16 was 85.7%.

Performance Measure 4: Service Accessibility

Service Accessibility is the percentage of population in proximity to bus service. Accessibility to OCTA service is defined as 90% of Orange County jobs and residents are within ½ mile of an OCTA bus route. A review of service accessibility conducted in 2017 shows that 88.1 % of jobs and residents are within ½ mile of an OCTA bus route.

Meeting Transit Service Standards and Policies

Recent decreases in ridership contribute to OCTA's inability to meet all standards and policies. The OCTA Short-Range Transit Plan outlines priorities for meeting transit policies and standards as new resources become available. The priorty for improvements are (in order):

1. **Addressing on-time performance issues**, particularly for low-income and/or minority routes. The poorest performing routes should be addressed first, along with routes with long headways where customers are more likely to time their arrival at stops based on the scheduled times.

2. **Addressing loads**, focusing on routes with the greatest number of trips where loads exceed 130 percent of capacity.

3. **Addressing headway issues**. Applying the headway standards will be an iterative process, because many of the routes with headways exceeding the maximum standard have low demand and/or cycle times that do not fit a 30-minute or 60-minute schedule. Routing adjustments may be needed to maximize the efficiency of the schedules, or exceptions may be allowed in specific cases.

4. **Addressing coverage and service span issues**, adding service in areas where gaps in coverage have been identified and land use patterns and/or demographics suggest that there is demand for transit service.

FIGURE 6: Performance Standards and Policies

PERFORMANCE STANDARDS AND POLICIES

TIME PERIOD DEFINITIONS:

WEEKDAY PEAK PERIODS: 6 A.M. - 9 A.M. AND 3 P.M. - 6 P.M.
OFF-PEAK: WEEKDAYS OFF-PEAK ARE THE PERIODS PRECEDING OR FOLLOWING THE DEFINED A.M. AND P.M. PEAK PERIODS, AND ALL-DAY ON WEEKENDS. AND ALL-DAY ON WEEKENDS AND HOLIDAYS

HEADWAYS:

Policy: Service operates on Local Routes (1-99 series) and Bus Rapid Transit/Limited Stop Routes (500-series) every 30-minutes or better during weekdays and weekends.
Service operates on Community Routes (100-199 series) every 60-minutes or better during weekdays and weekends.
Service operates on Express Routes (200-series and 700-series), and Rail Feeder Routes (400-series) weekdays only with a minimum of two trips scheduled in the morning and afternoon commute periods.
Service operates on Special Event Routes (600-series) for a limited period of time with service scheduled to meet the needs of the event.

TARGET HEADWAY STANDARDS:	LOCAL ROUTES (1-99 series)	BUS RAPID TRANSIT LIMITED (500-series)	COMMUNITY ROUTES (100-199 series)	EXPRESS ROUTES (200, 700-series)	RAIL FEEDER ROUTES (400-series)	SPECIAL EVENTS (600-series)
PEAK WEEKDAY PERIOD (6-9 A.M., 3-6 P.M.):	30 MIN	30 MIN	60 MIN	(2)	(2)	N/A
OFF-PEAK/WEEKENDS:	30 MIN	30 MIN	60 MIN	N/A	N/A	N/A

(2) Minimum two one-way trips per peak weekday period.

LOADING STANDARDS:

Policy: The average of all loads during the weekday peak periods should not exceed achievable vehicle capacity which is 20 to 26 passengers for intermediate size buses; 44 to 49 passengers for low floor 40-foot buses; and 83 passengers for 60-foot buses.

Vehicle Type	Average Passenger Capacities Seated	Standing	Total	Maximum Load Factor	Maximum Load Factor %
26' Cut-Away Bus	20	N/A	20	1.0	100%
31' Cut-Away Bus	26	N/A	26	1.0	100%
*40' Standard Bus**	34	10	44	1.3	130%
*40' Standard Bus**	36	10	46	1.3	130%
*40' Standard Bus**	37	11	48	1.3	130%
*40' Standard Bus**	38	11	49	1.3	130%
60' Articulated Bus	64	19	83	1.3	130%

**OCTA standard 40-foot buses vary in seats provided, from 34-seats on buses used for freeway express service to 38-seats on LNG buses.*

TARGET LOAD STANDARDS BY SERVICE TYPE:	LOCAL ROUTES (1-99 series)	BUS RAPID TRANSIT LIMITED (500-series)	COMMUNITY ROUTES (100-199 series)	EXPRESS ROUTES (200, 700-series)	RAIL FEEDER ROUTES (400-series)	SPECIAL EVENTS (600-series)
WEEKDAY PEAK PERIOD(% SEATS):	130% (3)	130% (3)	130% (3)	100%	130%	N/A
OFF-PEAK/WEEKEND (% SEATS):	100%	100%	100%	N/A	N/A	N/A

(3) 130% average during peak one hour in each peak period; maintain 125% average in remaining two hours in each peak

ON-TIME PERFORMANCE STANDARD:

Defined: Measured at the timepoint, a trip is on-time as long as it does not leave the timepoint ahead of the scheduled departure time, and no more than 5-minutes later than the scheduled departure time.

Standard: At the system level, 85% of the actual departure times will meet the definition for being On-Time. Change to 85% at the line level as reliable On-Time Performance measuring system becomes available.

Exclusions: Early departure times at timepoints located within Free Running time route segments will be considered to be On-Time. Stationlink routes OTP is measured for trips scheduled to arrive at Metrolink Stations in the P.M.

TARGET ACCESSIBILITY STANDARD:

% OF SERVICE AREA POPULATION & JOBS WITHIN 1/2 MILE OF A BUS ROUTE: 90% OR HIGHER

Coordination of Transit Service with Other Carriers

OCTA coordinates the delivery of transit services with several transit agencies. They include the City of Laguna Beach, the City of Irvine, Riverside Transit Agency, Norwalk Transit System, Los Angeles County Metropolitan Transportation Authority, Long Beach Transit, Foothill Transit, North County Transit District, Omnitrans, Anaheim Transportation Network, various specialized charter bus services, and commuter rail services. OCTA also coordinates with cities during the planning and implementation of Project V community circulators.

Additionally, OCTA coordinates schedules and bus stops with neighboring agencies and commuter rail services. Internet-based services such as Google transit include respective service schedules and facilitate transfers between the various systems where feasible.

Commuter Rail Service

Metrolink is Southern California's commuter rail system that links residential communities to employment and activity centers. Metrolink is operated by the Southern California Regional Rail Authority (SCRRA), a joint powers authority of five member agencies representing the counties of Los Angeles, Orange, Riverside, San Bernardino, and Ventura.

Currently, Metrolink provides service on seven routes, covering 534 miles through six counties in Southern California. On an average weekday, there are 171 trains serving roughly 40,000 passenger trips at 60 stations. Orange County plays an important and growing role within this system.

As one of the five SCRRA member agencies, OCTA administers and funds Orange County's portion of the Metrolink commuter rail system. Orange County's share of Metrolink service covers 68 route miles and sees approximately 16,000 average weekday boardings, comprising more than 40 percent of Metrolink's total system-wide boardings. There are 11 stations in Orange County that serve a total of 54 one-way trips each weekday on three lines:

- **Orange County (OC) Line**: Daily service from Los Angeles Union Station to Oceanside;
- **Inland Empire-Orange County (IEOC) Line**: Daily service from San Bernardino and Riverside through Orange to Oceanside; and

- **91 / Perris Valley (91/PV) Line**: Daily service from South Perris through Riverside and Fullerton to Los Angeles Union Station.

In 2006, Metrolink Weekend service was introduced on the OC and IEOC Lines, with increased service during the summer travel season. In July 2014, weekend service was added on the 91/PV Line, providing four trains between Riverside and Los Angeles Union Station. Weekend ridership varies considerably dependent upon the season and local events, but generally the OC, IEOC and 91/PV Lines carry a total of approximately 2,700 riders per weekend day.

OCTA and other local agencies provide free transfers to local bus service to deliver Metrolink passengers to their final destinations. OCTA has 10 dedicated StationLink bus routes that connect with Orange County Metrolink stations in Anaheim Canyon, Anaheim, Orange, Santa Ana, Tustin, Irvine and Laguna Niguel/Mission Viejo. In Irvine, the iShuttle has four routes that provide peak hour connections to and from the Tustin and Irvine stations. Anaheim Resort Transportation also provides transfers at the Anaheim Regional Transportation Intermodal Center (ARTIC). These local transit connections offer Metrolink ticket holders easy connections between stations and major employment and activity centers, with schedules designed to meet Metrolink weekday train arrivals and departures.

In addition to Metrolink, Amtrak's Pacific Surfliner provides daily service with 24 trains between Los Angeles Union Station and downtown San Diego as an alternative for commuters. Within Orange County, Amtrak station stops include Fullerton, Anaheim, Santa Ana, Irvine, San Juan Capistrano, and San Clemente.

Future Transit Improvements

OCTA's 2014 Long-Range Transportation Plan (LRTP) outlines a vision for multi-modal transportation improvements throughout Orange County. OCTA is continuing to work towards implementing all of the components presented in the LRTP.

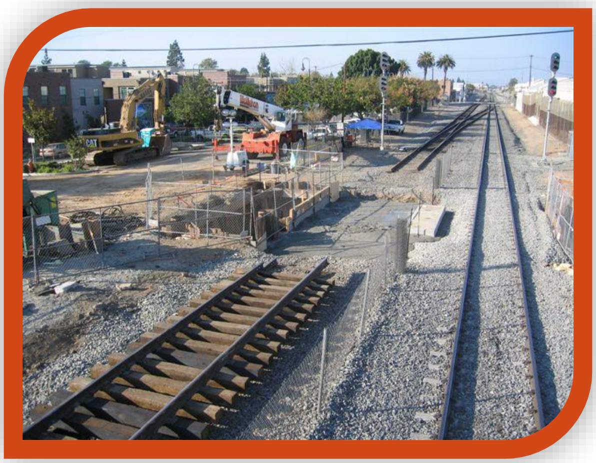
The components of the Preferred Plan, as presented in the 2014 LRTP, include transit improvements such as: (1) expanding bus service hours and routes, (2) expanding the level of Metrolink commuter rail service to Los Angeles, (3) improving local connections to and from Metrolink stations, (4) implementing streetcar connections between

Metrolink stations and popular destinations, and (5) connecting Metrolink service to new regional transportation systems and centers over the span of the plan.

OCTA completed the 2013 Short-Range Transit Plan (SRTP), which directs fixed-route transit improvements if additional resources become available. Any additional revenue service hours will be split between schedule maintenance and new service. OCTA is currently working on the Transit Master Plan which will provide guidance on appropriate service allocations and capital investments.

Commuter Rail Service Improvements

Following the completion of the Metrolink Service Expansion Program (MSEP) improvements in 2012, OCTA deployed a total of ten new Metrolink intra-county trains operating between Fullerton and Laguna Niguel/Mission Viejo, primarily during midday and evening hours. Efforts to increase ridership through a redeployment of the trains without significantly impacting operating costs have been underway since 2014. In April 2015, several schedule changes added a connection between the 91 Line and the intra-county service at Fullerton to allow a later southbound peak evening departure from Los Angeles to Orange County. Staff will continue to monitor ridership on these trains, but data through December 2016 shows sustained ridership as a result of these schedule changes.



Part of OCTA's re-deployment plan involves providing new trips from Orange County to Los Angeles. Staff continues to work with BNSF, RCTC, and Metro to address track-sharing issues, operating constraints and funding that will impact options for redeployment. Metrolink has taken the lead in discussions with the BNSF Railway to evaluate the current shared use and indemnification/liability agreements that govern the use of each agency's respective railroad rights of way. These discussions are on-going and special counsel has been brought in to assist. Operation of additional Metrolink trains to Los Angeles is contingent upon addressing indemnification and liability agreements and the completion of a triple track project on the BNSF Railway between Fullerton and Los Angeles, which is currently anticipated in late 2017.

OCTA is also working to design and construct a new Metrolink station in the City of Placentia that will help accommodate ridership growth from service expansion. Funding for the MSEP is being provided though Measure M2, Orange County's half-cent sales tax for transportation improvements.

Chapter 4: Transportation Demand Management

Transportation Demand Management (TDM) strategies are geared toward increasing vehicle occupancy, promoting the use of alternative modes, reducing the number of automobile trips, decreasing overall trip lengths, and improving air quality. The adoption of a TDM ordinance was required of every local jurisdiction for Orange County's 1991 Congestion Management Program (CMP). The adoption of these ordinances is no longer a statutory requirement, however OCTA continues to encourage local jurisdictions to maintain these ordinances as a means of reducing greenhouse gas emissions.

TDM Ordinances

The model TDM ordinance, prepared by OCTA, promotes carpools, vanpools, alternate work hours, park and ride facilities, telecommuting, and other traffic reduction strategies. OCTA updated the model ordinance in 2001 to reflect the adoption of Rule 2202 by the South Coast Air Quality Management District (SCAQMD), which requires employers with 250 or more employees at a worksite to develop an emission reduction program to help meet an emission reduction target set by the SCAQMD.

Principal provisions of the TDM model ordinance are as follows:

- Applies to non-residential public and private development proposals expected to generate more than 250 employees;
- Contains a methodology for determining projected employment for specified land use proposals;
- Includes mandatory facility-based development standards (conditions of approval) that apply to proposals that exceed the established employment threshold;
- Presents optional provisions for implementing operational TDM programs and strategies that target the property owner or employer, and requires annual reporting on the effectiveness of programs and strategies proposed for facilities;
- Contains implementation and monitoring provisions; and
- Includes enforcement and penalty provisions.

Several jurisdictions have adopted ordinances that go beyond those contained in the model TDM ordinance. Such strategies include:

- Encouraging employers to establish and help subsidize telecommuting, provide monetary incentives for ridesharing, and implementing alternative work hour programs;
- Proposing that new development projects establish and/or participate in Transportation Management Associations (TMAs);
- Implementing bus loading facilities at worksites;
- Implementing pedestrian facilities such as sidewalks, paved pathways, and pedestrian grade separations over arterial streets to connect worksites to shopping, eating, recreation, parking, or transit facilities; and
- Participating in the development of remote parking facilities and the high-occupancy vehicles (i.e., shuttles, etc.) to serve them.

Countywide TDM Strategies

TDM efforts in Orange County are not just limited to the implementation of the local TDM ordinance provisions. Countywide services and programs, as described below, also help to manage demand on the multimodal system.

Transit/Shuttle Services

Local fixed-route bus service comprises the largest portion of OCTA's transit services. In addition, OCTA provides feeder bus service to commuter rail (Metrolink) stations. Express bus service provides patrons with longer routes that utilize freeways to connect residential areas to Orange County's main employment centers. OCTA also provides community routes for connecting to the local and express bus networks, as well as limited-stop routes for higher speed connections to other OCTA modes and networks. ACCESS is OCTA's shared-ride service for people who are unable to use the regular, fixed-route bus service because of functional limitations caused by a disability. These passengers must be certified by OCTA to use the ACCESS system by meeting the Americans with Disabilities Act (ADA) eligibility criteria.

OCTA Vanpool Program

The OCTA Vanpool Program assists commuters working in Orange County. OCTA coordinates with commuters, employers, and private vanpool operators to organize and sustain vanpools, and provides a monthly subsidy for each vanpool to offset vehicle lease and maintenance costs. In addition to Caltrans-maintained park-and-ride lots, OCTA maintains park-and-ride lots throughout the County and supports the Guaranteed Ride Home Program. OCTA provides trip planning tools on their website and on the phone through the new 5-1-1 service. OCTA has also provided the necessary data to Google Transit® to integrate trip planning with other Southern California transit operators. These efforts are designed to reduce single-occupancy commuting.

Transportation Management Associations

Transportation Management Associations (TMAs) are comprised of groups of employers who work together to solve mutual transportation problems by implementing programs to increase average vehicle ridership. Presently, Orange County has TMAs located in the following areas:

- Irvine (Irvine Spectrum TMA)
- Anaheim (Anaheim Transportation Network)

Park-and-Ride Lots

Currently there are 29 park-and-ride lots in Orange County providing 9,775 parking spaces. Of the 29 lots, 11 are located at Metrolink stations, accounting for 6,996 of the parking spaces. Also, six of the lots are located at OCTA transit centers, which account for 1,492 parking spaces. The remaining 1,287 spaces are at Caltrans-managed lots.

Park-and-ride lots serve as transfer points for commuters to change from one mode of travel (usually single-occupancy automobile) to another, higher capacity mode (bus, train, carpool, or vanpool). Providing a convenient system of park-and-ride transfer points throughout Orange County encourages ridesharing and the use of higher capacity transit systems, which improves the efficiency of the transportation system. Park-and-ride lots are also a natural companion to Orange County's network of High Occupancy Vehicle (HOV) lanes and transitways on the freeways.

Parking Cash-Out Programs

Parking cash-out programs are employer-funded programs that provide cash incentives to employees who do not drive to work. The most effective programs provide an incentive equal to the full cost of employee parking. State law requires certain employers who provide subsidized parking for their employees to offer a cash allowance in lieu of a parking space. This law is called the parking cash-out program. The intent of the law is to reduce vehicle commute trips and emissions by offering employees the option of "cashing out" their subsidized parking space and taking transit, biking, walking or carpooling to work.

Guaranteed Ride Home Program

Employers throughout Orange County have the option to participate in OCTA's Guaranteed Ride Home Program. This program provides reliability for those who rideshare but are faced with an unexpected illness, at-home emergency, or unexpected overtime.

Complete Streets

On September 30, 2008 Governor Arnold Schwarzenegger signed Assembly Bill 1358, the California Complete Streets Act. The Act states: "In order to fulfill the commitment to reduce greenhouse gas emissions, make the most efficient use of urban land and transportation infrastructure, and improve public health by encouraging physical activity, transportation planners must find innovative ways to reduce vehicle miles traveled (VMT) and to shift from short trips in the automobile to biking, walking and use of public transit."

The legislation impacts local general plans by adding the following language to Government Code Section 65302(b)(2)(A) and (B):

> (A) Commencing January 1, 2011, upon any substantial revision of the circulation element, the legislative body shall modify the circulation element to plan for a balanced, multimodal transportation network that meets the needs of all users of the streets, roads, and highways for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context of the general plan.
>
> (B) For the purposes of this paragraph, "users of streets, roads, and highways" means bicyclists, children, persons with disabilities, motorists, movers of commercial goods, pedestrians, users of public transportation, and seniors.

As directed in the Pedestrian Action Plan, OCTA staff has developed a Complete Streets Checklist to consider bicycle and pedestrian accommodation in projects planned and designed by OCTA. This provides a method to illustrate decision-making and transparency in ultimate design outcomes and avoid conflict when a project is ready for construction.

Active Transportation

In 2016, the League of American Bicyclists renewed their designation of Orange County as a Bronze-level bike friendly community. This was in recognition of the collective county-level and local efforts to improve conditions for bicycling in Orange County. This includes countywide regional bikeway planning, recent bicycle and pedestrian safety marketing campaigns, and encouraging first/last mile linkages to transit for both bicyclists and pedestrians. In support of these efforts, OCTA allocates funding to local agencies through the Bicycle Corridor Improvement Program (BCIP) call for projects.

There are also efforts to improve conditions for pedestrians. OCTA's Pedestrian Action Plan recommends actions to improve pedestrian safety countywide. Work on many of these actions has entailed: regular bicycle and pedestrian safety campaigns, hosting educational webinars for community members and local agency staff, hosting a quarterly meeting of a Bicycle and Pedestrian Subcommittee with public membership, collaboration with the Southern California Association of Governments on the *Go Human* region-wide active transportation safety campaign, an inventory of sidewalks on major roadways, support to cities pursuing active transportation funding, and supporting legislation related to bicycle and pedestrian topics such as bicycle diversion training.

A variety of planning work is expected during the next few years including preparation of OC Active, the countywide active transportation plan, a systemic safety analysis, a plan for active transportation counts, and collaboration with law enforcement to evaluate related laws and analyze crash data.

Motorist Aid and Traffic Information System (511)

Orange County's 511 service is a one-stop source for up-to-the-minute travel information, advisories and trip planning information. Traffic and transit updates are provided via the free Go511 application, calling 511, or visiting Go511.com.

The 511 Motorist Aid and Travelers' Information System (MATIS) helps commuters outsmart traffic with the following services:

- Real-time traffic speed, congestion & incident information
- Live freeway cameras & roadwork advisories
- Bus & rail trip planner
- Scheduled departures for 70+ transit agencies in SoCal
- Carpool & ride matching information
- Park & Ride lot locations (website/phone)
- Airport information (website only)
- Bike maps, tips & resources (website only)
- Local weather conditions (website only)

The 511 system can be accessed around the clock throughout Orange County by calling 511. Accessing the Go511 system from other surrounding counties is also available by calling 877.22.go511.

Freeway Construction Mitigation

OCTA and Caltrans developed a comprehensive public outreach program for commuters impacted by construction projects and improvements on Orange County freeways. The outreach program alleviates traffic congestion during freeway construction by providing up-to-date ramp, lane, and bridge closure information; as well as suggestions for alternate routes and travel modes.

Outreach efforts include public workshops, open houses, fast fax construction alerts, flyers and newsletters, as well as other materials and presentation events. Also, OCTA's website (www.octa.net), and the Orange County Freeway Construction Helpline (1-800 724-0353), make detour and closure information available. In addition, most jurisdictions implement traffic management plans to alleviate roadway congestion during construction.

Chapter 5: Land Use Impact Analysis

The Congestion Management Program (CMP) Traffic Impact Analysis (TIA) measures impacts of proposed development projects on the CMP Highway System (CMPHS). Each jurisdiction in Orange County was allowed to select either the process outlined in the CMP TIA guidelines (Appendix B-1), or their existing traffic-environmental analysis process, as long as consistency is maintained with the CMP TIA guidelines.

Since 1994, the selected TIA process has been consistently applied to all development projects meeting the adopted trip generation thresholds (i.e., 2,400 or more daily trips for projects adjacent to the CMPHS, and 1,600 or more daily trips for projects that directly access the CMPHS). These traffic impact analyses focus on:

- Identifying locations where, and the extent to which, trips generated by the proposed project caused CMPHS intersections to exceed their Level of Service (LOS) standards;
- Assessing feasible mitigation strategies capable of reducing the identified impact, thereby maintaining the LOS standard; and,
- Utilizing existing environmental processes and inter jurisdictional forums to conduct cooperative, inter jurisdictional discussion when proposed CMP mitigation strategies included modifications to roadway networks beyond the jurisdiction's boundaries; and/or, when a proposed development was identified that will increase traffic at CMPHS locations outside the jurisdiction's boundaries.

However, OCTA does allow exemptions from this requirement for selected categories of development projects, consistent with State legislation (Appendix B-2 for a listing of exempt projects). Additionally, the biennial reporting process enables jurisdictions to report any locations where projected measurements would not meet the CMPHS LOS standards; as well as to discuss the projected impacts from development projects undergoing CMP traffic impact analyses. All jurisdictions in Orange County comply with the CMP land use coordination requirement.

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Chapter 6: Capital Improvement Program

The Capital Improvement Program (CIP) is a seven-year program of projects and programs that is adopted by each Orange County jurisdiction and integrated into a countywide CIP by the OCTA. It includes projects that will help to maintain or improve traffic conditions on the Congestion Management Program Highway System (CMPHS) and adjacent facilities. In addition to traditional capital projects, which preserve investments in existing facilities, the CIP can include projects that increase the capacity of the multi-modal system and provide air quality benefits, such as transit projects. Consistency with statewide standards is emphasized in order for projects in the CIP to compete for State funding.

The CIP projects, prepared by local jurisdictions for inclusion in the Orange County CMP, mitigate transportation impacts identified in the Land Use Impact Analysis component of the CMP, and preserve and maintain CMPHS infrastructure. Many types of CIP projects have been submitted by local jurisdictions in the past, including freeway ramp widenings, transportation systems management projects such as bus turnouts, intersection improvements, roadway widenings, signal coordination projects, and roadway resurfacing projects.

Each Orange County jurisdiction's CIP is included in Appendix E, which is published separately and provided on OCTA's website at www.octa.net/Plans-and-Programs/Congestion-Management-Program/Overview/. All projects in the CIP that are State or federally funded, or locally funded but of regional significance, are included in the Orange County portion of the Federal Transportation Improvement Program (FTIP), and are consistent with the Regional Transportation Plan (RTP), both of which are approved by SCAG.

Further, based upon a resolution by the California Transportation Commission's (G-17-22), the Measure M program of projects is being included in the 2017 CMP (by reference) in order to satisfy the CMP requirement of this resolution. For a listing of the Measure M program of projects please see Appendix F.

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Chapter 7: CMP Conformance

As Orange County's Congestion Management Agency, the Orange County Transportation Authority (OCTA) is legislatively required to monitor the implementation of all elements of the Congestion Management Program (CMP), and biennially determine conformance. In so doing, OCTA consults with local jurisdictions.

OCTA determines if the local jurisdictions are in conformance with the CMP by monitoring the following:

- Consistency with level of service standards;
- Adoption of Capital Improvement Programs;
- Adoption and implementation of a program to analyze the impacts of land use decisions, including an estimate of the costs associated with mitigating those impacts; and
- Adoption and implementation of deficiency plans when highway and roadway level of service standards are not maintained.

OCTA gathers local traffic data to determine the levels of service (LOS) at intersections throughout the CMP Highway System (CMPHS), as discussed in Chapter 2. In addition, the local jurisdictions complete a set of checklists, developed by OCTA, that guide them through the CMP conformity process (Appendix D). The checklists address the legislative requirements of the CMP, including land use coordination, the Capital Improvement Program, and transportation demand management strategies.

Based on the LOS data and CMP checklists completed by the local jurisdictions, as summarized in Figure 7, the following was determined for the 2017 CMP Update:

Level of Service

The LOS data, collected by OCTA, was provided to local jurisdictions for verification. A few discrepancies in LOS reporting occurred as a result of slight variations in the data collection methodology used by the cities and OCTA, or due to erroneously reported intersection geometry. Any discrepancies in the LOS reporting were resolved through an interactive, cooperative process between the cities and OCTA. The data shows that all local jurisdictions are in compliance with the established LOS standards.

Capital Improvement Program

All local jurisdictions submitted adopted seven-year capital improvement programs. The CIPs included projects to maintain or improve the traffic LOS on the CMPHS, or adjacent facilities which benefit the CMPHS.

Land Use Coordination

All local jurisdictions have adopted CMP Traffic Impact Analysis (TIA) processes for analyzing the impacts of land use decisions on the CMP Highway System. All local jurisdictions have applied their TIA processes to development projects that met the CMP minimum threshold of 2,400 or more daily trips (1,600 or more trips per day for development projects that will directly access the CMPHS).

Deficiency Plans

Based on the data exhibited in Figure 7, all non-exempt intersections on the CMP highway system were found in compliance with LOS requirements. Therefore, no deficiency plans were required for the 2017 CMP.

Regional Consistency

To ensure consistency between CMPs within the SCAG region, OCTA submits each biennial update of the Orange County CMP to SCAG. As the regional agency, SCAG evaluates consistency with the Regional Transportation Plan and with the CMPs of adjoining counties, and incorporates the program into the Federal Transportation Improvement Program (FTIP), once consistency is determined.

FIGURE 7: Summary of Conformance

Jurisdiction	Capital Improvement Program	Deficiency Plan	Land Use	Level of Service	2017 Compliance
Aliso Viejo *	Yes	N/A	Yes	N/A	Yes
Anaheim	Yes	N/A	Yes	Yes	Yes
Brea	Yes	N/A	Yes	Yes	Yes
Buena Park	Yes	N/A	Yes	Yes	Yes
Costa Mesa	Yes	N/A	Yes	Yes	Yes
Cypress	Yes	N/A	Yes	Yes	Yes
Dana Point	Yes	N/A	Yes	Yes	Yes
Fountain Valley *	Yes	N/A	Yes	N/A	Yes
Fullerton	Yes	N/A	Yes	Yes	Yes
Garden Grove	Yes	N/A	Yes	Yes	Yes
Huntington Beach	Yes	N/A	Yes	Yes	Yes
Irvine	Yes	N/A	Yes	Yes	Yes
La Habra	Yes	N/A	Yes	Yes	Yes
La Palma*	Yes	N/A	Yes	N/A	Yes
Laguna Beach	Yes	N/A	Yes	Yes	Yes
Laguna Hills	Yes	N/A	Yes	Yes	Yes
Laguna Niguel	Yes	N/A	Yes	Yes	Yes
Laguna Woods	Yes	N/A	Yes	Yes	Yes
Lake Forest	Yes	N/A	Yes	Yes	Yes
Los Alamitos	Yes	N/A	Yes	Yes	Yes
Mission Viejo	Yes	N/A	Yes	Yes	Yes
Newport Beach	Yes	N/A	Yes	Yes	Yes
Orange	Yes	N/A	Yes	Yes	Yes
Placentia	Yes	N/A	Yes	Yes	Yes
Rancho Santa Margarita *	Yes	N/A	Yes	N/A	Yes
San Clemente *	Yes	N/A	Yes	N/A	Yes
San Juan Capistrano	Yes	N/A	Yes	Yes	Yes
Santa Ana	Yes	N/A	Yes	Yes	Yes
Seal Beach *	Yes	N/A	Yes	N/A	Yes
Stanton	Yes	N/A	Yes	Yes	Yes
Tustin	Yes	N/A	Yes	Yes	Yes
Villa Park *	Yes	N/A	Yes	N/A	Yes
Westminster	Yes	N/A	Yes	Yes	Yes
Yorba Linda *	Yes	N/A	Yes	N/A	Yes
County *	Yes	N/A	Yes	Yes	Yes

*No CMP intersections within jurisdiction

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Appendix A: Freeway Level of Service

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.000	SAN DIEGO COUNTY LINE	4	66	3663	1100	0.83	7.22	17	**B**	64	3420	959	0.89	7.22	16	**B**	
																	138,600
1.000	AVENIDA CALIFIA	4	71	4126	1250	0.83	7.22	18	**C**	67	3978	1152	0.86	7.22	18	**B**	
																	147,100
1.627	EL CAMINO REAL	4	69	4403	1329	0.83	7.22	20	**C**	65	4141	1211	0.85	7.22	19	**C**	
																	160,100
2.306	AVENIDA PRESIDIO	4	67	4911	1446	0.85	7.22	22	**C**	64	4540	1324	0.86	7.22	21	**C**	
																	162,100
2.663	AVENIDA PALIZADA	4	63	4281	1257	0.85	7.22	21	**C**	59	3966	1033	0.96	7.22	18	**C**	
																	187,400
3.393	AVENIDA PICO	4	44	4831	1293	0.93	7.22	30	**D**	62	5009	1286	0.97	7.22	21	**C**	
																	199,600
5.801	CAMINO ESTRELLA	4	66	6544	1700	0.96	7.22	27	**D**	60	4669	1381	0.85	7.22	24	**C**	
																	242,100
6.780	JCT RTE 1	4	49	3827	1070	0.89	4.25	22	**C**	67	2901	743	0.98	4.25	11	**B**	
																	234,250
7.344	CAMINO CAPISTRANO	4	65	6598	1704	0.97	4.25	27	**D**	58	5695	1480	0.96	4.25	26	**D**	
																	252,000
8.795	SAN JUAN CREEK	4	65	6730	1739	0.97	4.27	27	**D**	58	5790	1503	0.96	4.27	27	**D**	
																	259,000
9.604	JCT. RTE. 74	4	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	278,500
10.910	JUNIPERO SERRA	5	69	10662	2790	0.96	4.27	33	**D**	68	9133	2353	0.97	4.27	28	**D**	
																	286,700
12.490	JCT RTE 73	4	68	6135	1702	0.90	4.27	26	**C**	65	6209	1628	0.95	4.27	25	**C**	
																	248,200
12.943	AVERY PARKWAY	4	68	5689	1552	0.92	4.27	23	**C**	64	5612	1440	0.97	4.27	23	**C**	
																	255,600
13.776	CROWN VALLEY	4	63	5363	1507	0.89	3.50	24	**C**	62	5019	1316	0.95	3.50	22	**C**	
																	302,600
15.217	OSO PARKWAY	4	64	7195	1968	0.91	3.50	31	**D**	62	7115	1805	0.99	3.50	30	**D**	
																	315,400
16.528	LA PAZ ROAD	4	55	8006	2148	0.93	3.50	40	**E**	62	7277	1862	0.98	3.50	30	**D**	
																	312,000
17.472	ALICIA PARKWAY	6	47	10714	2837	0.94	3.50	41	**E**	66	8474	2187	0.97	3.50	22	**C**	
																	333,000
18.685	NIGUEL/EL TORO	5	51	10581	2724	0.97	3.50	44	**E**	63	7740	1967	0.98	3.50	26	**C**	
																	345,800
19.890	LAKE FOREST	5	69	10475	2697	0.97	3.50	32	**D**	63	7734	1989	0.97	3.50	26	**C**	
																	278,800

File Name: 2015 Volumes AADT LOS for Orange County (003).xls

Calculated By: Bassem

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
21.304	JCT. RTE. 405	3	64	5170	1339	0.97	3.37	28	**D**	62	4147	1078	0.96	3.37	24	**C**	
																	153,100
22.213	ALTON PARKWAY	4	68	6664	1734	0.96	3.37	26	**D**	63	6122	1576	0.97	3.37	25	**C**	
																	200,300
23.120	JCT. RTE. 133	4	68	7159	1890	0.95	5.50	28	**D**	59	6763	1753	0.96	5.50	30	**D**	
																	243,000
23.942	SAND CANYON	4	62	6532	1717	0.95	5.50	28	**D**	49	6450	1687	0.96	5.50	35	**E**	
																	255,600
24.991	JEFFREY ROAD	5	40	8644	2516	0.86	5.50	52	**F**	57	7967	2031	0.98	5.50	29	**D**	
																	271,000
26.583	CULVER DRIVE	5	41	7611	1964	0.97	5.50	40	**E**	44	7133	1855	0.96	5.50	35	**D**	
																	294,000
27.589	JAMBOREE ROAD	5	43	8941	2407	0.93	5.50	46	**F**	42	7594	1960	0.97	5.50	38	**E**	
																	316,000
28.250	TUSTIN RANCH	6	43	10231	2824	0.91	5.50	45	**E**	38	9090	2393	0.95	5.50	43	**E**	
																	324,000
29.091	RED HILL AVENUE	5	42	9689	2535	0.96	5.50	49	**F**	36	8331	2142	0.97	5.50	49	**F**	
																	324,000
29.616	NEWPORT AVENUE	5	50	10225	2617	0.98	5.50	43	**E**	44	9013	2346	0.96	5.50	43	**E**	
																	279,000
30.263	JCT. RTE. 55	4	56	7852	2032	0.97	5.50	38	**E**	50	6001	1548	0.97	5.50	32	**D**	
																	329,000
30.8	1ST STREET	5	65	10899	2761	0.99	5.50	35	**D**	49	8675	2215	0.98	5.50	37	**E**	
																	352,000
31.23	4TH STREET	5	62	10374	2689	0.96	5.50	36	**E**	47	8244	2117	0.97	5.50	37	**E**	
																	352,000
32.3	17TH STREET	5	68	10034	2584	0.97	5.50	31	**D**	34	8388	2139	0.98	5.50	52	**F**	
																	362,000
33.2	MAIN STREET	5	62	10324	2634	0.98	5.50	35	**E**	40	9207	2370	0.97	5.50	49	**F**	
																	365,500
35	CHAPMAN	5	69	6411	1652	0.97	7.00	20	**C**	32	7491	1894	0.99	7.00	49	**F**	
																	253,000
35.1	STATE COLLEGE	5	72	7896	2089	0.94	7.00	24	**C**	33	8899	2246	0.99	7.00	56	**F**	
																	241,000
35.6	GENE AUTRY	5	70	6693	1745	0.96	7.00	21	**C**	28	8525	2245	0.95	7.00	66	**F**	
																	241,000
36.48	KATELLA	4	66	5955	1570	0.95	9.60	25	**C**	24	6961	1832	0.95	9.60	79	**F**	
																	264,700
37.38	HARBOR	4	66	5908	1592	0.93	9.60	25	**C**	34	7182	1839	0.98	9.60	57	**F**	
																	263,800

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
37.7	BALL	4	67	6708	1763	0.95	9.60	28	**D**	38	8110	2092	0.97	9.60	57	**F**	
																	276,000
38.9	LINCOLN	5	70	6304	1699	0.93	9.60	20	**C**	63	8158	2074	0.98	9.60	28	**D**	
																	265,300
39.3	EUCLID	4	67	6104	1662	0.92	9.60	26	**D**	52	7668	1980	0.97	9.60	40	**E**	
																	259,800
40.5	BROOKHURST	4	69	6005	1588	0.95	9.60	24	**C**	62	7141	1832	0.97	9.60	31	**D**	
																	240,900
40.98	LA PALMA	5	68	6227	1615	0.96	9.60	20	**C**	58	7413	1931	0.96	9.60	28	**D**	
																	240,900
41.8	MAGNOLIA	4	68	3813	994	0.96	9.60	15	**B**	64	4811	1230	0.98	9.60	20	**C**	
																	240,900
42.5	ORANGETHROPE	6	69	5404	1432	0.94	11.60	15	**B**	65	6307	1647	0.96	11.60	18	**B**	

** % Truck and AADT Values are the most recent values published at www.dot.ca.gov/hq/traffops/saferesr/trafdata/ which is still currently 2014 data **

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.000	SAN DIEGO COUNTY LINE	4	67	3486	947	0.92	7.22	15	**B**	66	4735	1206	0.98	7.22	19	**C**	
																	138,600
1.000	AVENIDA CALIFIA	4	67	3303	903	0.91	7.22	14	**B**	68	4597	1165	0.99	7.22	18	**B**	
																	147,100
1.627	EL CAMINO REAL	4	68	3431	931	0.92	7.22	14	**B**	66	4933	1264	0.98	7.22	20	**C**	
																	160,100
2.306	AVENIDA PRESIDIO	4	65	6709	1747	0.96	7.22	28	**D**	64	8064	2150	0.94	7.22	35	**D**	
																	162,100
2.663	AVENIDA PALIZADA	5	63	9566	2508	0.95	7.22	33	**D**	63	10753	2911	0.92	7.22	39	**E**	
																	187,400
3.393	AVENIDA PICO	5	64	4381	1118	0.98	7.22	15	**B**	57	4365	1109	0.98	7.22	16	**B**	
																	199,600
5.801	CAMINO ESTRELLA	4	67	4772	1298	0.92	7.22	20	**C**	55	6526	1674	0.97	7.22	32	**D**	
																	242,100
6.780	JCT RTE 1	4	66	2775	727	0.95	4.25	11	**B**	51	3999	1119	0.89	4.25	23	**C**	
																	234,250
7.344	CAMINO CAPISTRANO	5	64	5158	1350	0.96	4.25	17	**B**	53	6682	1770	0.94	4.25	27	**D**	
																	252,000
8.795	SAN JUAN CREEK	4	68	4912	1321	0.93	4.27	20	**C**	49	6423	1709	0.94	4.27	36	**E**	
																	259,000
9.604	JCT. RTE. 74	4	61	6195	1654	0.94	4.27	28	**D**	62	7518	2058	0.91	4.27	34	**D**	
																	278,500
10.910	JUNIPERO SERRA	5	66	6063	1603	0.95	4.27	20	**C**	64	8056	2057	0.98	4.27	26	**D**	
																	286,700
12.490	JCT RTE 73	4	63	5641	1477	0.95	4.27	24	**C**	65	6717	1720	0.98	4.27	27	**D**	
																	248,200
12.943	AVERY PARKWAY	4	66	5301	1408	0.94	4.27	22	**C**	65	6002	1529	0.98	4.27	24	**C**	
																	255,600
13.776	CROWN VALLEY	4	64	5279	1421	0.93	3.50	22	**C**	64	5741	1489	0.96	3.50	24	**C**	
																	302,600
15.217	OSO PARKWAY	4	59	7250	1917	0.95	3.50	33	**D**	53	7738	1966	0.98	3.50	37	**E**	
																	315,400
16.528	LA PAZ ROAD	4	63	7239	1928	0.94	3.50	31	**D**	67	8696	2230	0.97	3.50	34	**D**	
																	312,000
17.472	ALICIA PARKWAY	5	58	7248	1937	0.94	3.50	27	**D**	63	9300	2356	0.99	3.50	31	**D**	
																	333,000
18.685	NIGUEL/EL TORO	5	68	8109	2140	0.95	3.50	26	**C**	57	10335	2633	0.98	3.50	37	**E**	
																	345,800
19.890	LAKE FOREST	6	61	8333	2174	0.96	3.50	24	**C**	39	10374	2633	0.98	3.50	46	**F**	
																	278,800

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
21.304	JCT. RTE. 405	3	65	4356	1135	0.96	3.37	24	**C**	64	4603	1234	0.93	3.37	26	**D**	
																	153,100
22.213	ALTON PARKWAY	3	63	4213	1117	0.94	3.37	24	**C**	66	4045	1086	0.93	3.37	22	**C**	
																	200,300
23.120	JCT. RTE. 133	5	66	7242	1870	0.97	5.50	23	**C**	74	3205	955	0.84	5.50	11	**A**	
																	243,000
23.942	SAND CANYON	5	61	8241	2133	0.97	5.50	29	**D**	66	7780	1996	0.97	5.50	25	**C**	
																	255,600
24.991	JEFFREY ROAD	5	57	8378	2161	0.97	5.50	31	**D**	65	8181	2102	0.97	5.50	27	**D**	
																	271,000
26.583	CULVER DRIVE	5	54	8998	2341	0.96	5.50	36	**E**	61	9227	2342	0.98	5.50	32	**D**	
																	294,000
27.589	JAMBOREE ROAD	6	58	9475	2396	0.99	5.50	28	**D**	52	9783	2490	0.98	5.50	33	**D**	
																	316,000
28.250	TUSTIN RANCH	5	58	10068	2556	0.98	5.50	36	**E**	60	10556	2700	0.98	5.50	37	**E**	
																	324,000
29.091	RED HILL AVENUE	5	51	10111	2606	0.97	5.50	42	**E**	54	10170	2601	0.98	5.50	40	**E**	
																	324,000
29.616	NEWPORT AVENUE	6	47	10823	2834	0.95	5.50	42	**E**	48	10951	2776	0.99	5.50	40	**E**	
																	279,000
30.263	JCT. RTE. 55	4	44	6515	1678	0.97	5.50	39	**E**	54	7000	1792	0.98	5.50	34	**D**	
																	329,000
30.8	1ST STREET	5	38	8971	2266	0.99	5.50	49	**F**	51	9177	2166	1.06	5.50	35	**D**	
																	352,000
31.23	4TH STREET	5	38	8965	2262	0.99	5.50	49	**F**	65	9157	2333	0.98	5.50	30	**D**	
																	352,000
32.3	17TH STREET	5	37	9389	2495	0.94	5.50	55	**F**	49	8926	2342	0.95	5.50	39	**E**	
																	362,000
33.2	MAIN STREET	4	32	9511	2460	0.97	5.50	79	**F**	52	8936	2297	0.97	5.50	45	**F**	
																	365,500
35	CHAPMAN	6	49	8554	2224	0.96	7.00	32	**D**	39	8259	2072	1.00	7.00	37	**E**	
																	253,000
35.1	STATE COLLEGE	5	52	8253	2135	0.97	7.00	34	**D**	54	8066	2069	0.97	7.00	32	**D**	
																	241,000
35.6	GENE AUTRY	5	47	10220	2645	0.97	7.00	46	**F**	57	10463	2685	0.97	7.00	39	**E**	
																	241,000
36.48	KATELLA	4	50	7667	2010	0.95	9.60	42	**E**	55	7401	1902	0.97	9.60	36	**E**	
																	264,700
37.38	HARBOR	4	58	8426	2152	0.98	9.60	39	**E**	61	7436	1887	0.99	9.60	33	**D**	
																	263,800

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
37.7	BALL	4	49	7594	1994	0.95	9.60	43	**E**	56	6906	1752	0.99	9.60	33	**D**	
																	276,000
38.9	LINCOLN	4	39	7688	1989	0.97	9.60	53	**F**	55	7197	1846	0.97	9.60	35	**D**	
																	265,300
39.3	EUCLID	4	36	7701	2008	0.96	9.60	59	**F**	64	7291	1883	0.97	9.60	31	**D**	
																	259,800
40.5	BROOKHURST	4	29	6957	1880	0.93	9.60	67	**F**	60	7310	1871	0.98	9.60	33	**D**	
																	240,900
40.98	LA PALMA	6	33	7316	1988	0.92	9.60	43	**E**	64	7693	1972	0.98	9.60	21	**C**	
																	240,900
41.8	MAGNOLIA	6	30	6949	1992	0.87	9.60	46	**F**	67	7040	1809	0.97	9.60	19	**C**	
																	240,900
42.5	ORANGETHROPE	4	57	4546	1237	0.92	9.35	23	**C**	69	4698	1222	0.96	9.35	19	**C**	

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
R0.00	LOS ANGELES/ORANGE COUNTY LINE																
																	96,000
R0.650	JCT. RTE. 405																
																	142,200
R2.653	WESTMINSTER, KNOTT AVENUE/GOLDEN WEST STREET INTERCHANGE	3	32	5346	1392	0.96	8.70	60	**F**	63	4982	1266	0.98	8.70	28	**D**	
																	150,200
R3.587	GARDEN GROVE, JCT. RTE. 39	3	29	5253	1400	0.94	4.90	65	**F**	58	5081	1326	0.96	4.90	31	**D**	
																	183,000
R4.812	GARDEN GROVE, MAGNOLIA STREET INTERCHANGE	4	59	6930	1819	0.95	4.90	32	**D**	64	6791	1753	0.97	4.90	28	**D**	
																	196,000
R5.817	GARDEN GROVE, BROOKHURST STREET INTERCHANGE	4	35	6755	1837	0.92	4.90	53	**F**	51	6286	1635	0.96	4.90	33	**D**	
																	202,000
R6.811	GARDEN GROVE, EUCLID STREET INTERCHANGE	4	24	6295	1689	0.93	4.90	73	**F**	34	5826	1497	0.97	4.90	45	**E**	
																	216,000
R7.829	GARDEN GROVE, HARBOR BOULEVARD	4	23	6566	1732	0.95	4.80	77	**F**	48	6046	1555	0.97	4.80	34	**D**	
																	223,000
R8.822	GARDEN GROVE, GARDEN GROVE BOULEVARD INTERCHANGE	4	48	5898	1585	0.93	4.80	34	**D**	40	5444	1375	0.99	4.80	35	**E**	
																	229,800
R9.729	ORANGE, MANCHESTER AVENUE/ CITY DRIVE INTERCHANGE	2	54	3362	872	0.96	4.80	33	**D**	46	3378	892	0.95	4.80	40	**E**	
																	235,000
R10.478	SANTA ANA, JCT. RTES. 5 AND 57; SANTA ANA/ ORANGE FREEWAYS	2	40	3740	1012	0.92	4.50	51	**F**	52	3604	926	0.97	4.50	36	**E**	
																	146,000
R10.992	SANTA ANA, MAIN STREET	3	50	5843	1511	0.97	4.50	41	**E**	51	5174	1340	0.97	4.50	36	**E**	
																	146,000
R11.825	ORANGE, GLASSELL STREET INTERCHANGE	3	57	5220	1397	0.93	4.50	33	**D**	45	5540	1390	1.00	4.50	42	**E**	
																	141,300
R12.866	TUSTIN AVENUE INTERCHANGE	4	38	5824	1495	0.97	4.50	40	**E**	62	6600	1711	0.96	4.50	28	**D**	
																	118,000
R13.164	JCT. RTE. 55, COSTA MESA FREEWAY																

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
R0.00	LOS ANGELES/ORANGE COUNTY LINE																
																	96,000
R0.65	JCT. RTE. 405																
																	142,200
R2.653	WESTMINSTER, KNOTT AVENUE/GOLDEN WEST STREET INTERCHANGE	3	55	4501	1185	0.95	8.70	30	**D**	46	4181	1072	0.98	8.70	32	**D**	
																	150,200
R3.587	GARDEN GROVE, JCT. RTE. 39	3	62	5228	1358	0.96	4.90	30	**D**	56	4964	1272	0.98	4.90	31	**D**	
																	183,000
R4.812	GARDEN GROVE, MAGNOLIA STREET INTERCHANGE	4	66	6523	1710	0.95	4.90	27	**D**	64	6704	1722	0.97	4.90	28	**D**	
																	196,000
R5.817	GARDEN GROVE, BROOKHURST STREET INTERCHANGE	4	65	6217	1629	0.95	4.90	26	**C**	60	6657	1725	0.96	4.90	29	**D**	
																	202,000
R6.811	GARDEN GROVE, EUCLID STREET INTERCHANGE	4	63	6040	1572	0.96	4.90	25	**C**	59	6635	1710	0.97	4.90	30	**D**	
																	216,000
R7.829	GARDEN GROVE, HARBOR BOULEVARD	4	64	6416	1691	0.95	4.80	27	**D**	45	6941	1762	0.98	4.80	40	**E**	
																	223,000
R8.822	GARDEN GROVE, GARDEN GROVE BOULEVARD INTERCHANGE	4	64	4463	1191	0.94	4.80	19	**C**	60	4067	1055	0.96	4.80	18	**B**	
																	229,800
R9.729	ORANGE, MANCHESTER AVENUE/ CITY DRIVE INTERCHANGE	3	66	4622	1168	0.99	4.80	24	**C**	35	4722	1267	0.93	4.80	49	**F**	
																	235,000
R10.478	SANTA ANA, JCT. RTES. 5 AND 57; SANTA ANA/ ORANGE FREEWAYS	3	66	4228	1081	0.98	4.50	22	**C**	51	4215	1084	0.97	4.50	29	**D**	
																	146,000
R10.992	SANTA ANA, MAIN STREET	4	64	5708	1462	0.98	4.50	23	**C**	41	5637	1433	0.98	4.50	36	**E**	
																	146,000
R11.825	ORANGE, GLASSELL STREET INTERCHANGE	3	59	6342	1662	0.95	4.50	38	**E**	48	5753	1450	0.99	4.50	42	**E**	
																	141,300
R12.866	TUSTIN AVENUE INTERCHANGE	4	61	5924	1609	0.92	4.50	27	**D**	38	6033	1530	0.99	4.50	41	**E**	
																	118,000
R13.164	JCT. RTE. 55, COSTA MESA FREEWAY																

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0	TUSTIN, FINLEY AVENUE																
																	48,500
0.267	JCT. RTE. 1																
																	55,600
1.513	COSTA MESA, EAST 17TH STREET																
																	87,700
1.82	COSTA MESA, HARBOR BOULEVARD																
																	71,600
2.021	COSTA MESA, 19TH STREET																
																	94,600
R2.772	COSTA MESA, VICTORIA/22ND STREETS	4	67	3971	1026	0.97	3.60	16	**B**	65	3638	964	0.94	3.60	15	**B**	
																	134,100
R4.022	COSTA MESA, MESA DRIVE	4	59	9837	2566	0.96	3.60	44	**E**	60	7058	1863	0.95	3.60	31	**D**	
																	153,600
R4.77	JCT. RTE. 73, CORONA DEL MAR FREEWAY	3	68	3317	856	0.97	3.60	17	**B**	67	4094	1072	0.95	3.60	22	**C**	
																	153,600
R5.99	JCT. RTE. 405, SAN DIEGO FREEWAY	3	62	6194	1584	0.98	3.50	34	**D**	46	4152	1075	0.97	3.50	32	**D**	
																	162,000
R6.99	SANTA ANA, MAC ARTHUR BOULEVARD	4	62	9213	2391	0.96	5.80	40	**E**	30	8598	2353	0.91	5.80	82	**F**	
																	281,900
R7.85	SANTA ANA, DYER ROAD	4	56	12652	3296	0.96	5.80	61	**F**	37	10725	2785	0.96	5.80	78	**F**	
																	288,100
R9.437	SANTA ANA, EDINGER AVENUE	4	59	9135	2807	0.81	5.80	49	**F**	23	10813	2864	0.94	5.80	127	**F**	
																	304,100
R9.96	TUSTIN, MC FADDEN STREET INTERCHANGE	5	56	13612	3470	0.98	5.80	51	**F**	54	12897	3426	0.94	5.80	53	**F**	
																	287,400
10.45	TUSTIN, JCT. RTE. 5, SANTA ANA FREEWAY	3	61	6880	1780	0.97	7.70	40	**E**	47	7708	2030	0.95	7.70	60	**F**	
																	238,900
10.979	SANTA ANA, FOURTH STREET INTERCHANGE	4	65	6861	1786	0.96	7.70	29	**D**	46	7692	2008	0.96	7.70	46	**F**	
																	259,100
11.785	TUSTIN, SEVENTEENTH STREET INTERCHANGE	4	63	10600	2756	0.96	7.70	45	**F**	54	11804	3030	0.97	7.70	58	**F**	
																	251,000

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
12.967	JCT. RTE. 22 WEST, GARDEN GROVE FREEWAY	4	68	5676	1454	0.98	7.50	22	**C**	69	5557	1439	0.97	7.50	22	**C**	
																	263,600
13.7	CHAPMAN AVENUE	4	65	6117	1570	0.97	5.90	25	**C**	57	7454	1903	0.98	5.90	34	**D**	
																	231,000
15.242	ORANGE, KATELLA AVENUE INTERCHANGE	4	65	4626	1196	0.97	5.90	19	**C**	56	5654	1448	0.98	5.90	27	**D**	
																	215,000
16.981	ORANGE, LINCOLN AVENUE INTERCHANGE	4	62	6614	1732	0.95	5.90	29	**D**	47	7460	1960	0.95	5.90	43	**E**	
																	215,900
17.876	JCT RTE 91																

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM PEAK PERIOD PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	2014 AADT
0	TUSTIN, FINLEY AVENUE																
																	48,500
0.267	JCT. RTE. 1																
																	55,600
1.513	COSTA MESA, EAST 17TH STREET																
																	87,700
1.82	COSTA MESA, HARBOR BOULEVARD																
																	71,600
2.021	COSTA MESA, 19TH STREET																
																	94,600
R2.772	COSTA MESA, VICTORIA/22ND STRETS	3	64	5330	1414	0.94	3.60	30	**D**	62	5243	1386	0.95	3.60	31	**D**	
																	134,100
R4.022	COSTA MESA, MESA DRIVE	4	68	4051	1060	0.96	3.60	16	**B**	65	5450	1402	0.97	3.60	22	**C**	
																	153,600
R4.77	JCT. RTE. 73, CORONA DEL MAR FREEWAY	3	59	4346	1185	0.92	3.60	27	**D**	62	3626	955	0.95	3.60	21	**C**	
																	153,600
R5.99	JCT. RTE. 405, SAN DIEGO FREEWAY	3	43	4118	1088	0.95	3.50	34	**D**	30	4659	1210	0.96	3.50	54	**F**	
																	162,000
R6.99	SANTA ANA, MAC ARTHUR BOULEVARD	4	62	10470	2783	0.94	5.80	46	**F**	58	10049	2880	0.87	5.80	51	**F**	
																	281,900
R7.85	SANTA ANA, DYER ROAD	4	54	8818	2269	0.97	5.80	44	**E**	40	7458	1897	0.98	5.80	48	**F**	
																	288,100
R9.437	SANTA ANA, EDINGER AVENUE	4	53	8598	2187	0.98	5.80	42	**E**	61	7423	1894	0.98	5.80	32	**D**	
																	304,100
R9.96	TUSTIN, MC FADDEN STREET INTERCHANGE	4	44	8784	2283	0.96	5.80	54	**F**	59	7881	2051	0.96	5.80	35	**E**	
																	287,400
10.45	TUSTIN, JCT. RTE. 5, SANTA ANA FREEWAY	4	47	8353	2182	0.96	7.70	48	**F**	48	7425	1907	0.97	7.70	41	**E**	
																	238,900
10.979	SANTA ANA, FOURTH STREET INTERCHANGE	3	34	5130	1332	0.96	7.70	54	**F**	58	4536	1172	0.97	7.70	28	**D**	
																	259,100
11.785	TUSTIN, SEVENTEENTH STREET INTERCHANGE	4	48	5864	1512	0.97	7.70	33	**D**	51	6002	1542	0.97	7.70	31	**D**	
																	251,000

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
12.967	JCT. RTE. 22 WEST, GARDEN GROVE FREEWAY	3	66	8169	2234	0.91	7.50	47	**F**	67	5876	1494	0.98	7.50	31	**D**	
																	263,600
13.7	CHAPMAN AVENUE	5	51	7497	2046	0.92	5.90	33	**D**	59	7970	2033	0.98	5.90	29	**D**	
																	231,000
15.242	ORANGE, KATELLA AVENUE INTERCHANGE	4	50	6489	1689	0.96	5.90	35	**D**	64	6586	1676	0.98	5.90	27	**D**	
																	215,000
16.981	ORANGE, LINCOLN AVENUE INTERCHANGE	4	60	7451	1960	0.95	5.90	34	**D**	64	6853	1784	0.96	5.90	29	**D**	
																	215,900
17.876	JCT RTE 91																

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
11.1	AT CHAPMAN OFF	5	67	5522	1472	0.94	6.14	18	**C**	67	5206	1358	0.96	6.14	17	**B**	
																	244,200
11.22	CHAPMAN	5	67	6274	1614	0.97	6.14	20	**C**	66	5622	1461	0.96	6.14	18	**C**	
																	250,000
11.68	ORANGEWOOD	5	70	7825	2051	0.95	6.14	24	**C**	65	6778	1782	0.95	6.14	23	**C**	
																	250,000
12.2	STADIUM	5	N/A	N/A	N/A	N/A	6.14	N/A	**N/A**	N/A	N/A	N/A	N/A	6.14	N/A	**N/A**	
																	250,000
12.5	KATELLA	5	N/A	N/A	N/A	N/A	6.14	N/A	**N/A**	N/A	N/A	N/A	N/A	6.14	N/A	**N/A**	
																	250,000
12.9	DOUGLAS	5	68	7793	2019	0.96	6.14	24	**C**	59	7198	1831	0.98	6.14	25	**C**	
																	251,800
13.38	BALL	5	67	6988	1849	0.94	6.14	23	**C**	52	6409	1618	0.99	6.14	26	**C**	
																	251,800
13.9	WAGNER	5	64	6698	1738	0.96	6.14	22	**C**	52	6390	1672	0.96	6.14	27	**D**	
																	251,000
14.73	LINCOLN	5	49	7209	1855	0.97	6.14	31	**D**	30	6809	1736	0.98	6.14	47	**F**	
																	251,000
15.4	LA PALMA	3	58	4668	1221	0.96	6.14	29	**D**	59	4422	1124	0.98	6.14	26	**C**	
																	279,000
15.7	N OF 91	3	58	5877	1507	0.97	6.14	36	**E**	59	5256	1343	0.98	6.14	31	**D**	
																	278,000
16.5	ORANGETHROPE	6	63	8789	2295	0.96	6.14	25	**C**	60	8634	2221	0.97	6.14	26	**C**	
																	278,000
17.18	CHAPMAN	6	70	7792	1999	0.97	6.14	20	**C**	65	6763	1769	0.96	6.14	19	**C**	
																	244,800
18.3	YORBA LINDA	5	64	5654	1448	0.98	6.14	19	**C**	42	6532	1687	0.97	6.14	33	**D**	
																	244,800
19.1	ROLLING HILLS	4	65	5715	1518	0.94	6.14	24	**C**	56	6638	1719	0.97	6.14	32	**D**	
																	238,000
19.8	IMPERIAL	5	71	5846	1520	0.96	6.14	18	**B**	23	6959	1835	0.95	6.14	65	**F**	
																	227,000
21.16	LAMBERT ROAD	4	67	5704	1534	0.93	6.14	24	**C**	47	5618	1497	0.94	6.14	33	**D**	
																	221,100
22	TONNER CANYON	3	68	5566	1490	0.93	6.14	30	**D**	61	5064	1318	0.96	6.14	30	**D**	
																	221,000

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
11.08	CHAPMAN 1	4	54	6176	1598	0.97	6.14	31	**D**	49	5882	1525	0.96	6.14	32	**D**	
																	244,200
11.55	ORANGEWOOD	4	50	7274	1937	0.94	6.14	40	**E**	55	6936	1795	0.97	6.14	34	**D**	
																	250,000
12.2	STADIUM	5	N/A	N/A	N/A	N/A	6.14	N/A	**N/A**	N/A	N/A	N/A	N/A	6.14	N/A	**N/A**	
																	250,000
12.4	KATELLA	4	49	6407	1685	0.95	6.14	36	**E**	56	6121	1554	0.98	6.14	29	**D**	
																	250,000
12.9	DOUGLAS	4	49	7806	2054	0.95	6.14	43	**E**	52	7619	2016	0.94	6.14	40	**E**	
																	250,000
13.27	BALL	4	45	7285	1950	0.93	6.14	45	**F**	52	7141	1869	0.96	6.14	37	**E**	
																	251,800
13.9	WAGNER	5	47	8351	2253	0.93	6.14	40	**E**	59	7740	1990	0.97	6.14	28	**D**	
																	251,800
14.65	LINCOLN	5	57	7997	2196	0.91	6.14	32	**D**	67	7298	1890	0.97	6.14	23	**C**	
																	251,000
15.4	LA PALMA	4	42	7023	1801	0.97	6.14	44	**E**	53	7117	1819	0.98	6.14	35	**E**	
																	251,000
15.7	N OF 91	4	63	5763	1528	0.94	6.14	25	**C**	68	5271	1343	0.98	6.14	20	**C**	
																	279,000
16.46	ORANGETHROPE	5	51	7506	1978	0.95	6.14	32	**D**	57	7382	1885	0.98	6.14	28	**D**	
																	278,000
17.18	CHAPMAN 3	4	27	7293	1924	0.95	6.14	73	**F**	39	6637	1735	0.96	6.14	46	**F**	
																	278,000
18.18	YORBA LINDA	5	33	7741	2078	0.93	6.14	52	**F**	47	6603	1703	0.97	6.14	30	**D**	
																	244,800
19.1	ROLLING HILLS	4	25	7048	1907	0.92	6.14	79	**F**	13	6562	1677	0.98	6.14	136	**F**	
																	244,800
19.73	IMPERIAL	4	19	6419	1754	0.91	6.14	97	**F**	62	5527	1441	0.96	6.14	24	**C**	
																	238,000
20.7	LAMBERT	4	74	6683	1779	0.94	6.14	25	**C**	63	5321	1376	0.97	6.14	22	**C**	
																	227,000
22.06	TONNER CANYON	4	27	6605	1773	0.93	6.14	68	**F**	65	6025	1527	0.99	6.14	24	**C**	
																	221,100

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
10.000	JCT RTE 5	3	66.383	3387	918	0.92	0.95	19	**C**	65.85	1707	444	0.96	0.95	9	**A**	
																	35,600
11.760	GREENFIELD DR	3	52.15	2956	790	0.94	0.95	20	**C**	67.425	1231	341	0.90	0.95	7	**A**	
																	34,500
13.404	LA PAZ ROAD	3	67.5	3820	1014	0.94	0.95	20	**C**	66.892	1479	396	0.93	0.95	8	**A**	
																	48,600
14.393	ALISO CREEK ROAD	4	68.817	5016	1332	0.94	0.95	19	**C**	69.25	1827	475	0.96	0.95	7	**A**	
																	57,400
16.250	EL TORO ROAD	4	59.767	6652	1702	0.98	1.04	29	**D**	53.733	3917	1070	0.92	1.04	20	**C**	
																	67,200
18.696	TOLL PLAZA	4	66.55	6479	1693	0.96	1.04	26	**C**	68.483	2902	765	0.95	1.04	11	**B**	
																	67,200
21.428	NEWPORT COAST DRIVE	4	52.15	2956	790	0.94	1.04	15	**B**	67.425	1231	341	0.90	1.04	5	**A**	
																	68,100
22.448	BONITA CANYON DRIVE/FORD ROAD	4	66.183	6190	1603	0.97	1.04	24	**C**	67.875	2465	640	0.96	1.04	9	**A**	
																	65,100
24.78	JAMBOREE ROAD	3	61.058	4455	1156	0.96	1.04	25	**C**	40.6	4433	1172	0.95	1.04	39	**E**	
																	175,000
26.58	COSTA MESA, JCT RTE 55	3	64.208	3574	966	0.92	1.04	20	**C**	46.167	5308	1370	0.97	1.04	40	**E**	
																	117,200
27.28	COSTA MESA, BEAR STREET	3	64.883	3684	986	0.93	1.04	20	**C**	43.85	5181	1349	0.96	1.04	41	**E**	
																	117,200
27.81	JCT RTE 405, SAN DIEGO FREEWAY	3	64.375	3635	983	0.92	2.35	21	**C**	46.85	5421	1400	0.97	2.35	40	**E**	

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
10.000	JCT RTE 5	3	67	1498	421	0.89	0.95	8	**A**	65	3005	788	0.95	0.95	16	**B**	
																	35,600
11.760	GREENFIELD DR	3	69	831	242	0.86	0.95	5	**A**	65	2291	604	0.95	0.95	12	**B**	
																	34,500
13.404	LA PAZ ROAD	3	66	927	272	0.85	0.95	5	**A**	36	3029	770	0.98	0.95	29	**D**	
																	48,600
14.393	ALISO CREEK ROAD	3	67	1107	315	0.88	0.95	6	**A**	58	4035	1044	0.97	0.95	24	**C**	
																	57,400
16.250	EL TORO ROAD	3	68	1222	333	0.92	1.04	7	**A**	62	4297	1102	0.97	1.04	24	**C**	
																	67,200
18.696	TOLL PLAZA	4	67	2285	592	0.96	1.04	9	**A**	44	6500	1713	0.95	1.04	39	**E**	
																	67,200
21.428	NEWPORT COAST DRIVE	4	70	1682	442	0.95	1.04	6	**A**	61	5729	1501	0.95	1.04	25	**C**	
																	68,100
22.448	BONITA CANYON DRIVE/FORD ROAD	4	66	1878	483	0.97	1.04	7	**A**	63	5667	1465	0.97	1.04	23	**C**	
																	65,100
24.78	JAMBOREE ROAD	3	56	4638	1209	0.96	1.04	29	**D**	60	4840	1255	0.96	1.04	28	**D**	
																	175,000
26.58	COSTA MESA, JCT RTE 55	3	65	1038	276	0.94	1.04	6	**A**	62	1345	343	0.98	1.04	7	**A**	
																	117,200
27.28	COSTA MESA, BEAR STREET	3	29	4716	1228	0.96	1.04	58	**F**	65	4389	1139	0.96	1.04	24	**C**	
																	117,200
27.81	JCT RTE 405	2	35	2919	743	0.98	2.35	42	**E**	61	2770	707	0.98	2.35	23	**C**	

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Postmile	SEGMENT	# of Lanes	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0	LOS ANGELES-ORANGE COUNTY LINE	4	52.067	6751	1770	0.95	6.48	35	**E**	61.375	6082	1580	0.96	6.48	27	**D**	
																	243,000
R0.489	LA PALMA, ORANGETHORPE AVENUE	4	60.475	6855	1917	0.89	6.48	33	**D**	62.1	5645	1549	0.91	6.48	26	**C**	
																	254,500
R0.848	BUENA PARK, VALLEY VIEW STREET	4	54.517	10132	2795	0.91	6.48	53	**F**	60.292	9702	2453	0.99	6.48	42	**E**	
																	259,000
R1.842	BUENA PARK, KNOTT AVENUE	4	55	6144	1612	0.95	6.48	30	**D**	55	6386	1653	0.97	6.48	31	**D**	
																	264,100
R2.615	BUENA PARK, JCT. RTE. 39/BEACH	4	47.442	6873	1884	0.91	8.08	41	**E**	50.133	6754	1725	0.98	8.08	36	**E**	
																	263,700
R3.638	FULLERTON, JCT. RTE. 5, SANTA ANA FREEWAY	3	59.95	3830	1082	0.88	6.80	25	**C**	59.842	4244	1079	0.98	6.80	25	**C**	
																	199,000
1.232	ANAHEIM, BROOKHURST AVENUE	4	64.533	6619	1675	0.99	6.80	27	**D**	62.45	6190	1610	0.96	6.80	27	**D**	
																	262,100
2.234	EUCLID AVENUE INTERCHANGE	4	N/A	N/A	N/A	N/A	6.80	N/A	**N/A**	N/A	N/A	N/A	N/A	6.80	N/A	**N/A**	
																	274,000
3.258	FULLERTON, HARBOR BOULEVARD	4	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	266,000
3.512	ANAHEIM, LEMON STREET/ HARVARD AVENUE	4	N/A	N/A	N/A	N/A	6.80	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	266,000
4.256	ANAHEIM, EAST STREET	4	N/A	N/A	N/A	N/A	6.80	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	258,700
5.258	ANAHEIM, STATE COLLEGE BOULEVARD	4	57.667	6128	1600	0.96	9.20	29	**D**	55.317	6706	1910	0.88	9.20	36	**E**	
																	254,000
6.119	ANAHEIM, JCT. RTE. 57, ORANGE FREEWAY	4	57.667	6128	1600	0.96	8.70	29	**D**	55.317	6706	1910	0.88	8.70	36	**E**	
																	224,000
7.353	KRAEMER BOULEVARD/ GLASSELL STREET	3	57.892	5105	1328	0.96	8.70	32	**D**	58.725	5013	1299	0.96	8.70	31	**D**	
																	216,700
8.399	TUSTIN AVENUE INTERCHANGE	4	54.875	6063	1671	0.91	8.70	32	**D**	40.3	6877	1784	0.96	8.70	46	**F**	

Postmile	SEGMENT	# of Lanes	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
																	231,300
9.187	JCT. RTE. 55 SOUTH	4	N/A	N/A	N/A	N/A	6.5	N/A	**N/A**	N/A	N/A	N/A	N/A	6.5	N/A	**N/A**	
																	322,000
10.091	LAKEVIEW AVENUE	6	63.583	7269	1862	0.98	4.5	20	**C**	63.55	8072	2089	0.97	4.5	22	**C**	
																	302,900
11.540	PERALTA, JCT. RTE. 90 WEST	5	66.492	6073	1585	0.96	5	20	**C**	67.483	6568	1669	0.98	5	20	**C**	
																	256,000
14.431	WEIR CANYON ROAD	5	68.842	5716	1483	0.96	5	18	**B**	66.6	6194	1571	0.99	5	19	**C**	
																	233,700
15.925	JCT RTE 241	4	67.083	5575	1502	0.93	5.00	23	**C**	53.275	6624	1686	0.98	5.00	32	**D**	
																	259,600
16.404	GYPSUM CANYON ROAD INTERCHANGE	4	69.375	5079	1315	0.97	5.00	19	**C**	62.392	5977	1543	0.97	5.00	25	**C**	
																	259,600
17.950	COAL CANYON ROAD	5	71	7010	1868	0.94	5.00	22	**C**	60.142	8073	2076	0.97	5.00	28	**D**	
																	259,600
18.905	ORANGE/RIVERSIDE COUNTY LINE	6	66.3	6846	1854	0.92	5.00	19	**C**	28.708	8862	2279	0.97	5.00	54	**F**	

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0	LOS ANGELES-ORANGE COUNTY LINE	4	N/A	N/A	N/A	N/A	6.48	N/A	N/A	N/A	N/A	N/A	N/A	6.48	N/A	N/A	
																	243,000
R0.49	LA PALMA, ORANGETHROPE AVENUE	4	61	5883	1501	0.98	6.48	25	**C**	61	5309	1421	0.93	6.48	24	**C**	
																	254,500
R1	BUENA PARK, VALLEY VIEW STREET	4	57	5684	1467	0.97	6.48	26	**D**	49	9840	2503	0.98	6.48	53	**F**	
																	259,000
R1.99	BUENA PARK, KNOTT AVENUE	4	56	6900	1823	0.95	6.48	34	**D**	53	6058	1543	0.98	6.48	30	**D**	
																	264,100
R2.6	BUENA PARK, JCT. RTE. 39/BEACH	4	48	7065	1820	0.97	8.08	39	**E**	40	6607	1682	0.98	8.08	43	**E**	
																	263,700
R3.4	FULLERTON, JCT. RTE. 5, SANTA ANA FREEWAY	3	54	5075	1365	0.93	6.80	35	**D**	50	4906	1291	0.95	6.80	36	**E**	
																	199,000
1.12	ANAHEIM, BROOKHURST AVENUE	3	59	4986	1291	0.97	6.80	30	**D**	59	4863	1278	0.95	6.80	30	**D**	
																	262,100
2.11	EUCLID AVENUE INTERCHANGE	3	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	274,000
3.13	FULLERTON, HARBOR BOULEVARD	4	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	266,000
3.91	ANAHEIM, LEMON STREET/ HARVARD AVENUE	4	N/A	N/A	N/A	N/A	6.80	N/A	**N/A**	N/A	N/A	N/A	N/A	6.80	N/A	**N/A**	
																	266,000
4.18	ANAHEIM, EAST STREET	3	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	N/A	N/A	N/A	N/A	**N/A**	
																	258,700
5.14	ANAHEIM, STATE COLLEGE BOULEVARD	3	63	4379	1119	0.98	9.20	25	**C**	57	4369	1110	0.98	9.20	27	**D**	
																	254,000
6.15	ANAHEIM, JCT. RTE. 57, ORANGE FREEWAY	3	51	5768	1560	0.92	8.70	42	**E**	55	4965	1421	0.87	8.70	36	**E**	
																	224,000

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
7.4	KRAEMER BOULEVARD/ GLASSELL STREET	5	67	6871	1768	0.97	8.70	22	**C**	60	6140	1621	0.95	8.70	23	**C**	
																	216,700
8.36	TUSTIN AVENUE INTERCHANGE	4	56	7021	1799	0.98	8.70	34	**D**	56	5858	1489	0.98	8.70	28	**D**	
																	231,300
9.187	JCT. RTE. 55 SOUTH	4	N/A	N/A	N/A	N/A	6.50	N/A	**N/A**	N/A	N/A	N/A	N/A	6.50	N/A	**N/A**	
																	322,000
10.091	LAKEVIEW AVENUE	5	71	8349	2155	0.97	4.50	25	**C**	52	7478	1907	0.87	4.50	34	**D**	
																	302,900
11.540	PERALTA, JCT. RTE. 90 WEST	5	69	7324	1869	0.98	5.00	22	**C**	59	6023	1531	0.98	5.00	21	**C**	
																	256,000
14.431	WEIR CANYON ROAD	5	69	7963	2029	0.98	5.00	24	**C**	61	6247	1610	0.97	5.00	22	**C**	
																	233,700
15.925	JCT RTE 241	4	65	7225	1853	0.97	5.00	29	**D**	65	5639	1424	0.99	5.00	22	**C**	
																	259,600
16.404	GYPSUM CANYON ROAD INTERCHANGE	4	62	7487	1884	0.99	5.00	31	**D**	54	55630	1417	9.81	5.00	27	**D**	
																	259,600
17.950	COAL CANYON ROAD	5	61	10166	2646	0.96	5.00	35	**E**	68	6590	1720	0.96	5.00	21	**C**	
																	259,600
18.905	ORANGE/RIVERSIDE COUNTY LINE	4	52	6845	1768	0.97	5.00	35	**D**	66	4540	1203	0.94	5.00	19	**C**	

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			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.000	LAGUNA BEACH, JCT. RTE. 1, PACIFIC COAST HIGHWAY																
																	21,900
0.230	LAGUNA BEACH, N OR CLIFF DRIVE																
																	28,300
0.962	LAGUNA BEACH, CANYON ACRES DRIVE																
																	37,700
3.416	LAGUNA BEACH, EL TORO ROAD																
																	19,800
7.710	LAGUNA CANYON ROAD																
																	19,800
8.376	JCT. RTE. 405, SAN DIEGO FREEWAY																
																	34,600
8.990	BARRANCA1	2	67	1619	426	0.95	4.53	13	**B**	62	2594	701	0.93	4.53	23	**C**	
																	29,700
9.100	BARRANCA2	3	68	1646	449	0.92	4.53	9	**A**	57	3667	980	0.94	4.53	23	**C**	
																	29,700
9.37	S OF 5	2	69	693	183	0.95	4.53	5	**A**	63	2250	630	0.89	4.53	20	**C**	
																	29,700
9.77	N OF 5	2	70	1321	359	0.92	4.53	11	**A**	62	4124	1126	0.92	4.53	37	**E**	
																	29,700
10.05	MARINE WAY	2	66	1090	282	0.97	4.53	9	**A**	64	3408	950	0.90	4.53	30	**D**	
																	29,700
10.50	N OF MARINE	3	68	1092	295	0.93	4.53	6	**A**	63	3432	952	0.90	4.53	21	**C**	
																	29,700
10.73	S OF PM 11	4	70	1345	350	0.96	4.53	5	**A**	66	4682	1265	0.93	4.53	20	**C**	
																	29,700
11.08	AT PM 11	3	67	1296	335	0.97	4.53	7	**A**	63	4532	1213	0.93	4.53	26	**D**	
																	29,700
11.35	N OF PM 11	3	51	1310	337	0.97	4.53	9	**A**	51	4529	1236	0.92	4.53	33	**D**	
																	29,700
11.70	IRVINE BLVD 1	3	67	1879	501	0.94	3.19	10	**A**	51	6300	1717	0.92	3.19	45	**F**	
																	47,100
12.05	IRVINE BLVD 3	3	67	1281	335	0.96	3.19	7	**A**	64	4387	1191	0.92	3.19	25	**C**	
																	47,100
12.42	S OF PORTOLA	4	69	1360	352	0.97	3.19	5	**A**	61	4608	1275	0.90	3.19	21	**C**	
																	47,100
12.77	NB133 TO 241	2	60	816	220	0.93	3.19	7	**A**	52	2349	693	0.85	3.19	27	**D**	
																	47,100

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
13.04	ORANGE 1	2	68	800	211	0.95	3.19	6	**A**	62	2277	666	0.85	3.19	22	**C**	
																	47,000
13.42	ORANGE 2	3	65	1548	412	0.94	3.19	9	**A**	65	3147	913	0.86	3.19	19	**C**	
																	47,000

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.000	LAGUNA BEACH, JCT. RTE. 1, PACIFIC COAST HIGHWAY																
																	21,900
0.230	LAGUNA BEACH, N OR CLIFF DRIVE																
																	28,300
0.962	LAGUNA BEACH, CANYON ACRES DRIVE																
																	37,700
3.416	LAGUNA BEACH, EL TORO ROAD																
																	19,800
7.710	LAGUNA CANYON ROAD																
																	19,800
8.376	JCT. RTE. 405, SAN DIEGO FREEWAY																
																	34,600
8.990	BARRANCA1	3	53	2873	747	0.96	4.53	19	C	66	1836	485	0.95	4.53	10	A	
																	29,700
9.37	S OF 5	2	51	2174	587	0.93	4.53	24	C	64	755	214	0.88	4.53	7	A	
																	29,700
9.77	N OF 5	2	39	2869	748	0.96	4.53	39	E	64	773	227	0.85	4.53	7	A	
																	29,700
10.05	MARINE WAY	3	52	4211	1058	1.00	4.53	28	D	65	1197	328	0.91	4.53	7	A	
																	29,700
10.50	N OF MARINE	3	60	4099	1036	0.99	4.53	24	C	66	1179	316	0.93	4.53	7	A	
																	29,700
10.73	S OF PM 11	4	62	9105	2317	0.98	4.53	38	E	68	2694	720	0.94	4.53	11	A	
																	29,700
11.08	AT PM 11	3	59	5186	1326	0.98	4.53	31	D	66	1405	377	0.93	4.53	8	A	
																	29,700
11.35	N OF PM 11	3	50	5366	1370	0.98	4.53	37	E	64	1448	396	0.91	4.53	8	A	
																	29,700
11.70	IRVINE BLVD 1	3	63	4975	1266	0.98	3.19	27	D	67	1255	353	0.89	3.19	7	A	
																	29,700
12.05	IRVINE BLVD 3	3	36	4718	1191	0.99	3.19	45	F	68	2569	815	0.79	3.19	16	B	
																	47,100
12.42	S OF PORTOLA	4	51	5337	1361	0.98	3.19	27	D	67	1377	374	0.92	3.19	6	A	
																	47,100
13.04	ORANGE 1	2	52	2357	621	0.95	3.19	24	C	67	660	176	0.94	3.19	5	A	
																	47,100
13.42	ORANGE 2	2	66	2360	616	0.96	3.19	19	C	63	1271	330	0.96	3.19	11	A	
																	47,100

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
14.550	OSO	2	68	782	216	0.91	6.36	7	**A**	68	306	88	0.87	6.36	3	**A**	
																	6,600
17.768	ANTONIO	2	66	779	204	0.95	6.36	6	**A**	65	382	114	0.84	6.36	4	**A**	
																	16,000
18.488	SANTA MARGARITA	2	69	1296	362	0.90	6.36	11	**A**	66	476	129	0.92	6.36	4	**A**	
																	36,600
20.077	LOS ALISOS	3	64	3172	815	0.97	1.70	17	**B**	64	1500	402	0.93	1.70	8	**A**	
																	37,200
21.802	PORTOLA UC	4	66	4942	1315	0.94	1.70	20	**C**	67	2204	599	0.92	1.70	9	**A**	
																	32,300
23.418	ALTON	3	68	3374	911	0.93	3.08	18	**C**	67	1263	346	0.91	3.08	7	**A**	
																	39,800
24.968	PORTOLA	3	67	3360	894	0.94	3.08	18	**C**	67	1147	299	0.96	3.08	6	**A**	
																	38,900
27.378	JCT RTE 133	3	68	1065	364	0.73	3.08	7	**A**	68	1099	316	0.87	3.08	6	**A**	
																	32,600
32.541	CHAPMAN-SANTIAGO RD UC	2	68	1283	355	0.90	3.08	11	**A**	65	2264	650	0.87	3.08	20	**C**	
																	48,000
36.099	WINDY RIDGE TOLL	3	69	1831	474	0.97	3.08	9	**A**	51	4182	1087	0.96	3.08	29	**D**	
																	48,000
39.079	JCT RTE 91	4	66	1758	463	0.95	1.66	7	**A**	51	3042	804	0.95	1.66	16	**B**	

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
14.550	OSO	2	67	264	88	0.75	6.36	3	**A**	67	585	162	0.90	6.36	5	**A**	
																	6,600
17.768	ANTONIO	2	67	2350	612	0.96	6.36	19	**C**	65	2694	685	0.98	6.36	22	**C**	
																	16,000
18.488	SANTA MARGARITA	2	67	391	108	0.91	6.36	3	**A**	67	1184	330	0.90	6.36	10	**A**	
																	36,600
20.077	LOS ALISOS	2	64	1313	385	0.85	1.70	12	**B**	63	2674	721	0.93	1.70	23	**C**	
																	37,200
21.802	PORTOLA UC	2	67	877	253	0.87	1.70	8	**A**	65	2383	626	0.95	1.70	19	**C**	
																	32,300
23.418	ALTON	3	68	1133	319	0.89	3.08	6	**A**	65	3026	794	0.95	3.08	16	**B**	
																	39,800
24.968	PORTOLA	2	68	762	224	0.85	3.08	7	**A**	66	2466	647	0.95	3.08	20	**C**	
																	38,900
27.378	JCT RTE 133	4	68	1879	515	0.91	3.08	8	**A**	67	3748	971	0.96	3.08	15	**B**	
																	32,600
32.541	CHAPMAN-SANTIAGO RD UC	3	65	3444	934	0.92	3.08	20	**C**	68	1395	374	6.00	3.08	1	**A**	
																	48,000
36.099	WINDY RIDGE TOLL	3	60	4836	1252	0.97	3.08	28	**D**	65	1705	454	0.94	3.08	9	**A**	
																	48,000
39.079	JCT RTE 91	5	62	7007	1857	0.94	1.66	24	**C**	71	1999	565	0.88	1.66	6	**A**	

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.000	WALNUT AVENUE	2	67	231	60	0.96		2	**A**	66	2046	537	0.95		16	**B**	
																	82,500
0.239	JAMBOREE	3	62	2856	743	0.96		16	**B**	61	2856	743	0.96		16	**B**	
																	37,600
1.638	IRVINE	2	64	626	164	0.95		5	**A**	63	2002	518	0.97		16	**B**	
																	36,000
2.848	PORTOLA	3	66	901	234	0.96		5	**A**	65	2308	610	0.95		13	**B**	
																	32,300
6.035	CHAPMAN	3	66	709	198	0.90		4	**A**	66	2032	532	0.95		11	**A**	
																	32,300
6.205	JCT RTE 241																

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.000	WALNUT AVENUE	2	67	231	60	0.96		2	**A**	66	2046	537	0.95		16	**B**	
																	82,500
0.239	JAMBOREE	2	65	4295	1128	0.95		35	**D**	62	4831	1129	1.07		36	**E**	
																	37,600
1.638	IRVINE	2	65	3183	840	0.95		26	**C**	67	428	117	0.91		3	**A**	
																	36,000
2.848	PORTOLA	2	61	2520	654	0.96		22	**C**	63	768	202	0.95		6	**A**	
																	32,300
6.035	CHAPMAN	2	65	4295	1128	0.95		35	**D**	62	4831	1229	0.98		39	**E**	
																	32,300
6.205	JCT RTE 241																

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.230	JCT. RTE. 5	3	33	4662	1228	0.95	5.00	50	F	67	3227	850	0.95	5.00	17	B	
																	190,400
0.949	IRVINE CENTER	5	52	7434	1944	0.96	5.00	31	D	70	5784	1476	0.98	5.00	17	B	
																	213,000
1.804	JCT. RTE. 133	4	29	7726	2133	0.91	5.20	77	F	53	6473	1731	0.93	5.20	33	D	
																	250,000
2.876	SAND CANYON	4	34	8309	2157	0.96	5.20	65	F	47	7213	1903	0.95	5.20	42	E	
																	255,600
3.947	UNIVERSITY	4	42	8335	2115	0.99	5.60	52	F	46	7358	1923	0.96	5.60	43	E	
																	244,000
5.618	CULVER DRIVE	4	60	8575	2199	0.97	5.60	38	E	55	7600	1964	0.97	5.60	37	E	
																	268,000
6.917	JAMBOREE	5	64	8722	2209	0.99	5.60	28	D	45	7579	1969	0.96	5.60	36	E	
																	277,100
7.803	MAC ARTHUR	5	64	9037	2345	0.96	5.00	30	D	39	8632	2186	0.99	5.00	46	F	
																	279,000
8.740	JCT. RTE. 55	4	63	4614	1212	0.95	3.49	19	C	54	5270	1382	0.95	3.49	26	D	
																	239,000
9.46	BRISTOL	4	65	6067	1572	0.96	3.49	24	C	57	6446	1645	0.98	3.49	29	D	
																	229,000
9.9	BEAR	5	68	7474	1917	0.97	3.49	23	C	55	8547	2197	0.97	3.49	33	D	
																	229,000
10.9	FAIRVIEW	6	69	7913	2019	0.98	3.49	20	C	54	8911	2247	0.99	3.49	28	D	
																	292,000
11.4	HARBOR	7	65	8915	2281	0.98	3.49	21	C	27	9579	2591	0.92	3.49	55	F	
																	312,000
12.85	EUCLID	5	70	7701	1979	0.97	3.49	23	C	36	8177	2082	0.98	3.49	47	F	
																	291,000
13.74	BROOKHURST	4	68	6595	1709	0.96	3.49	26	C	40	6868	1768	0.97	3.49	45	E	
																	268,900
14.82	WARNER	4	68	6852	1750	0.98	3.49	26	D	53	6827	1763	0.97	3.49	34	D	
																	252,000
15.17	MAGNOLIA	4	66	6758	1751	0.96	3.49	27	D	53	3733	1742	0.54	3.49	33	D	
																	265,600
16.52	BEACH	4	56	7069	1855	0.95	3.49	34	D	48	6838	1731	0.99	3.49	36	E	
																	265,600
17.45	MCFADDEN	4	57	8125	2116	0.96	3.49	38	E	54	7931	2006	0.99	3.49	38	E	
																	265,600
17.92	GOLDENWEST	4	59	7170	1867	0.96	3.49	32	D	58	7178	1812	0.99	3.49	32	D	
																	265,600
19.24	WESTMINISTER	4	54	5964	1546	0.96	3.49	29	D	54	6444	1661	0.97	3.49	31	D	
																	262,400
20.33	BRYANT	4	57	7109	1838	0.97	3.49	33	D	59	7037	1829	0.96	3.49	31	D	

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
																	245,000
22.55	SEAL BEACH	6	64	10617	2889	0.92	3.49	31	**D**	60	10365	2630	0.99	3.49	30	**D**	
																	377,000
23.62	SALMON	5	N/A	N/A	N/A	N/A	3.49	N/A	N/A	N/A	N/A	N/A	N/A	3.49	N/A	N/A	
																	369,500

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
0.230	JCT. RTE. 5	5	66	5540	1469	0.94	5.00	18	C	65	6625	1793	0.92	5.00	22	C	
																	190,400
0.949	IRVINE CENTER	5	67	5537	1480	0.94	5.00	18	C	64	6613	1776	0.93	5.00	23	C	
																	213,000
1.804	JCT. RTE. 133	4	63	6457	1668	0.97	4.90	27	D	65	6644	1750	0.95	4.90	28	D	
																	250,000
2.876	SAND CANYON	4	64	6792	1900	0.89	5.20	31	D	47	7080	1802	0.98	5.20	39	E	
																	255,600
3.947	UNIVERSITY	4	54	7598	1963	0.97	5.60	38	E	50	6876	1782	0.96	5.60	37	E	
																	244,000
5.618	CULVER DRIVE	4	49	7769	1997	0.97	5.60	42	E	46	7077	1799	0.98	5.60	40	E	
																	268,000
6.917	JAMBOREE	6	64	7542	1958	0.96	5.60	21	C	38	7899	2105	0.94	5.60	38	E	
																	277,100
7.803	MAC ARTHUR	5	55	10444	2720	0.96	5.00	40	E	54	8840	2280	0.97	5.00	35	D	
																	279,000
8.740	JCT. RTE. 55	4	34	7476	1987	0.94	3.49	59	F	47	6697	1735	0.96	3.49	37	E	
																	239,000
9.54	BRISTOL	5	41	9037	2386	0.95	3.49	47	F	65	6360	1647	0.97	3.49	21	C	
																	229,000
9.9	BEAR	4	34	7927	2086	0.95	3.49	62	F	62	5748	1449	0.99	3.49	24	C	
																	229,000
10.28	FAIRVIEW	5	44	8581	2221	0.97	3.49	41	E	65	6378	1611	0.99	3.49	20	C	
																	292,000
11.2	HARBOR	6	35	10415	2705	0.96	3.49	53	F	62	9133	2329	0.98	3.49	25	C	
																	312,000
12.5	EUCLID	5	41	9346	2389	0.98	3.49	47	F	62	8504	2182	0.97	3.49	29	D	
																	291,000
13.81	BROOKHURST	4	53	8387	2120	0.99	3.49	41	E	61	7806	2001	0.98	3.49	34	D	
																	268,900
14.72	WARNER	4	34	6976	1916	0.91	3.49	58	F	44	7206	1825	0.99	3.49	43	E	
																	252,000
15.16	MAGNOLIA	4	43	7660	2061	0.93	3.49	49	F	29	8223	2107	0.98	3.49	73	F	
																	265,600
16.26	EDINGER	5	36	7428	2067	0.90	3.49	47	F	61	7809	1995	0.98	3.49	27	D	
																	265,600
16.6	BEACH	4	35	5324	1469	0.91	3.49	43	E	61	5703	1452	0.98	3.49	24	C	
																	265,600
17.45	MCFADDEN	4	38	7147	1920	0.93	3.49	52	F	37	7656	1950	0.98	3.49	54	F	
																	265,600
17.98	GOLDENWEST	4	42	5847	1725	0.85	3.49	42	E	59	6185	1587	0.97	3.49	27	D	
																	262,400
19.05	WESTMINISTER	4	31	6400	1904	0.84	3.49	62	F	51	6748	1781	0.95	3.49	35	E	

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			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
																	245,000
20.33	BRYANT	5	42	7556	2048	0.92	3.00	39	**E**	63	7245	1847	0.98	3.00	24	**C**	
																	377,000
22.54	SEAL BEACH	6	33	9487	2698	0.88	3.00	56	**F**	41	10228	2584	0.99	3.00	43	**E**	
																	369,500
23.62	SALMON	4	35	5653	1574	0.90	3.00	45	**F**	61	6280	1605	0.98	3.00	27	**D**	
																	254,200

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Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
R 1.26	KATELLA 1	4	66	4680	1191	0.98	4.63	18	**C**	35	5936	1525	0.97	4.63	44	**E**	
																	166,200
R 1.55	KATELLA 2	4	69	4370	1208	0.90	4.63	18	**B**	62	5521	1418	0.97	4.63	23	**C**	
																	173,100

** % Truck and AADT Values are the most recent values published at
www.dot.ca.gov/hq/traffops/saferesr/trafdata/ which is still currently 2014 data **

Postmile	SEGMENT	# of LANES	AM PEAK PERIOD							PM PEAK PERIOD							2014 AADT
			AM Speed	AM (PHV)	PHV (15 min)	PHF	% Truck	AM Density	AM LOS	PM Speed	PM (PHV)	PHV (15 min)	PHF	% Truck	PM Density	PM LOS	
R 1.26	KATELLA 1	4	62.35	5619	1607	0.87	4.63	26	**D**	64.708	5318	1365	0.97	4.63	22	**C**	
																	166,200
R 1.55	KATELLA 2	4	64.108	4993	1451	0.86	4.63	23	**C**	66.625	4825	1263	0.96	4.63	19	**C**	
																	173,100

** % Truck and AADT Values are the most recent values published at
www.dot.ca.gov/hq/traffops/saferesr/trafdata/ which is still currently 2014 data **

Appendix B-1: Meeting CMP Traffic Impact Analysis Requirements

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Meeting CMP Traffic Impact Analysis Requirements

AN OPTIONAL GUIDANCE FOR LOCAL JURISDICTIONS

Prepared for:

Orange County Environmental Management Agency
Orange County Transportation Commission
Orange County Transit District
League of Cities, Orange County Division
Transportation Corridor Agencies

Prepared by:

Kimley-Horn and Associates, Inc.
and
The Planning Center

June 11, 1991

CMP-TIA REQUIREMENTS

Requirements of CMP legislation

- Analyze impacts of land use decisions on CMP Highway System.
- Estimate costs associated with mitigation of impacts on CMP Highway System.
- Exclude costs associated with mitigating the impacts of interregional travel.
- Allow credits against mitigation costs for local public and private contributions to improvements to the CMP Highway System.
  - For toll road facilities, allow credits only for local public and private contributions which will not be reimbursed from toll revenues or other state or federal sources.
- Report annually on actions taken to adopt and implement a program to analyze the impacts of land use decisions on the CMP Highway System and to estimate the costs of mitigating those impacts.

Year One Goal

- Identify the impacts of development anticipated to occur over the next 7 years on the CMP Highway System and the projected costs of mitigating those impacts.

Actions Required of Local Jurisdictions

- A TIA will be required for CMP purposes for all proposed developments generating 2,400 or more daily trips. For developments which will directly access a CMP Highway System link, the threshold for requiring a TIA should be reduced to 1,600 or more trips per day.
- Document procedures used to identify and analyze traffic impacts of new development on CMP Highway System. This documentation should include the following:
  - Identification of type of development proposals which are subject to a traffic impact analyses (TIA);
  - Description of required or acceptable TIA methodology; and
  - Description of inter-jurisdictional coordination process used when impacts cross local agency boundaries.
- Document procedures/standards used to determine the costs of mitigation requirements for impacts of new development on CMP Highway System.
- Document methodology and procedures for determining applicable credits against mitigation costs including allowable credits associated with contributions to toll road facilities.

SECTION 1 – INTRODUCTION

Purpose

State legislation creating the Congestion Management Program (CMP) requires that the program contain a process to analyze the impacts of land use decisions by local governments on the regional transportation system. Once impacts of a land use decision are identified, the CMP also requires that the costs to mitigate the impacts be determined.

For CMP purposes, the regional transportation system is defined by the legislation as all state highways and principal arterials at a minimum. This system is referred to as the CMP Highway System. The identification and analysis of impacts along with estimated mitigation costs are determined with respect to this CMP Highway System.

The objectives of this report are to:

- Provide guidance to local agencies in conducting traffic impact analyses.
- Assist local agencies in maintaining eligibility for funds through documentation of CMP compliance.
- Make available minimum standards for jurisdictions wishing to use them for identifying and analyzing impacts on CMP Highway System.
- Establish CMP documentation requirements for those jurisdictions which elect to use their own TIA methodology.
- Establish a baseline from which TIA standardization may evolve as experience is gained in the CMP process.
- Cause the analysis of impacts on the CMP Highway System to be integrated into the local agency development review process.
- Provide a method for determining the costs associated with mitigating development impacts.
- Provide a framework for facilitating coordination between agencies when appropriate.

Background

Through a coordinated effort among local jurisdictions, public agencies, business and community groups, Orange County has developed a Congestion Management Program framework in response to the requirements of Assembly Bill 1791. This framework is contained in the Congestion Management Program Preparation Manual which was issued in January 1991 as a joint publication of the following agencies:

- County of Orange
- Orange County Division, League of California Cities
- Orange County Transportation Commission
- Orange County Transit District

- Transportation Corridor Agencies

The CMP Manual describes the CMP Program requirements for each component prescribed by the CMP provision of AB 1791. The components include one entitled Land Use Coordination, which sets forth the basic requirements for the assessment, mitigation, and monitoring of traffic impacts to the CMP Highway System which are attributable to development projects.

Consolidation of Remaining Issues

This report is intended to present a useful reference in addressing the remaining issues associated with the identification and treatment of development impacts on the CMP Highway System. It is desirable that a standardized approach be utilized for determining which projects require analysis and in carrying out the resulting traffic impact analysis (TIA). It is also desirable that a reasonably uniform approach be utilized in determining appropriate mitigation strategies and estimating the associated costs.

TIA Survey History

In 1989, Kimley-Horn and Associates, Inc. conducted a survey of TIA procedures being used at the time by local jurisdictions within Orange County. The survey revealed that although there were some commonalities, there was considerable variation in approach, scope, evaluation methodology, and project disposition.

As part of the CMP process, it was determined that the identification of TIA elements which can or should be standardized should be accomplished. Additional documentation of cost estimating practices and the development of standardized costs and estimating procedures will be valuable in achieving desired consistency among jurisdictions.

In order to accomplish these objectives, Kimley-Horn's previous TIA survey was updated and additional information was solicited from each local agency within Orange County. The information was obtained through telephone interviews with City Engineers and Planners after they had an opportunity to examine the survey questionnaire which was mailed to them in advance of the interview. The information obtained was used in preparing the methodology recommendations contained in this report. A summary of the update survey results is provided in the Appendix.

Relationships with Other Components

In addition to being an integral part of the Land Use Coordination component of the CMP, the traffic impact analysis requirements also relate to all other CMP components to a greater or lesser degree. These components include the following:

- Modeling
- Level of Service
- Transit Standards
- Traffic Demand Management
- Deficiency Plans
- Capital Improvement Program

The Land Use Coordination section in Chapter 3 of the CMP Preparation Manual dated January, 1991 contains a detailed description of each of the component linkages listed above.

SECTION 2- REQUIREMENTS OF CMP LEGISLATION

The complete text of CMP legislation is contained in Appendix A to the Preparation Manual for the Congestion Management Program for Orange County dated January, 1991. For ease of reference, the requirements of this legislation related to analysis of the impacts of land use decisions made by local jurisdictions are summarized as follows:

- Analyze impacts of land use decisions on CMP Highway System.
- Estimate costs associated with mitigation of impacts on CMP Highway System.
- Exclude costs associated with mitigating the impacts of interregional travel.
- Allow credits against mitigation costs for local public and private contributions to improvements to the CMP Highway System.
    - For toll road facilities, allow credits only for local public and private contributions which will not be reimbursed from toll revenues or other state or federal sources.
- Report annually on actions taken to adopt and implement a program to analyze the impacts of land use decisions on the CMP Highway System and to estimate the costs of mitigating those impacts.

SECTION 3 - ACTIONS REQUIRED OF LOCAL AGENCIES

The provisions of CMP legislation, as summarized in the preceding section, impose a requirement on local jurisdictions to carry out certain actions in order to demonstrate their compliance with the CMP program. This compliance will maintain eligibility to receive state gas tax funds made available by the voter approved Proposition 111. The actions and documentation requirements related to the identification and analysis of traffic impacts include the following:

- A TIA will be required for CMP purposes for all proposed developments generating 2,400 or more daily trips. For developments which will directly access a CMP Highway System link, the threshold for requiring a TIA should be reduced to 1,600 or more trips per day.
- Document procedures used to identify and analyze traffic impacts of new development on CMP Highway System. This documentation should include the following:
    - Identification of type of development proposals which are subject to a traffic impact analyses (TIA);
    - Description of required or acceptable TIA methodology; and
    - Description of inter-jurisdictional coordination process used when impacts

cross local agency boundaries.

- Document procedures/standards used to determine the costs of mitigation requirements for impacts of new development on CMP Highway System.
- Document methodology and procedures for determining applicable credits against mitigation costs including allowable credits associated with contributions to toll road facilities.
- Establish annual monitoring and reporting process to summarize activities performed in analyzing the impacts of land use decisions on the CMP Highway System and in estimating the associated mitigation costs. Procedures for incorporating mitigation measures into the Capital Improvement Program should also-be established.
- For the first year, local jurisdictions may assume that all interregional travel occurs on the freeway system or they may develop an analysis methodology to determine the amount of interregional travel occurring on arterials which are part of the CMP Highway System. During the first year, TIAs need to analyze only the impacts to arterial portions of the CMP Highway System.

SECTION 4 - CMP TRAFFIC IMPACT ANALYSIS METHODOLOGY

In order to assure that the CMP Program meets its objectives of linking land use decisions with the adequate evaluation of impacts related to those decisions, traffic impact analyses must often be undertaken. There are a number of essential elements which should be included in traffic impact analyses (TIA) used to support the program. Many local jurisdictions already employ development review processes which will be adequate for addressing CMP requirements. For those jurisdictions wishing technical guidance in carrying out the analysis of traffic impacts on the CMP Highway System, this section offers an appropriate TIA methodology.

PROJECTS REQUIRING TIA ANALYSIS

All development in Orange County will use the CMP Network to a greater or lesser extent from time-to-time. The seven-year capital improvement program, together with deficiency plans to respond to deficiencies which cannot be resolved in the 7-year timeframe, are developed in response to anticipated growth in travel within a jurisdiction. Thus, a certain level of travel growth is addressed in the normal planning process and it is not necessary to evaluate relatively small projects with a TIA or to rely on TIA's as the primary means of identifying needed CMP Highway System improvements. Furthermore, County voters have approved a sales tax increase which will fund major improvements to the transit and highway systems serving the County.

Many jurisdictions will require an EIR for a proposed development project. When required, the EIR should include steps necessary to incorporate the required CMP analysis. Most or all of the TIA elements described in this section would normally be incorporated into the typical EIR traffic analysis.

Certain development projects not requiring an EIR should still be evaluated through a TIA process due to their land use type, intensity, proximity to the CMP network, and/or duration of development timeframe. In other words, developments which will significantly alter the anticipated demand on a CMP roadway should be evaluated through a TIA approach.

At the present time, there is a wide-ranging approach to determining which projects will require a TIA. In some jurisdictions, there are formal guidelines, while in others it depends primarily on the judgment of a member of staff relative to the probable significance of the project's impact on the surrounding road system.

The OCTC TIA guidelines recommended defining three percent of the level of service standard as significant impact. This seems reasonable for application for CMP purposes. Thus, project impacts of three percent or less can be mitigated by impact fees or other revenues. Projects with a potential to create an impact of more than three percent of Level of Service E capacity will require TIA's. On this basis, it is recommended that all development projects which generate more than 2,400 daily trips be subject to a TIA for CMP evaluation. For projects which will directly access or be in close proximity to a CMP Highway System link a reduced threshold of 1,600 trips/day would be appropriate. Appendix B provides background information of the derivation of these threshold values.

TIA PROCESS

There are a number of essential elements in the TIA process itself. It is desirable that all of these elements be evaluated within an acceptable range of criteria in order to assure the objectives of the CMP process and to maintain a reasonable degree of equity from jurisdiction to jurisdiction. It is recognized, however, that for certain of the elements, some variations relating to professional judgment and local criteria and characteristics are necessary and appropriate to the process. These factors have been fully considered in developing the descriptions of the following elements:

- Evaluation of existing conditions
- Trip generation
- Internal capture and passer-by traffic
- Trip distribution and assignment
- Radius of development influence
- Background traffic
- Capacity analysis methodology
- Impact costs/mitigation

Evaluation of Existing Conditions

In order to evaluate the relative impacts of a proposed development, determine CMP Highway System status and define appropriate mitigation for new impacts, it is necessary to understand the existing conditions on the affected roadway network. Evaluation of existing conditions is common to nearly all jurisdictions in Orange County. Given that most jurisdictions use link and intersection capacity analysis techniques compatible with the techniques identified in the level-of-service component, no changes in existing local jurisdiction procedures should be necessary in connection with the CMP Program.

Trip Generation

At the foundation of traffic impact analyses is the quantification of trip generation. Use of the ITE Trip Generation Manual is common throughout Orange County. In addition, other widely accepted practices are being used when appropriate to supplement the lit data. These practices include use of acceptable rates published by local agencies and surveys conducted at similar sites, subject to approval of the reviewing agency. Given the uniformity of practice in Orange County to date, no major adjustments in this procedure should be required. It would be desirable however to establish a central library for reporting the results of special trip generation studies and making these results available to all other jurisdictions who wish them.

Internal Capture and Passer-by Traffic

Techniques for identifying the internal relationship of travel within mixed-use developments and the degree to which development captures passer-by trips as opposed to creating new trips are being applied by approximately 2/3 of the local jurisdictions within Orange County. The use of guidelines in the ITE Trip Generation Manual and appropriate professional judgment are the predominant techniques employed. To supplement the guidance available through ITE documentation, local jurisdictions are encouraged to undertake additional studies to document rates applicable within their jurisdiction. The determination of applicable rates should be undertaken by experienced transportation engineering professionals with thorough documentation of the methodology, data, and assumptions used. It is recommended that those jurisdictions which do not currently allow these adjustments establish revised TIA procedures incorporating this element. As with trip generation data, a central library would be desirable for reporting of data and analyses performed locally related to determination of appropriate factors.

Trip Distribution and Assignment

Several appropriate distribution and assignment techniques are used in Orange County, depending on the size of the development and the duration of buildout. Manual and computer modeling approaches are used as appropriate. Manual methods based on the best socio-economic information available to the agency and applicant should be acceptable except when a development's size makes a modeling approach more appropriate. Sources of this information include demographic surveys, market analyses, and previous studies.

Radius of Development Influence

There are numerous ways to identify the study area to be evaluated in a TIA. These include both qualitative and quantitative approaches. One of the most effective ways is through the determination of the quantity of project traffic on CMP roadway links compared to a selected level of impact. The goal of a quantitative approach is to be sure that all elements of the CMP network are addressed in a comparable manner from jurisdiction to jurisdiction. This is important due to the potential for overlapping impacts among jurisdictions. It is also important to maintain flexibility within a quantitative process to allow transportation professionals at local jurisdictions to add areas to the study which are of specific concern. It is not intended that CMP practices should restrict this aspect of each agency's existing TIA process.

It is recommended that the study area for CMP Highway System links be defined by a measure of significant impact on the roadway links. As a starting point, it is proposed that the measure be three percent of existing roadway capacity. Thus, when a traffic impact analysis is being done it would require the inclusion of CMP roadway links that are impacted by 3 percent or more of their LOS E capacity. If a TIA is required only for CMP purposes, the study area would end when traffic falls below three percent of capacity on individual roadway links. If the TIA is also required for other purposes, additional analysis can be required by the local jurisdiction based on engineering judgment or local regulation as applicable.

Background Traffic

In order for a reasonable assessment of the level of service on the CMP network, it is necessary to not only identify the proposed development impact, but also the other traffic which can be expected to occur during the development of the project. There are numerous methods of evaluating background traffic. The implications of these alternative methods are that certain methodologies may result in deficiencies, while other methodologies may find an acceptable operating conditions.

The cost to mitigate impacts of a land use decision is unrelated to background traffic. Rather, it is related to the cost of replacing the capacity which is consumed by the proposed development. However, it is necessary to understand background traffic in order to evaluate level-of-service. Background traffic is composed of existing traffic demands and growth from new development which will occur over a specific period of time. Both the existing and the growth elements of background traffic contain sub-elements. These include traffic which is generated within Orange County, that which begins and/or ends within the County, and interregional traffic which has neither end in Orange County. CMP legislation stipulates that interregional traffic will not be considered in CMP evaluations with respect to LOS compliance or determining costs of mitigation.

Given that the CMP process is new, there is no existing practice of separating interregional traffic from locally generated traffic. Until a procedure for identifying interregional traffic is developed, local jurisdictions may assume that all interregional traffic occurs on the freeway system. Initially TIA's required for CMP purposes need only analyze the impacts to arterial portions of the CMP Highway System.

Local governments in Orange County are generally consistent in their approach to background traffic. There are three major approaches used. The first is to use historical growth factors which are applied to existing traffic volumes to project future demands. The second is to aggregate the impacts of specific individual projects which have been approved or planned but not built to identify the total approved background traffic on the study area roadway system. A third method is to use computer modeling to identify total traffic demands which represent both background traffic and project impact traffic. For the present CMP program, it is recommended that the discretion for the appropriate process lie within the local jurisdiction, however, the method to be used in the jurisdiction should be clearly defined in the agency's TIA rules and procedures. In addition, it is recommended that all jurisdictions create a listing of approved development projects and a map showing their locations which would be updated frequently and be available to other jurisdictions on request. The listing should include information related to type and size of land use and phasing for each project.

It is appropriate to periodically update long range forecasts based on development approvals and anticipated development growth in the region and plan a transportation system which will provide the necessary level-of-service for this amount of development. When a development proposal will significantly alter this long-term plan, it will be necessary to address the aggregate of all approved development to assure that there is a long-term solution. However, from a TIA perspective, it is reasonable and practical to consider only that development traffic which can be expected to exist at the time of buildout of a new development proposal. That is to say, for CMP purposes background traffic should be limited to that traffic which is generated by development which will exist at the time of buildout of a proposed development. CEQA requirements may dictate that other background traffic scenarios be analyzed as well.

Capacity Analysis Methodology

Once the projected traffic demands are known, it is necessary to evaluate these demands relative to available and planned roadway capacity. The methodology used in capacity determination in Orange County is relatively uniform. Additionally, the level of service (LOS) component of the CMP Program has identified specific criteria which are to be used in determining level-of-service on the CMP Highway System.

Impact Costs/Mitigation

This element is at the heart of the CMP process; that is to identify the costs of mitigating a land development decision on the CMP System.

The current practice throughout Orange County is to require mitigation only when the level-of-service standard is exceeded. However, some jurisdictions require regular impact mitigation fees and phasing road improvements with development. The growth management requirement of the sales tax Measure M mandates a traffic phasing program. Often, mitigation is equated to construction of roadway improvements to maintain an acceptable level-of-service and/or to maintain the existing level-of-service. In some instances, a pay and go mitigation approach is allowed. This means that new development may pay its fair share and go forward and the provision of improvements remain the responsibility for the local jurisdiction.

In order to assess responsibility for impacts, there are a variety of approaches. One approach is to consider impact traffic as a percent of total traffic. Impact traffic may also be taken as a percentage of existing capacity. Another common approach is to use the net impact of development as a percent of total future traffic demand.

Since CMP legislation requires the identification of costs of land use decisions and impacts across jurisdictional lines, it is desirable that the CMP program have a consistent method for identifying the costs of development impacts. On the other hand, a wide variety of mitigations can occur from jurisdiction to jurisdiction.

It is recommended that the impact costs be calculated as the total of new development traffic on a roadway link requiring improvement divided by the capacity of the improvement times the cost of the improvement. This can be expressed in a formula as follows:

$$\textbf{Impact Cost} = \frac{\text{Development Traffic}}{\text{Capacity of Improvement}} \times \text{Improvement Cost}$$

Improvements to be included in the cost analysis should be those identified in the jurisdiction's adopted Circulation Element and any additional improvements identified in the development TIA. The total impact cost for a development would be the sum of costs for all significantly impacted links. Funds collected from these assessments could be aggregated and applied to specific projects on an annual basis in accordance with locally established priorities. If project impacts extend across jurisdictional boundaries the impact costs calculated for significantly impacted links in an adjacent jurisdiction should be allocated to that jurisdiction for use in its program of prioritized improvements.

Through this process, progress can be achieved in implementing system improvements without having to wait for 100% of the funds being collected for each individual improvement. In theory, all required improvements will be accomplished over time as new developments are approved which will generate traffic to utilize available and planned system capacity. The costs should be based on recent Unit cost experience in Orange County and may include planning, permitting, preliminary engineering, design, right-of-way, construction, landscaping, construction inspection, and, if applicable, financing costs.

There are two approaches to mitigation. One is traffic reduction and the other is to build improvements to accommodate the new traffic. Traffic reduction through transportation demand ordinances or other regulations which will reduce impacts can be calculated in the same way a development impact would be calculated. But in this case, it would be taken as a credit or a reduction in impact. Mitigation techniques such as TDM or phasing or reduction in project intensity merely reduce for a new development the amount of impact which must be mitigated and are changes which should occur prior to the calculation of project impact costs. A monitoring program should be established to confirm that anticipated reductions are realized.

To comply with the CMP process, a local jurisdiction should accomplish two things. First, it should demonstrate that it is analyzing and mitigating the impact of new development on the CMP Highway System. Second, it should maintain the level-of-service standards or adopt a deficiency plan Consistent with CMP legislation. In order to demonstrate the mitigation which has been undertaken, the local jurisdiction should maintain a record of the cumulative impact cost of all development approvals and the cumulative mitigation value of improvements provided by the local jurisdiction. These could be construction programs or credits from a TDM ordinance or other traffic reduction measures. It is then only necessary to show on an annual basis that the total improvement costs plus traffic reduction credits are equal to or greater than the total impact cost of new development approvals to prove mitigation compliance.

The maintenance of level-of-service would come through implementation of improvements contained in the 7-year capital improvements element, Measure M and state-funded improvements, additional improvements which may be made in conjunction with development approvals, and from deficiency plans which may be required from time to time. From a TIA perspective, it would be necessary to document the following:

a. the level-of-service on the CMP network at buildout of the proposed development will be: 1) level—of-service "E or better, or 2) will not result in a cumulative increase of more than 0.10 in v/c ratio if the established LOS standard is worse than LOS E.

b. a deficiency plan exists to address the links for which level-of-service is not provided, and

c. a deficiency plan will be developed for a new link when a deficiency will occur.

DOCUMENTATION OF RULES AND PROCEDURES

To assure a clear understanding of the TIA procedures which are necessary to support a viable CMP program, it is recommended that a set of rules and procedures be established by each local jurisdiction. Ideally, these rules and procedures would cover the requirements for the full TIA analysis and would include minimum requirements for the CMP process. Local jurisdictions which prefer not to adopt separate CMP TIA standards could implement standards for CMP requirements within a TIA and maintain their existing approach for all other aspects of their existing TIA process. The following is a summary of the elements which should be included in CMP procedures documentation and the methodologies applicable to each element:

1. **Thresholds for Requiring a TIA for CMP** - Projects with the potential to create an impact of more than 3% of LOS "E' capacity on CMP Highway system links should require a TIA. All projects generating 2,400 or more daily trips should require a TM for CMP evaluation. If a project will have direct access to a CMP link this threshold should be reduced to 1,600 or more daily trips. A TIA should not be required again if one has already been performed for the project as part of an earlier development approval which takes the impact on the CMP Highway System into account.

2. **Existing Conditions Evaluation** - Identify current level-of-service on CMP roadways and intersections where the proposed development traffic will contribute to 3 percent of the existing capacity. Use procedures defined in the level-of-service component for evaluation of level—of-service.

3. **Trip Generation** - ITE trip generation rates or studies from other agencies and locally approved studies for specific land uses.

4. **Internal Capture and Passerby Traffic** - Justification for internal capture should be

included in the discussion. Passerby traffic should be calculated based upon ITE data or approved special studies.

5. **Distribution and Assignment** - Basis for trip distribution should be discussed and should be linked to demographic or market data in the area. Quantitative and/or qualitative information can be used depending on the size of the proposed development. As the size of the project increases, there should be a tendency to use a detailed quantitative approach for trip distribution. Trip assignment should be based on existing and projected travel patterns and the future roadway network and its travel time characteristics.
6. **Radius of Impact/Project Influence** - The analysis should identify the traffic assignment on all CMP roadway links until the impact becomes less than 3 percent of level of service E capacity.
7. **Background Traffic** - Total traffic which is expected to occur at buildout of the proposed development should be identified.
8. **Impact Assessment Period** - This should be the buildout timeframe of the proposed development.
9. **Capacity Analysis Methodology**- The methodology should be consistent with that specified in the level-of—service component of the CMP Program.
10. **Improvement Costs** - The cost of roadway improvements should include all costs of implementation including studies, design, right-of-way, construction, construction inspection, and financing costs, if applicable.
11. **Impact Costs and Mitigation** - The project impact divided by the capacity of a roadway improvement times the cost of the improvement should be identified for each significantly impacted CMP link and summed for the study area.
12. **Projected Level-of-Service** - The TIA should document that the projected level-of-service on all CMP links in the study area will be at Level-of-Service "E" or the existing level-of-service whichever is less, or that a deficiency plan exists or will be developed to address specific links or intersections.

SECTION 5 – APPENDICES

Appendix A – Summary of TIA Update Survey Results (Available Upon Request)

Appendix B – Deviation of Thresholds for Projects Requiring TIA Analysis

APPENDIX B

DERIVATION OF THRESHOLDS FOR PROJECTS REQUIRING TRAFFIC IMPACT ANALYSIS

The TIA process recommendation is to require a TIA for any project generating 2,400 or more daily trips. This number is based on the desire to analyze any impacts which will be 3% or more of the existing capacity. Since most CMP Highway System will be four lanes or more, the capacity used to derive the threshold is a generalized capacity of 40,000 vehicles/day. The calculations are as follows:

40,000 veh./day x 3% = 1,200 veh./day

Assuming 50/50 distribution of project traffic on a CMP link

1,200 x 2 = 2,400 veh./day total generation

As can be seen, a project which will generate 2,400 trips/day will have an expected maximum link impact on the CMP system of 1,200 trips/day based on a reasonably balanced distribution of project traffic. On a peak-hour basis, the 3% level of impact would be 120 peak-hour trips. For intersections, a 3% level of impact applied to the sum of critical volume (1,700 veh./hr.) would be 51 vehicles per hour.

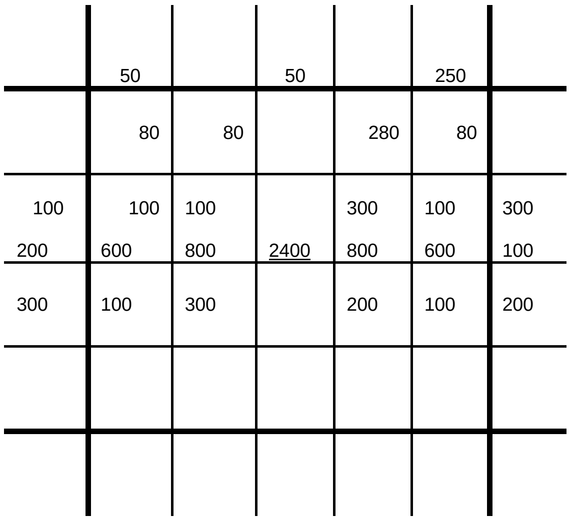
A level of impact below 3% is not recommended because it sets thresholds which are generally too sensitive for the planning and analytical tools available. Minor changes in project assumptions can significantly alter the results of the analysis and the end result can be additional unnecessary cost to the developer and additional review time by staff with little benefit. Additionally, a lower threshold of significance will expand the study area, which also increases effort and costs, and increases the probability that the analysis would extend beyond jurisdictional boundaries.

The following illustration shows that the 2,400 trip/day threshold would be expected to produce a 3% impact on the CMP System only when the project has relatively direct access to a CMP link. As a project location moves further off the CMP System the expected impacts is reduced. With a more directional distribution of project traffic a development with direct CMP System access cold produce a 3% impact with somewhat lower daily trip generation.

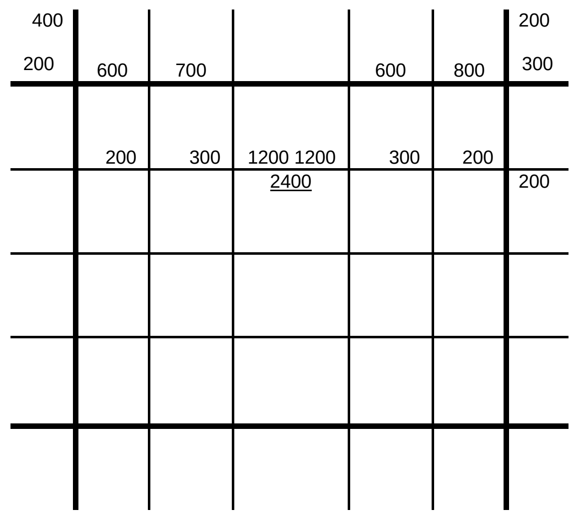
The table included on the following page illustrates the daily trip generation thresholds which would produce various levels of impact on the CMP System for project locations with and without direct access to the system. Based on a 3% impact the trip generation thresholds for requiring a TIA are 1,600 veh./day with direct CMP System access and 2,400 veh./day if a project does not have direct CMP System access.

CMP Highway System Impacts for Development Generating 2,400 trips/day

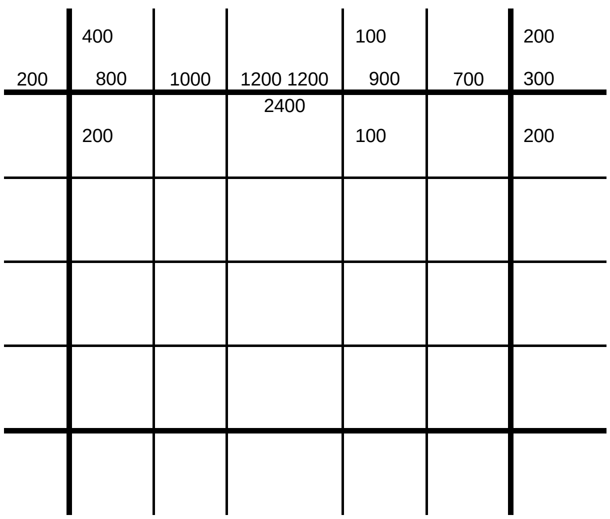
Based on proximity to CMP System



MAXIMUM IMPACT < 1%



MAXIMUM = 1.8%



MAXIMUM = 3%
COULD BE 4.5% WITH 75/25 SPLIT

Alternative Criteria

Assume 75/25 distribution

For direct access to CMP System:
1,200/.75 = 1,600 veh./day

For no direct CMP System Access:
Approximately 1/3 less impact on CMP System
1,600 x 3/2 = 2,400 veh./day

Significant Impact	Daily Trip Generation: Direct Access	Daily Trip Generation: No Direct Access
1%	500	800
2%	1,100	1,600
3%	1,600	2,400

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Appendix B-2: Traffic Impact Analysis Exempt Projects

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Appendix B-2: Traffic Impact Analysis Exempt Projects

Projects exempt from the requirements of a mandatory, CMP Traffic Impact Analysis are listed below. This list is not meant to be all-inclusive. Any inquiries regarding additional exemptions shall be transmitted in writing to the Orange County Transportation Authority, attention CMP Program Manager.

Project Not Requiring a CMP TIA Analysis:

1. Applicants for subsequent development permits (i.e., conditional use permits, subdivision maps, site plans, etc.) for entitlement specified in and granted in a development agreement entered into prior to July 10, 1989.[1]
2. Any development application generating vehicular trips below the Average Daily Trip (ADT) threshold for CMP Traffic Impact Analysis, specifically, any project generating less than 2,400 ADT total, or any project generating less than 1,600 ADT directly onto the CMPHS. [1, 2]
3. Final tract and parcel maps. [1, 2, 3]
4. Issuance of building permits. [1, 2, 3]
5. Issuance of certificates of use and occupancy. [1, 2, 3]
6. Minor modifications to approved developments where the location and intensity of project uses have been approved through previous and separate local government actions prior to January 1, 1992. [1, 2, 3]

---

[1] Vehicular trips generated by CMP TIA-exempt development applications shall not be factored out in any traffic analyses or levels of service calculations for the CMPHS.

[2] Exemption from conduction a CMP TIA shall not be considered an exemption from such projects' participation in approved, transportation fee programs established by the local jurisdiction.

[3] A CMP TIA is not required for these projects only in those instances where development approvals granting entitlement for the project sites were granted prior to the effective date of CMP TIA requirements (i.e., January 1992).

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Appendix C-1: CMP Deficiency Plan Flow Chart

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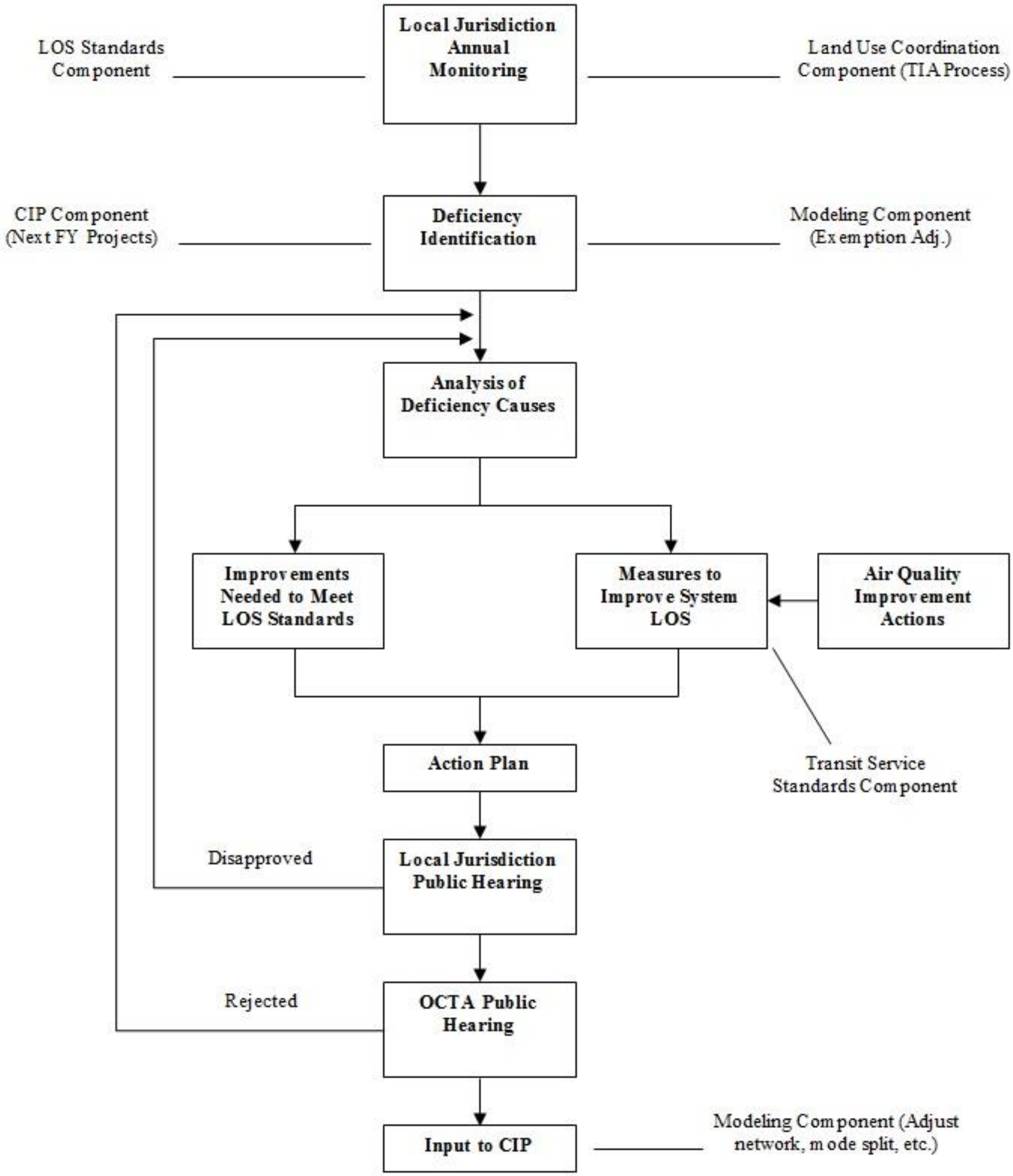
APPENDIX C-1: CMP Deficiency Plan Flow Chart



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Appendix C-2: Deficiency Plan Decision Flow Chart

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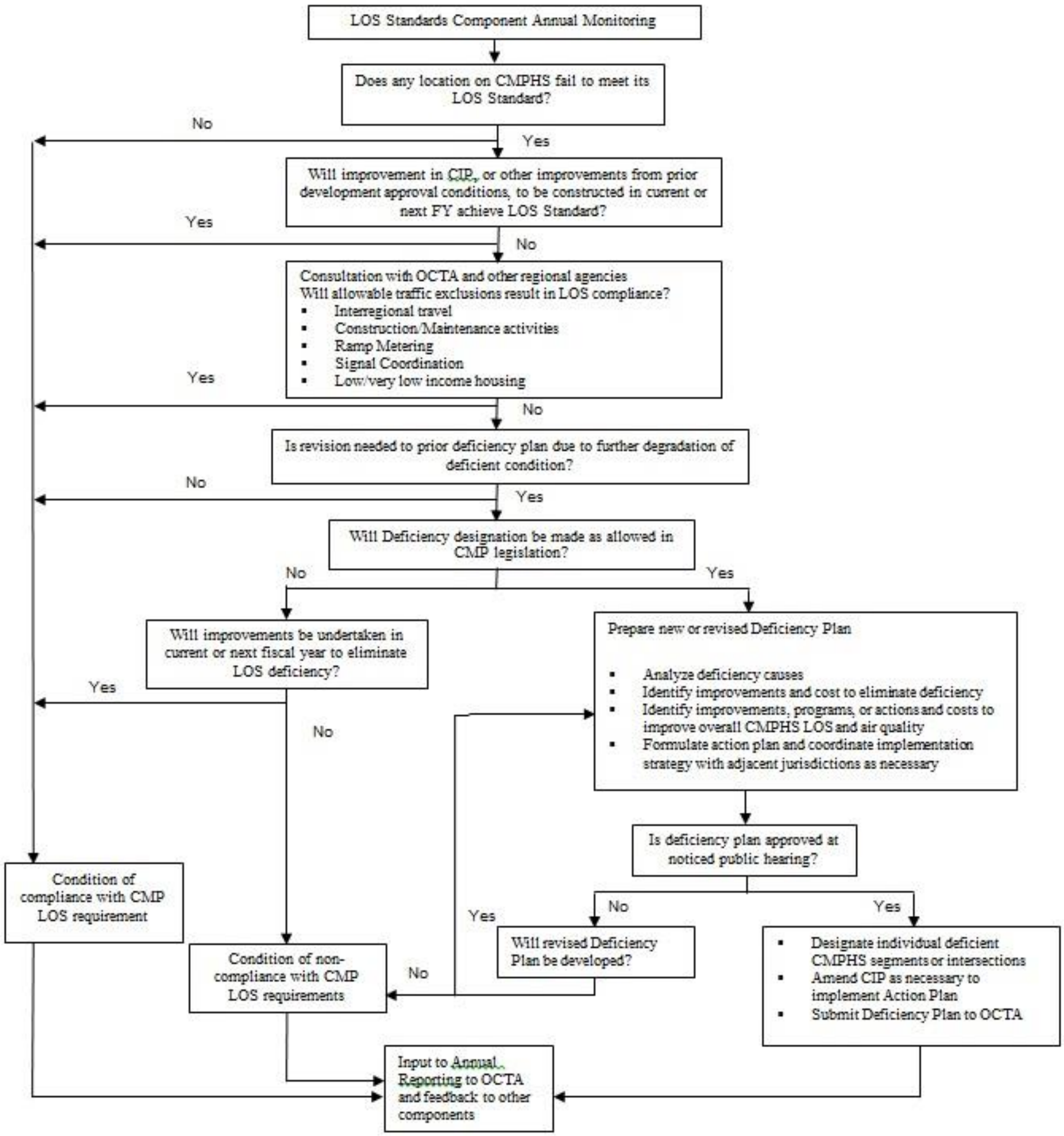
APPENDIX C-2: Deficiency Plan Decision Flow Chart



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Appendix D: CMP Monitoring Checklists

Jurisdiction:	Choose an item.

CMP Monitoring Checklist: Level of Service

CMP Checklist		YES	NO	N/A
1.	Check "Yes" if either of the following apply: • There are no CMP intersections in your jurisdiction. • Factoring out statutorily-exempt activities[1], all CMP intersections within your jurisdiction are operating at LOS E (or the baseline level, if worse than E) or better.	☐	☐	
NOTE: ONLY THOSE AGENCIES THAT CHECKED "NO" FOR QUESTION 1 NEED TO ANSWER THE REMAINING QUESTIONS.				
2.	If any, please list those intersections that are not operating at the CMP LOS standards. • ____________________ • ____________________ • ____________________			☐
3.	Will deficient intersections, if any, be improved by mitigation measures to be implemented in the next 18 months or improvements programmed in the first year of any recent funding program (i.e., local agency CIP, CMP CIP, Measure M CIP)?	☐	☐	☐
	a. If not, has a deficiency plan been developed for each intersection that will be operating below the CMP LOS standards?	☐	☐	☐

Additional Comments:

I certify that the information contained in this checklist is true.

______________	______________	______________	______________
Name (Print)	Title	Signature	Date

[1]The following activities are statutorily-exempt from deficiency determinations: interregional travel, traffic generated by the provision of low and very low income housing, construction rehabilitation or maintenance of facilities that impact the system, freeway ramp metering, traffic signal coordination by the state or multi-jurisdictional agencies, traffic generated by high-density residential development within 1/4 mile of a fixed-rail passenger station, traffic generated by mixed-use residential development within 1/4 mile of a fixed-rail passenger station.

Jurisdiction:	Choose an item.

	CMP Monitoring Checklist: Deficiency Plans			
	CMP Checklist	**YES**	**NO**	**N/A**
1.	Check "Yes" if either of the following apply: • There are no CMP intersections in your jurisdiction. • Factoring out statutorily-exempt activities[2], all CMPHS intersections within your jurisdiction are operating at LOS E (or the baseline level, if worse than E) or better.	☐	☐	
	NOTE: ONLY THOSE AGENCIES THAT CHECKED "NO" FOR QUESTION 1 NEED TO ANSWER THE REMAINING QUESTIONS.			
2.	If any, please list those intersections found to not meet the CMP LOS standards. • ______________________________ • ______________________________ • ______________________________			☐
3.	Are there improvements to bring these intersections to the CMP LOS standard scheduled for completion during the next 18 months or programmed in the first year of the CIP?	☐	☐	☐
	NOTE: ONLY THOSE AGENCIES THAT CHECKED "NO" FOR QUESTION 3 NEED TO ANSWER THE REMAINING QUESTIONS.			
4.	Has a deficiency plan or a schedule for preparing a deficiency plan been submitted to OCTA?	☐	☐	☐
5.	Does the deficiency plan fulfill the following statutory requirements:			
	a. Include an analysis of the causes of the deficiency?	☐	☐	☐
	b. Include a list of improvements necessary to maintain minimum LOS standards on the CMPHS and the estimated costs of the improvements?	☐	☐	☐
	c. Include a list of improvements, programs, or actions, and estimates of their costs, which will improve LOS on the CMPHS and improve air quality?	☐	☐	☐
	i. Do the improvements, programs, or actions meet the criteria established by SCAQMD (see the CMP Preparation Manual)?	☐	☐	☐

[2]The following activities are statutorily-exempt from deficiency determinations: interregional travel, traffic generated by the provision of low and very low income housing, construction rehabilitation or maintenance of facilities that impact the system, freeway ramp metering, traffic signal coordination by the state or multi-jurisdictional agencies, traffic generated by high-density residential development within 1/4 mile of a fixed-rail passenger station, traffic generated by mixed-use residential development within 1/4 mile of a fixed-rail passenger station.

Jurisdiction:	Choose an item.

CMP Monitoring Checklist: Deficiency Plans (cont.)

CMP Checklist		YES	NO	N/A
6.	Are the capital improvements identified in the deficiency plan programmed in your seven-year CMP CIP?	☐	☐	☐
7.	Does the deficiency plan include a monitoring program that will ensure its implementation?	☐	☐	☐
8.	Does the deficiency plan include a process to allow some level of development to proceed pending correction of the deficiency?	☐	☐	☐
9.	Has necessary inter-jurisdictional coordination occurred?	☐	☐	☐
10.	Please describe any innovative programs, if any, included in the deficiency plan:			☐

Additional Comments:

I certify that the information contained in this checklist is true.

Name (Print)	Title	Signature	Date

OCTA

Jurisdiction:	Choose an item.

CMP Monitoring Checklist: Land Use Coordination

	CMP Checklist	YES	NO	N/A
1.	Have you maintained the CMP traffic impact analysis (TIA) process you selected for the previous CMP?	☐	☐	
	a. If not, have you submitted the revised TIA approach and methodology to OCTA for review and approval?	☐	☐	☐
2.	Did any development projects require a CMP TIA during this CMP cycle?[3]	☐	☐	
	NOTE: ONLY THOSE AGENCIES THAT CHECKED "YES" FOR QUESTION 2 NEED TO ANSWER THE REMAINING QUESTIONS.			
3.	If so, how many?		____________	
4.	Please list any CMPHS links & intersections that were projected to not meet the CMP LOS standards (indicate whether any are outside of your jurisdiction). • ______________________________ • ______________________________ • ______________________________			☐
	a. Were mitigation measures and costs identified for each and included in your seven-year CIP?	☐	☐	☐
	b. If any impacted links & intersections were outside your jurisdiction, did your agency coordinate with other jurisdictions to develop a mitigation strategy?	☐	☐	☐
5.	If a local traffic model was/will be used, did you follow the data and modeling consistency requirements as described in the CMP Preparation Manual (available online at http://www.octa.net/pdf/cmpprepmanual.pdf)?	☐	☐	☐

Additional Comments:

I certify that the information contained in this checklist is true.

Name (Print)	Title	Signature	Date
______________	______________	______________	________

[3]Exemptions include: any development generating less than 2,400 daily trips, any development generating less than 1,600 daily trips (if it directly accesses a CMP highway), final tract and parcel maps, issuance of building permits, issuance of certificate of use and occupancy, and minor modifications to approved developments where the location and intensity of project uses have been approved through previous and separate local government actions prior to January 1, 1992.

Jurisdiction:	Choose an item.

CMP Monitoring Checklist: Capital Improvement Program

CMP Checklist		YES	NO	N/A
1.	Did you submit a seven-year Capital Improvement Program (CIP) to OCTA by June 30?	☐	☐	☐
2.	Does the CIP include projects to maintain or improve the performance of the CMPHS (including capacity expansion, safety, maintenance, and rehabilitation)?	☐	☐	☐
3.	Is it consistent with air quality mitigation measures for transportation- related vehicle emissions?	☐	☐	☐
4.	Was the Web Smart CIP provided by the OCTA used to prepare the CMP CIP?	☐	☐	☐

Additional Comments:

I certify that the information contained in this checklist is true.

Name (Print)	Title	Signature	Date

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Appendix E: Capital Improvement Programs

Available online at:

http://www.octa.net/Plans-and-Programs/Congestion-Management-Program/Overview/

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Appendix F: Measure M Program of Projects

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FREEWAY IMPROVEMENT PROGRAM

Interstate 5 (I-5) Projects

- A **I-5** (SR-55 to SR-57)
- B **I-5** (El Toro "Y" Area to SR-55)
- C **I-5** (SR-73 to El Toro Road)
- C **I-5** (Avenida Pico to San Juan Creek Road)
- D **I-5** / Highway Interchanges

State Route 22 (SR-22) Projects

- E **SR-22** Access Improvements

State Route 55 (SR-55) Projects

- F **SR-55** (I-405 to I-5)
- F **SR-55** (I-5 to SR-91)

State Route 57 (SR-57) Projects

- G **SR-57** NB (Orangewood Avenue to Katella Avenue)
- G **SR-57** NB (Katella Avenue to Lincoln Avenue)
- G **SR-57** NB (Orangethorpe Avenue to Lambert Road)
- G **SR-57** NB (Lambert Road to Tonner Canyon Road)

State Route 91 (SR-91) Projects

- H **SR-91** WB (I-5 to SR-57)
- I **SR-91** (SR-57 to SR-55)
- J **SR-91** (SR-55 to Riverside County Line)

Interstate 405 (I-405) Projects

- K **I-405** (Euclid Street to I-605)
- L **I-405** (SR-55 to El Toro "Y" Area

Interstate 605 (I-605) Projects

- M **I-605** / Katella Interchange Improvements

Freeway Mitigation Restoration Projects
(Part of Projects A-M)

Freeway Mitigation Acquisition Projects
(Part of Projects A-M)

STREETS & ROADS

- O **Grade Separation Program** (shown)
- **Signal Synchronization Project Corridors**

TRANSIT PROJECTS

- R **Grade Separation and Station Improvement Projects**
- S **Transit Extensions to Metrolink**
- T **Metrolink Station Conversion to accept Future High-Speed Rail Systems**

M2 PROJECTS NOT SHOWN

Project N: Freeway Service Patrol

Project O: Streets & Roads - Regional Capacity Program

Project Q: Local Fair Share Program

Project R: Grade crossing and Trail Safety Enhancements

Metrolink Service Expansion Program

Project U: Senior Mobility Program (SMP), Senior Non-emergency Medical Transportation Program (SNEMT), and Fare Stabilization Programs

Project V: Community Based Transit/Circulators

Project W: Safe Transit Stops

Project X: Environmental Cleanup Program

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Appendix G: Orange County Subarea Modeling Guidelines

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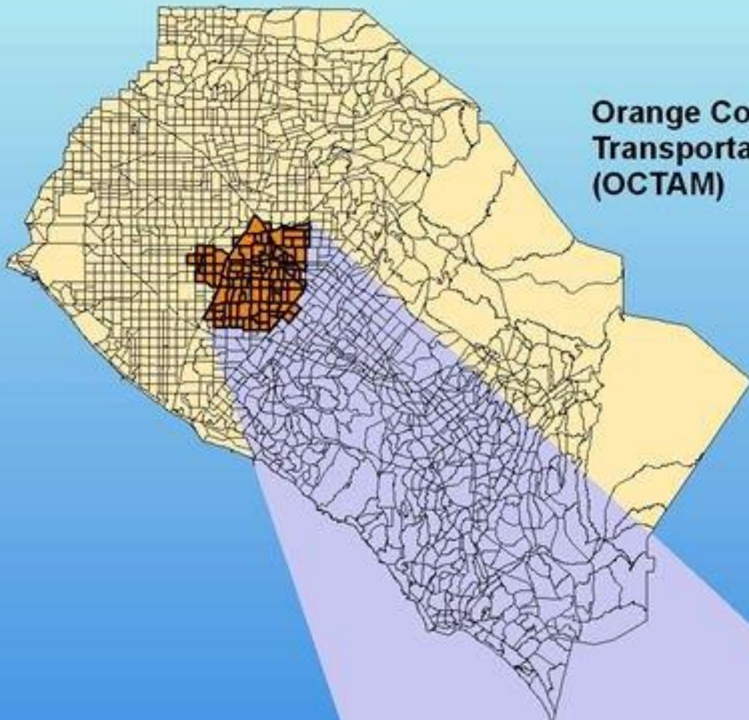

ORANGE COUNTY SUBAREA MODELING GUIDELINES MANUAL

OCTA

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1. INTRODUCTION

1.1 Purpose

The primary purpose of the Subarea Modeling Guidelines Manual is to promote consistency in transportation modeling within Orange County. The goal of the manual is to ensure consistency between local subarea models in Orange County and the Orange County Transportation Analysis Model (OCTAM), as well as with the Southern California Association of Governments' (SCAG) regional model.

The manual is also prompted by requirements of state and federal legislation including the Congestion Management Program (CMP), the Fixing America's Surface Transportation Act (FAST Act) which is the most current surface transportation act signed into law on December 4, 2015, and both state and federal Clean Air Acts. The CMP requires consistency in databases and modeling, while the FAST Act and Clean Air Acts require improved analytical capabilities to evaluate and monitor transportation improvements, policies, plans, and programs.

This manual will be periodically updated with improved modeling procedures and updated databases. A secondary goal of this manual is to work towards a single set of consistent models to be used by all modeling agencies in Orange County.

Notes:

1. All references to "OCTAM" are to the current version unless stated otherwise. At the time of writing the current version is OCTAM 4.0.
2. OCP (Orange County Projections) data is generally updated every four years.
   - **OCP-2004** was adopted by the Orange County Council of Governments (OCCOG) on February 26, 2004 and by the Orange County Board of Supervisors on May 11, 2004.
   - **OCP-2006** was approved and adopted by the OCCOG on November 20, 2006.
   - **OCP-2010 Modified** was approved and adopted by the OCCOG on January 26, 2012.
   - **OCP-2014 Modified** was approved and adopted by the OCCOG on June 23, 2016.

1.2 Background

Transportation modeling in Southern California began in the early sixties by the California Department of Transportation (Caltrans), formerly the Division of Highways. Caltrans provided modeling support services to other agencies within the region, including SCAG, for future transportation and air quality planning. In the early eighties, SCAG, the designated Metropolitan Planning Organization, began its own modeling group and assumed responsibility for regional transportation modeling.

In the late seventies, the Orange County Transportation Commission[1], County of Orange Environmental Management Agency[2], and Caltrans jointly developed a sub-regional transportation model for the Orange County Multi-Modal Transportation Study (MMTS). The MMTS model was an extraction of the Caltrans regional model, supplemented with a higher level of detail in Orange County. The model was used to develop the first comprehensive transportation blueprint for Orange County.

These early transportation models were based on the Urban Transportation Planning System (UTPS) computer programs developed by the Urban Mass Transportation Administration (UMTA)[3]. The UTPS computer programs were specifically written for processing on IBM mainframe computers. The costs for processing on an IBM mainframe system were expensive, hence, only larger agencies had sufficient resources to use transportation models in their planning activities.

The advent of personal computers and availability of several transportation modeling software packages has provided the opportunity for smaller government agencies, as well as the private sector to develop their own transportation models. The proliferation of transportation models in Orange County has raised the need to establish modeling guidelines to promote consistency in traffic forecasts.

1.3 Current Modeling Practice in Orange County

There are two levels of transportation modeling in Orange County: regional and subarea. The Orange County Transportation Authority (OCTA) is responsible for regional transportation modeling in Orange County. This responsibility was transferred from the County of Orange to OCTA in May 1995. OCTA's role as the regional modeling agency is to evaluate multi-modal transportation alternatives to support regional planning activities in Orange County. Some major transportation programs, either directly or indirectly, supported by OCTAM include: the Orange County Master Plan of Arterial Highways (MPAH), the Orange County Long-Range Transportation Plan, urban rail and corridor planning studies, input to SCAG's Regional Transportation Plan, State Transportation Improvement Program, State Implementation Plan, as well as transportation funding programs involving local (Measure M), state, and federal funds.

At the local level, some cities in Orange County have developed traffic models to analyze the land use and transportation components of their general plans, as well as development proposals, funding programs, and environmental documentation. City models typically contain detailed information to reflect local transportation conditions, and rely on OCTAM to provide regional travel patterns. OCTA provides local agencies

[1] Consolidated into the Orange County Transportation Authority in 1991.
[2] Now defunct, through major reorganization by the County of Orange.
[3] Reorganized to the Federal Transit Administration.

with regional modeling data and assists cities in evaluating proposed transit alternatives through cooperative project agreements.

Development of a subarea model is not required for all local projects. As local jurisdictions consider the development of a subarea model, they are encouraged to coordinate closely with OCTA regional modeling staff to ensure development of a subarea model is necessary. Significant resources are required to develop and maintain a subarea model and while OCTAM may not be appropriate for evaluation of local land use scenarios or impacts to minor local facilities, OCTAM can be applied to a wide variety of local projects including MPAH amendments, corridor studies, circulation elements, general plan amendments, arterial system gap closures, etc.

Subarea models throughout Orange County to date have not included mode choice or transit components. Projects that require evaluation of transit alternatives should be conducted through OCTAM application. As subarea models are improved and developed in greater detail, mode choice and transit components may be integrated into subarea models. While these subarea models may be able to forecast localized transit activity, regional transit implications may not be accurately captured in subarea models and as a result, any transit evaluation that impacts regional transit activity should be coordinated closely with OCTA regional modeling staff. Close coordination with OCTA is necessary as OCTA competitive funding programs may have specific requirements for the development of transit forecasts.

1.3.1 OCTAM Regional Model Overview

OCTAM is a regional model that is based on the traditional four-step sequential modeling methodology with “feedback loops” procedures. The model incorporates multi-modal analytical capabilities to analyze the following modes of travel: local and express bus transit, urban rail, commuter rail, toll roads, carpools, truck traffic, as well as non-motorized transportation which includes pedestrian and bicycle trips. The model responds to changes in land use types, household characteristics, transportation infrastructure, and travel costs such as transit fares, parking costs, tolls, and auto operating costs. OCTAM is a state-of-the-practice travel demand forecasting model designed to address transportation issues mandated by state and federal legislation.

OCTAM is currently based on the TransCAD software and the current validation report is available upon request.

Senate Bill (SB) 375

California passed Senate Bill 375 in 2008 in reaction to the passage of the Global Warming Solutions Act (Assembly Bill 32) in 2006 which was a landmark climate change legislation. SB 375 calls on the state’s urban regions to develop plans for more efficient land use and development, in order to reduce the greenhouse gases that contribute to global warming. SB 375 relies on Metropolitan Planning Organizations (MPOs) for implementation. MPOs must develop Sustainable Community Strategies

(SCSs) to achieve quantifiable targets, set by the state, for reducing greenhouse gas emissions through more efficient development and better coordination. SB 375 recognizes the regional 'blueprint' planning innovation developed by MPOs during the past decade to produce collaborative regional/local plans that achieve preferred scenarios for future regional development.

The Southern California Association of Governments (SCAG), acting as the MPO, provided subregions with the option of developing subregional SCSs as required under SB 375. Ultimately, local governments have jurisdiction over land use and development, and as such, SB 375 does not require that local governments comply with the SCSs nor does it redirect or create new funding sources to support sustainable planning practices or projects. While local governments are not required under law to comply with SB 375, compliance is considered to be smart planning practice and as such, subarea models may consider integration of components that address SB 375.

SB 375 compliance can be achieved through smart growth principles aimed at reducing dependency on auto travel. Recently, 3D or 4D components have been incorporated into transportation models in an attempt to address smart growth principles outlined in SB 375. The principles associated with the four D's – density of development, diversity of development, design of development and destination accessibility of development – are smart growth characteristics that influence mobility and travel impacts. These components have generally been incorporated into models through application of modules that integrate 4D elasticities.

Assembly Bill (AB) 1358

The Complete Streets Act (AB 1358) was signed into law in September 2008 and was introduced to ensure that the transportation plans of California communities meet the needs of all users of the roadway including pedestrians, bicyclists, users of public transit motorists, children, the elderly, and the disabled. This legislation requires that all modes of transportation be given equal consideration when Caltrans or any other government body in California spends funds on a road project. The objective of AB 1358 is to make roads safer for all travelers. Complete streets strategies identified in AB 1358 offer communities a tool to meet the standards set in AB 32, enacted in 2006, which requires the reduction of greenhouse gas emissions. OCTAM currently does not consider specific strategies associated with complete streets evaluation and willing to consider local strategies for incorporation into subarea models. Any treatments to accommodate complete streets should be documented clearly.

State Bill (SB) 743

On September 27, 2013, California Governor Jerry Brown signed SB 743 into law that identified a number of changes to transportation impact analysis as part of CEQA compliance. These changes will include elimination of auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts in many parts of California (if not statewide). New metrics that focus on vehicle-miles traveled (VMT) would be used for transportation impact analysis developed by the Office of Planning and Research. According to the legislative intent contained in SB 743, these changes to current practice were necessary to more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.

1.3.2 Subarea Model Overview

The cities' subarea models in Orange County are generally categorized as land use based traffic models designed to evaluate their general plan land use and traffic circulation system. These subarea models are typically based on a three-step sequential modeling methodology, which include trip generation, distribution and assignment. The sequential structure of these models is similar in concept to the regional model, with the exception of a mode choice model. Hence, the model estimates vehicle trips directly and does not address transit trips. These models focus on peak-hour link and intersection turn volumes, as well as average daily traffic (ADT).

1.3.3 Regional - Subarea Model Comparison

Table 1-1 compares and contrasts the salient features between the regional and subarea model structure. The principle differences between these models are highly attributable to application differences between socioeconomic data versus land use data, and mode choice issues. These differences are discussed further in **Section 1.4, Model Consistency Issues**.

Table 1-1 Salient Features Between Regional and Local Subarea Models

CATEGORY	OCTAM REGIONAL MODEL	LOCAL SUBAREA MODELS
Model Input Data	1. Socioeconomic data: population, workers, income, housing unit type, household size, school enrollment, university/college enrollment, retail, service and total employment. 2. Highway Networks: stratified into drive alone, 2-person carpool, 3 or more person carpool, and toll roads. 3. Transit Networks: local & express bus, urban & commuter rail, with walk & auto access.	1. Land uses by various categories converted to socioeconomic data. 2. Highway Network: most subarea models use a single purpose mixed-flow network.
Trip Generation	Regression/cross-classification with 14 trip purposes, of which one is work-at-home. The other 13 are split into peak and off-peak, with an auto ownership model to address accessibility using income, household size, and total employment accessible by transit.	Land use trip rates by land use categories or socioeconomic based trip rates by socioeconomic variable. Some recently developed models use a form of linear regression.
Trip Distribution	1. Gravity model – Home-based work based on composite impedance using estimated travel times, costs, and modal characteristics (logsum from trip distribution mode choice), all other trip purposes use estimated travel time. 2. The 13 trip purposes from trip generation are separated into peak and off-peak time periods and combined to 10 basic peak and off-peak trip purposes by consolidating the Home-based work sub-categories. 3. Each trip purpose is then distributed on their respective time period network, resulting in a total of 20 different trip distribution models.	1. Gravity model based on travel time. 2. Typically, three trip purposes. 3. Home-based work distributed on peak network, all others on off-peak network. Typical models rely on the OCTAM trip distribution patterns. Growth factors are applied through a FRATAR process to reflect changes in land use.
Mode Choice	Nested logit model with the following modes: Drive alone; 2-person carpool; 3-or-more person carpool; toll roads, local & express bus, urban rail; commuter rail; transit with park-and-ride, kiss-and-ride, and walk access.	No mode choice.
Trip Assignment	Four time periods: AM, Midday, PM, and Night. Combined for Average Daily Traffic and factored for peak-hour.	Recent models have incorporated the same time periods as OCTAM.
Post-Processing	Forecast Volumes: Future forecast arterial volumes are post-processed at the daily level based on NCHRP 255 procedures pivoting off of existing count volumes. Intersection peak hour turn movement volumes follow a similar procedure Active transportation and land use models	Forecast Volumes: Daily arterial and intersection turn movement volumes generally follow similar procedures as OCTAM although there are varied applications. No active transportation or land use components currently incorporated into local models

1.4 Model Consistency Issues

The purpose of this section is to inform those not intimately familiar with regional and subarea modeling issues, on the underlying assumptions of these models so they can better understand how to evaluate results that these models produce. The intent of this section is to educate and not critique these models.

This section will address two basic modeling consistency issues: 1) socioeconomic data versus land use data, and 2) modeling methodology. Section 1.4.1, Socioeconomic Versus Land Use Data Issues, discusses the differences between socioeconomic and land use forecasts and how they can be modeled to satisfy their respective objectives. Section 1.4.2, Modeling Methodology Issues, describes the four-step sequential modeling process and identifies issues involved with each step of the process. Resolution of these issues is addressed in Section 3, Subarea Modeling Methodology.

1.4.1 Socioeconomic Versus Land Use Data Issues

Regional transportation models, such as the OCTAM and the SCAG model, use socioeconomic data to estimate trip generation, mode choice, as well as several sub-models to address complex travel behavior and multi-modal transportation issues. Local traffic models use city/county general plans and development plans, which are generally described in terms of land use data, to estimate trip generation. There are some fundamental differences in objectives on how socioeconomic and land use data are applied in their respective models.

Socioeconomic Data

Socioeconomic data projections are based on a market based approach, which links international, national, and state economic and demographic trends to regional growth at the county level. In Orange County, sub-county level data is developed by the Center for Demographic Research (CDR) at California State University, Fullerton, in coordination with cities' and county's general plans, as well as major land developers.

The CDR develops and maintains the Orange County Projections (OCP) for population, housing, and employment data at the lowest level geography, in a Geographic Information System (GIS), such that it can readily be aggregated to the OCTAM traffic analysis zones (TAZ). In addition to the three basic socioeconomic variables, the CDR develops additional modeling variables used in OCTAM. A complete list of the OCTAM modeling variables is included in **Appendix A**.

Land Use Data

The land use projections used in Orange County cities' traffic models are based on general plan land use data. Cities are required by state planning laws and regulations to assess the impact of their general plan land uses on the traffic circulation system. The land use designations are often influenced by policy decisions and may not be closely correlated with socioeconomic trends, especially across political jurisdictions. Actual land development, however, is driven by market forces that may or may not coincide with general plan land use designations, and often result in general plan amendments to accommodate these market demands.

In many jurisdictions, land use data often over states employment projections and intensity of use. A *Manual of Transportation-Air Quality Modeling for Metropolitan Planning Organizations* (Deakin/Harvey/Skabardonis, 1993) identified that it is not unusual for employment forecasts aggregated from local plans to total several times the growth estimates for the region. In addition, the *Travel Forecasting Guidelines* (JHK and Associates, 1992) indicated that there is a greater level of uncertainty with land use based models since not all non-residential building floor space is occupied and occupancy densities can vary widely within an area.

Bridging the Socioeconomic and Land Use Issue

While development of OCP is coordinated with cities'/county's general plans, it also contains major land use development plans, which may not yet be included in general plans. Additionally, because of the dynamics of changing land uses and land use plans, the most current information may not be reflected in OCP, which is updated approximately once every four years. Furthermore, build out of general plans typically occurs beyond the 25-year OCP projections.

The above issues suggest that it would be difficult, if not impractical from a model implementation perspective, to maintain the exact same database between OCP and city/county land use data. These issues should be dealt with on a project by project basis with the affected jurisdictions. For purposes of the modeling guidelines manual, the focus will be on developing a process/procedure where given the same socioeconomic and land use data input assumptions, the regional and subarea models would produce reasonably similar results.

Before socioeconomic and land use data can be compared, the land use data must first be converted to equivalent housing units and employment estimates. The housing units must be converted to occupied dwelling units and non-residential land uses must be converted to total employment. Dwelling unit vacancy rates applied in OCP are shown in **Appendix B**. Typical employment conversion factors are shown in **Appendix C**, with ranges of values to reflect variation in occupancy rates and land use categories. The employment conversion rates are the results of work efforts by Austin-Foust Associates and Urban Crossroads, in coordination with OCTA.

1.4.2 Modeling Methodology Issues

The modeling consistency issues are addressed below for each step of the modeling process, i.e., trip generation, trip distribution, mode choice (if applicable), and trip assignment. Some issues are related to differences in planning requirements and the degree of technical sophistication in the modeling methodology.

Trip Generation

Regional Model: The OCTAM trip generation model is composed of two sub-models: a trip production model and a trip attraction model. The trip production model is a cross-classification model that was developed using a Multiple Classification Analysis technique.. The model is sensitive to household variables such as population, number of workers, median household income, household size, housing unit type, school enrollment and university/college enrollment. The model also includes an auto ownership accessibility variable to reflect how congestion and the transportation system affect trip generation. The model has the following ten basic trip purposes:

- Home-based work-direct (HBW-D)
- Home-based work-strategic (HBW-S)
- Home-based elementary and high school (HBSch)
- Home-based college and university (HBUniv)
- Home-based shop (HBS)
- Home-based other (HBO)
- Home-based social-recreational (HBSR)
- Non-home-based work (NHBW)
- Non-home-based other (NHBO)
- Home-based work at home

The home-based work (direct and strategic) trips are further separated into low, medium, and high-income categories. All trip purposes are then segmented into peak and off-peak time periods, with the exception of home-based work-at-home trips, which are excluded from further processing in the model. Prior to trip distribution, the direct and strategic home-based work trip purposes are combined into their respective income categories. The resulting twenty (20) trip purposes are then processed through the trip distribution models.

The trip attraction model uses multi-variable linear regression equations to estimate relative trip attractions for each OCTAM TAZ. Depending upon trip purpose, the variables include retail, service, and total employment, as well as population, single and multi-family dwelling units. The composite OCTAM trip generation methodology incorporates advanced state-of-the-practice techniques that respond to modeling issues raised by federal reviewing agencies and environmental special interest groups, such as trip inducement, accessibility, and non-motorized trips.

Subarea Model: Trip generation models developed by the cities convert their land use data to socioeconomic data and apply trip rates derived from relationships extrapolated from the regional model. Older trip generation models used by some cities in Orange County estimate trip generation by applying a separate trip rate factor to each land use category. The factors are typically taken from the Institute of Transportation Engineers (ITE) Trip Generation Manual or other relevant special traffic generation studies. Trip rates and land use categories incorporated into city models vary from city to city.

Issues: The two different approaches in trip generation could yield different results, due largely to the fundamental differences between the way in which regional socioeconomic data and city land use data are derived, and how they are applied in the different models. In large part, this issue has been addressed by converting land use data to socioeconomic data and applying appropriate trip rates. This approach has resulted in producing similar trip generation estimates between regional and subarea models, given the same input data assumptions.

Trip Attraction Balancing

Regional Model: The OCTAM trip generation model estimates trip productions and trip attractions independently of one another. Because they are calculated independently, it is unlikely that the total trip productions would match exactly with the total trip attractions. However, theoretically and mathematically, trip productions and trip attractions must be equal. As part of the OCTAM trip generation process, trip "balancing" is performed to insure that trip productions and trip attractions are equal. OCTAM balances trip attractions to match trip productions for all trip purposes.

Subarea Model: Trip generation estimated by local subarea models, typically assumes full "absorption" of the planned land use data. In order to accommodate the full intensity of planned land use data within the focus modeling area, trips are balanced outside the focus study area.

Issues: The balance between OCTAM productions and attractions is highly influenced by the employment to housing ratio of the input socioeconomic data. An imbalance between productions and attractions may vary by trip purpose and this may result in a defacto reduction in trip rates or employment if employment growth projections cannot be fully absorbed based on estimated trip productions and attractions. If attractions are reduced to match trip productions

Trip Distribution

Regional Model: The OCTAM trip distribution model is based on the gravity model concept and consists of ten (10) trip purposes, where each trip purpose is divided into peak and off-peak components, resulting in twenty (20) different trip distribution models. The travel impedance in the OCTAM gravity model is based on travel time for all trip purposes except for the HBW trips. All HBW trips use composite impedance, where level of service for all travel modes are considered in the impedance function. The "logsum" from the mode choice model is used to develop the composite impedance, which provides an internally consistent relationship between the distribution and mode choice models.

Subarea Model: Most local subarea trip distribution models in Orange County are based on three trip purposes and apply the gravity model concept, using travel times for impedance. Typically, in these models, the home-based work trip purpose is distributed under peak-period traffic conditions and other trip purposes are distributed under off-peak traffic conditions. Trip distribution varies considerably between cities' models. In general, calibration of these models has taken a heuristic approach whereby travel time factors (friction factors) are adjusted to balance trip generation and trip assignment screenline results.

However, subarea models developed recently have followed the methodology in this guidelines manual, where OCTAM zonal trip tables are adjusted based on zonal changes in trip generation produced by the city's model.

Issues: OCTAM recognizes that for each trip purpose some of the trips occur during the peak-period and some during the off-peak period. For example, according to the SCAG 1991 Origin and Destination Survey, approximately 75 percent the home-based work trips occur during the peak period and 25 percent during the off-peak period. A significant number of non-work trips also occur during the peak-period. These differences in assumptions, along with different trip purposes, different zone structure, and different zonal impedance factors, could contribute towards significantly different trip tables between OCTAM and the subarea models.

Subarea models developed under the guidelines manual addresses this issue by maintaining the trip distribution patterns of the parent OCTAM model.

Mode Choice

Regional Model: OCTAM incorporates ten (10) mode choice models which includes a peak and off-peak model for each of the following five (5) trip purposes: home-based work, home-based school, home-based other, non-home-based work, and non-home-based other. These models are sensitive to changes in transit level of service, HOV facilities, auto ownership, and travel costs such as tolls, transit fare, parking costs, price of fuel, etc. **Table 1-2** shows all of the modes included in the mode choice model.

Table 1-2 OCTAM Modes of Travel

Transit Modes	***Auto Modes***
1. Auto Access – Express Bus	1. Non-Toll - Drive Alone
2. Auto Access – Urban Rail	2. Tolls – Drive Alone
3. Auto Access – Commuter Rail	3. Non-Toll - 2-Person Carpool
4. Auto Access – Local Bus	4. Tolls – 2-Person Carpool
5. Walk Access – Express Bus	5. Non-Toll - 3 or more Person Carpool
6. Walk Access – Urban Rail	6. Tolls – 3 or More Person Carpool
7. Walk Access – Commuter Rail	7. Auto Passenger
8. Walk Access – Local Bus	
9. Non-Motorized	

Mode choice produces separate trips for vehicle trips that use toll roads and vehicle trips that avoid paying tolls. However, the default configuration for OCTAM traffic assignment is to not use the toll trips from mode choice. Vehicle trips using toll roads are determined in traffic assignment using a generalized cost function.

Subarea Model: Local traffic models estimate vehicle trips directly through their land use trip generation process. Chapter 3 proposes options on how various modes estimated by OCTAM (except transit) can be summarized for application in subarea models. Chapter 3 also proposes options on how transit forecast can be obtained for cities interested in analyzing transit.

Issues: Transit modeling issues generally extend far beyond the jurisdictional boundaries of a city and, as such, are more appropriately analyzed from a regional perspective. The complexities and dynamics of changes in transit level of service require frequent maintenance of the transit network. Adding mode choice modeling capabilities to a subarea model would significantly increase the complexity of the model and various model consistency issues must be addressed to maintain consistency.

Trip Assignment

Regional Model: OCTAM uses an iterative equilibrium assignment methodology that simultaneously assigns single occupant vehicles, 2-person carpool, and 3 or more person carpool trips on the highway and toll network (using a generalized cost function). Vehicle trips are assigned separately to four (4) different time period networks: AM-Peak Period (6:00 a.m. to 9:00 a.m.), PM-Peak Period (3:00 p.m. to 7:00 p.m.), Mid-day Period (9:00 a.m. to 3:00 p.m.), and Night Period (7:00 p.m. to 6:00 a.m.). The purpose of this approach is to accurately reflect the different levels of congestion during the day for air quality analysis and to better measure system performance between alternatives; such as, vehicle emissions, vehicle miles traveled (VMT), average speed, and congestion delays. This approach also provides the framework for peak-hour and peak-spreading analyses.

OCTAM transit trips are assigned to two different networks, AM-Peak and Mid-day. The peak period trips are assigned to the AM transit network and the off-peak period trips are assigned to the Mid-day network. Future transit trip assignment may include assigning transit trips to four (4) time period networks.

OCTAM incorporates speed feedback allowing travel times resulting from traffic assignment to be fed back to trip distribution. The model is then run iteratively until speeds input to trip distribution are reasonably consistent with speeds resulting from traffic assignment.

Subarea Model: Local subarea models are generally structured for AM and PM peak-hour and ADT analyses. The models focus on roadway and intersection capacity analyses, which are ultimately used to identify deficiencies in the roadway system and the required mitigation. Some of the more recent subarea models have toll diversion and HOV capabilities but differ on how they are applied. Historical subarea models often incorporated an incremental capacity restraint assignment methodology although recent models incorporate an equilibrium assignment. Trip assignment methodologies vary considerably between cities' models. This wide variation is typically a reflection of when the model was developed and by whom.

Issues: Differences in toll road and HOV methodology between OCTAM and subarea models could result in different forecasts. Trips are assigned to the highway network, with options to use the toll roads or non-toll facilities (using a generalized cost function). Subarea models use one of two different divergence methodologies: 1) toll costs are directly incorporated into each toll link, 2) a cost utility function is used to estimate proportional shares between a toll and non-toll path.

The OCTAM mode choice model directly estimates HOV trips. Some subarea models use a factoring approach to estimate HOV trips. These differences in methodology could produce different results. Differences in assignment methodology could also result in differences in traffic forecasts. OCTAM uses an iterative equilibrium methodology and, as noted, some subarea models use an iterative incremental methodology.

2. MODEL INPUT DATA CONSISTENCY CRITERIA

This chapter prescribes the model input data consistency requirements for traffic analysis zone (TAZ) boundaries, socioeconomic and land use data, as well as the transportation modeling networks. The Orange County Congestion Management Program requires consistency in socioeconomic data and land use data.

2.1 Traffic Analysis Zones

Socioeconomic and land use data are grouped into TAZs, which are generally based on census tract boundaries. Regional models use census tracts as the general criteria for establishing TAZ boundaries, primarily because census tract level socioeconomic data are readily available from the U.S. Census Bureau and regional planning agencies. A major update to the OCTAM TAZ system was completed in 2005 to better reflect the 2000 Census Block Group boundaries and corresponding detailed data incorporated into OCTAM. This effort increased the number of zones used in OCP-2004 (OCTAM 3.2), 1,657, to the new system of 1,741 zones used since OCP-2006 (OCTAM 3.3, 3.4, 4.0). The new zonal boundaries also took into account changes in land use in redeveloped areas and future development plans throughout the county. Retention of existing boundaries was a priority especially if these followed the traditional geographic boundaries such as railroads, rivers, freeways, and major arterials. Since the primary purpose of OCTAM is to accurately forecast regional traffic activity without regard to jurisdictional boundaries, political borders, such as city boundaries, are rarely explicitly considered in the development of TAZs.

The TAZs in most subarea models were developed as subsets of the OCTAM regional model and therefore, are generally consistent with the OCTAM TAZs. However, it should be noted that subarea models developed with older versions of OCTAM may not be consistent with the current version because of changes in census tract boundaries, and due to the strict regional requirement that TAZs must be fully compatible with census tract boundaries. As part of 2005 update effort, Orange County TAZs were updated from previous versions of OCTAM and numerous zones within Orange County were added or modified. Subarea models that were found to be consistent with older OCTAM versions should coordinate with OCTA to obtain the refined zone structure prior to incorporating updated OCTAM information (networks, OCP data, trip tables, etc) into subarea models.

TAZs of subarea models are often derived from city general plan land use coverages. In some cities, the census tract boundaries and the city's jurisdictional boundaries are not coterminous, causing similar inconsistencies with TAZ boundaries. These conditions make it difficult and time consuming to compare the regional socioeconomic data with city land use data.

For purposes of consistency, TAZs shall be developed using a basic contiguous building block system, such that data from one TAZ system could be easily compared with data from another TAZ system by simply aggregating the lowest common denominator zonal data. TAZs in a Subarea model must be a subset, equivalent, or aggregation of OCTAM. In cases of aggregation, the TAZ must also be contiguous with Community Analysis Area (CAA) and Regional Statistical Area (RSA) boundaries. In addition, the subarea model must define a “primary” modeling area where modeling results would be used in traffic studies. Typically, this would include all or a portion of the city’s jurisdictional boundary.

OCTA will provide current OCTAM TAZ related information in a readily usable format for subarea model development. TAZ, CAA, RSA, city jurisdictional boundary and other Geographic Information System (GIS) shapefiles will be made available as necessary and appropriate.

2.2 Socioeconomic/Land Use

The Orange County socioeconomic data used in OCTAM is based on the Orange County Projections (OCP), which are formally adopted by the Orange County Council of Governments and the Orange County Board of Supervisors. The cities’ land use data is based on their general plan land use and generally consistent with OCP. There are some fundamental differences in assumptions between the regional socioeconomic data and the cities’ land use data, i.e., housing units and employment cannot be compared directly between the two databases. Housing units in the OCP socioeconomic data are defined as “occupied units”, whereas, the land use data definition are “total units”. When comparing housing units, appropriate vacancy rates (**Appendix B**) should be applied to the cities’ land use data.

The non-residential categories in the land use data must first be converted to an equivalent employment estimate before they can be compared with the OCP employment data. The conversion rates shown in **Appendix C** should be used for purposes of this comparison, or an acceptable alternative. **Table 2-1** and **Table 2-2** are examples of formats for comparing socioeconomic and land use data. Comparisons shall be made for the OCTAM base year and horizon year projections.

It should be noted that socioeconomic/land use data are updated periodically as new demographic information and economic indicators becomes available, and as changes are made to general plan zoning. The OCP socioeconomic data is generally updated every four years in coordination with the Regional Transportation Plan update cycle. Whereas, local general plans/zoning changes may occur more frequently. How these changes affect subarea models depend upon the location and degree of change.

The OCP datasets are developed in concert with local jurisdictions through a well-defined process that has been implemented for all OCP development cycles. The OCP development process is a top-down, bottom-up approach to develop countywide population, housing and employment totals. The Center for Demographic Research (CDR) at California State University, Fullerton meets with and collects detailed input information from each jurisdiction. The process for the development of population, housing and employment estimates begins with development of the assumptions integrated into the forecasts which are reviewed and approved by the CDR Technical Advisory Committee (TAC). Initial countywide projections are developed and subsequently approved by the TAC and the Management Oversight Committee (MOC). Prior to development of TAZ level projections, the Orange County Council of Governments approves the countywide population, housing and employment forecasts. Development of the TAZ level projections includes the following steps:

- Develop base year estimates
- Jurisdictional review
- Adjust base year estimates
- Allocated countywide population, housing and employment to split TAZs
- Develop secondary variables by split TAZs
- Distribute draft projections
- Meet with jurisdictions
- Jurisdictional review
- Adjust projections
- Jurisdictional approval
- Approval by CDR TAC and MOC
- OCCOG TAC approval
- OCCOG approval

Once the TAZ level projections are approved by OCCOG, OCTA incorporates the revised projects into OCTAM and develops refined base year and future year models with the revised data, validating base year forecasts associated with the revised demographic base year. OCTA will make current OCP datasets available to jurisdictions for subarea model development purposes.

Table 2-1 Socioeconomic/Land Use Data Comparison (Primary Modeling Area)

OCTAM TAZ	Subarea TAZ	*Occupied Housing Units*			*Retail Employment*			*Service Employment*			*Other Employment*		
		OCTAM	**Subarea**	**%Diff.**	**OCTAM**	**Subarea**	**%Diff.**	**OCTAM**	**Subarea**	**%Diff.**	**OCTAM**	**Subarea**	**%Diff.**
Total Primary Area													

Table 2-2 Socioeconomic/Land Use Data Comparison (External Modeling Area)

RSA	CAA	*Occupied Housing Units*			*Retail Employment*			*Service Employment*			*Other Employment*		
		OCTAM	**Subarea**	**%Diff.**	**OCTAM**	**Subarea**	**%Diff.**	**OCTAM**	**Subarea**	**%Diff.**	**OCTAM**	**Subarea**	**%Diff.**
Total External Area													

2.3 Transportation Modeling Networks

The OCTAM and the subarea model highway and transit (if applicable) networks must be consistent. Consistency checks should be made to compare the number of lanes on freeways and arterials. This evaluation should include high occupancy vehicles (HOV) lanes, toll lanes and auxiliary lanes. How HOV lanes, toll lanes and auxiliary lanes are addressed in the model may vary based on the subarea model requirements. These lanes may have lower per lane capacities than mainline lanes to more accurately reflect operating characteristics. All freeway ramps within the primary area should be included in the subarea network with all ramp movements coded. While OCTAM highway and transit networks do not incorporate intersection control treatments, flexibility remains to incorporate intersection control treatments as appropriate in subarea networks. Network speed and capacity assumptions should be consistent with OCTAM although flexibility exists to refine assumptions based on local conditions. Network speed and capacity assumptions should be documented.

The consistency criteria for arterial highways should be based on number of lanes, divided verses undivided, and smart street designation. Review of the OCTAM network assumptions by the cities should assist in facilitating resolution of network consistency issues. OCTA maintains two future networks, a constrained network which consists of future projects considered fundable and a MPAH network that assumes full buildout of the MPAH. Based on specific needs of the subarea model, future forecasts may require either the constrained network or the MPAH network. Although for most applications, the MPAH network should be assumed throughout Orange County, specifically external to the primary study area or the models jurisdiction. It should be noted that some arterial facilities are currently constructed above and beyond their MPAH classification and should be coded as such in the existing and future subarea networks. Subarea network development should not solely rely upon OCTAM networks but should be verified through aerial photography or field reconnaissance to ensure accuracy throughout the subarea study area. Development of the existing and future subarea networks should be documented clearly.

3. RECOMMENDED SUBAREA MODELING METHODOLOGY

The intent of the subarea modeling methodology guidelines is to ensure consistency in subarea model development and application. The goal of this chapter is to establish procedures that would ultimately lead to models that yield similar results when the same set of socioeconomic/land use data and transportation system network are used.

While this chapter provides a definitive analytical approach, Chapter 4 allows for optional procedures and methodologies, provided guideline criteria are satisfied. This flexible framework allows creativity and advancement in state-of-the-practice while maintaining an acceptable level of transportation modeling consistency in Orange County.

3.1 Subarea Modeling Approach

The proposed modeling methodology maintains consistency between the OCTAM regional model and the subarea model by instituting a hierarchical modeling approach. OCTAM provides the basic trip tables from which subarea models would refine upon to reflect the level of detail necessary to address specific local traffic issues. This concept establishes an OCTAM base year subarea trip table by converting the OCTAM trip tables to the subarea TAZ system. Likewise, an OCTAM forecast year (horizon year) subarea trip table would be converted to the subarea TAZ system. Since these subarea trip tables are a direct conversion of the OCTAM trip tables, they should produce similar results when assigned to the subarea network. These trip tables will serve as the basis for evaluating and comparing changes in subarea modeling methodologies and assumptions with OCTAM.

A conceptual flow chart of the proposed subarea modeling methodology is shown in **Appendix E**.

3.1.1 Tiered Zone Structure

Historically, subarea models have incorporated a three-tiered zone structure approach:

- Tier-1 (Consolidated Area): This area is far removed from the focus of the subarea model, where the network and zone structure are highly conceptualized. In general, OCTAM TAZs in this area are aggregated to Community Analysis Areas (CAA) within Orange County, and to Regional Statistical Areas (RSA) for areas outside of Orange County.
- Tier-2 (Buffer Area): Tier-2 serves as a transition between the coarse grained Tier-1 and the primary focus area of the subarea model. OCTAM TAZs are normally used in this area.
- Tier-3 (Primary Area): Tier-3 would typically include the jurisdictional boundary of a city, plus an extended area, with the intent of producing reasonably similar results with a neighboring city's traffic model on adjacent roadway links. Within the primary modeling area, OCTAM TAZs are subdivided into smaller zones to provide the

detail necessary to address local traffic circulation issues. The subarea TAZs within the extended primary modeling area should be consistent with the adjacent city's model.

As model processing speed have improved and more detailed components are incorporated into subarea models, the former tiered structure is no longer be the desired approach for the subarea model structure. While there are benefits to a tiered structure, and subdividing/disaggregating zones in the primary area is likely necessary, OCTA remains flexible in defining the appropriate model structure for subarea models. As processing speeds have improved and subarea models may incorporate a mode choice component, it is feasible to develop a subarea model that applies OCTAM directly with primary area subdivided zones.

3.1.2 Highway Network

Current OCTAM base year and future year networks will be provided and discretion is left up to subarea models as to the most appropriate and efficient way to develop the networks.

Subarea models should appropriately account for HOV facilities as well as toll facilities. Subarea models that are directly impacted by the toll roads in Orange County should model them as toll roads. The toll road trip assignment must be consistent with OCTAM unless it can be demonstrated that better procedures and/or data are available to replace the OCTAM assumptions and procedures. OCTA will provide highway network assumptions, including speed and capacity tables by facility type for peak and off-peak periods to assist in the development of subarea model highway networks.

3.1.3 Transit Network

All transit planning and modeling should be coordinated with OCTA, the regional public transit agency in Orange County. This guideline document accommodates options to analyze transit alternatives for transportation infrastructure improvements and project mitigation. While regional transit planning is the responsibility of OCTA, local agencies may want to assess local transit alternatives that would be funded through local and/or private sources. While OCTA is responsible for regional transit planning, subarea models may incorporate the OCTA, mode choice model as appropriate for local transit planning requirements.

Application of a mode choice model requires detailed coordination of a transit network. OCTA will make its current base year and future year transit networks available for subarea model application as appropriate. In addition, documentation defining transit network coding conventions can be provided. The OCTAM transit networks are very detailed and can be difficult to develop, update, maintain and apply. Revising transit networks for subarea model application should be done with caution.

3.2 Trip Generation

A socioeconomic based trip generation procedure is recommended. The procedure is a two-step process: 1) convert city land use data to socioeconomic data, and 2) apply appropriate trip rates. In the first step, city land use data are converted to socioeconomic data based on the housing vacancy rates shown in **Appendix B**, and the employment conversion factors shown in **Appendix C**. Initially, the mid-range employment conversion factors in **Appendix C** should be used, and if warranted, adjustments within the range may be necessary to reflect local conditions. If subarea model employment conversion factors deviate from the range presented in Appendix C, appropriate justification is required to support application of factors that deviate from the recommended range, The second step of the process is to apply appropriate socioeconomic trip rates, shown in **Appendix D**, by OCTAM trip purposes. Under some conditions, adjustment to the vacancy rates presented in Appendix B and socioeconomic trip rates presented in Appendix D is warranted. Deviations from the rates presented must be justified through appropriate analysis and documentation.

The subarea modeling methodology concept that has generally been applied in Orange County is to use the local trip generation model to develop production and attraction factors, which will be used to update the OCTAM based subarea trip tables. Production and attraction growth factors would be developed based on changes in productions and attractions estimated by the subarea trip generation model. These factors would then be applied to the trip distribution component of the subarea model, using the FRATAR redistribution algorithm to adjust the trip table. This procedure would theoretically preserve the regional trip distribution patterns, while providing subarea models with the ability to analyze land use alternatives.

3.3 Trip Distribution

Application of the OCTAM trip distribution model for subarea models is highly recommended. The OCTAM trip distribution model would be made available either through OCTA staff resources or by OCTA approved consultants (funded by the requesting agency) under OCTA oversight. In the past, the trip distribution component of the subarea model has been based on the FRATAR redistribution procedure. While still allowed, it is not the recommended approach.

If FRATAR redistribution is pursued, the first step of the process is to transform the OCTAM trip tables to the subarea zonal structure by compressing and expanding the OCTAM TAZs to the appropriate subarea TAZs. In cases where OCTAM TAZs are subdivided into two or more subarea TAZs, the OCTAM trip ends will be proportioned based on the productions and attractions developed by the subarea trip generation model. If the FRATAR redistribution routine is applied in the subarea model, it should be applied with caution as direct application of FRATAR models may significantly alter regional trip distribution activity. Implications of subarea model FRATAR redistribution should be fully evaluated prior to application. Application of the OCTAM trip distribution model may eliminate the need to apply the FRATAR redistribution procedure.

In order to evaluate land use alternatives, production and attraction growth factors need to be developed using the subarea trip generation process. The growth factors would then be applied using a FRATAR trip redistribution process. Under certain conditions, it may be necessary to run a new OCTAM benchmark to supplement the FRATAR redistribution process. The OCTAM trip distribution model should be rerun if any of the following conditions occur:

1. A change in land use of more than 100% in the subarea TAZ(s) corresponding to the relevant OCTAM TAZ. A significant change in land use quantities can influence zonal distribution patterns.
2. Instances where the OCTAM TAZ has no trips and the corresponding subarea TAZ(s) has land use activity.
3. Addition of a freeway or major arterial highway; generally a roadway that would provide a significant change in travel time. Addition of a missing link in a gridded network probably would not fit this definition.

These guidelines are not hard and fast rules, and likely to change as the procedures are refined over time. Each guideline should be evaluated on its own merit.

3.4 Mode Choice (If Applicable)

Based on the level of analysis required to address specific local traffic circulation issues, there may not be a need for subarea models to incorporate a sophisticated mode choice model such as the one included in OCTAM. If a local agency desires to evaluate modal alternatives, they should coordinate with OCTA as OCTA is responsible for countywide transit planning efforts. Development of mode choice models may not be necessary for subarea models although the option to include a mode choice model exists to evaluate local transit applications as appropriate. As noted, OCTA retains jurisdiction over regional transit modeling and subarea models should not publish transit ridership forecasts for any regional transit components. Due to the sensitive nature of mode choice models and transit patronage forecasting in particular, caution should be used when applying a mode choice model for a subarea model.

The OCTAM mode choice model would be made available either through OCTA staff resources or by OCTA approved consultants (funded by the requesting agency) under OCTA oversight. The OCTAM vehicle trip tables with any combination of the following modes can also be provided: single occupant vehicles, 2-person carpool, 3-or-more person carpool, transit, and toll road users (if requested). Transit trips can be provided by sub-modes including local bus, express bus, urban rail, and commuter rail as well as by mode of access including walk and auto access.

The OCTAM mode choice trip tables provide the subarea model with the capability to respond to inquiries pertaining to mode choice issues, albeit limited in ability to explore the full range of modal alternatives. The procedure is to first translate the OCTAM mode choice output to the subarea zone structure then calculate mode split percentages for each origin and destination pair or trip interchange. How the mode split percentages are calculated depends on whether the subarea trip generation model is based on person or vehicle trips.

The mode split percentages would then be applied to the appropriate subarea person or vehicle trip table. This procedure will allow subarea models to estimate modal shares based on changes in travel demand resulting from an increase or decrease in trip generation. Major changes in the transportation system may require running the OCTAM mode choice model to properly reflect mode shift. Examples of major changes include significant changes in transit level of service, adding a major roadway or HOV facility and/or modeling transportation control measures that target single occupant vehicle trip reduction.

3.5 Trip Assignment

The two most common capacity restraint trip assignment methodologies used in Orange County are the equilibrium and incremental algorithms. Both of these methods are based on an iterative capacity restraint procedure. OCTAM and a few subarea models apply the equilibrium procedure, while other subarea models implement an incremental approach. While it is recommended that subarea models maintain an assignment procedure consistent with OCTA, including assignment by consistent time periods as OCTAM, the guidelines will evaluate each subarea assignment method on a case-by-case basis during the certification process. Alternative assignment procedures such as combined windowed/focused assignment procedures have successfully been implemented for subarea models to appropriately account for local assignment characteristics as well as regional assignment characteristics. Assignment procedures should be documented clearly with specific justification for implementation.

OCTA can provide OCTAM trip tables by five trip purposes (home-based work, home-based school, home-based other, work-based other and other-based other). OCTAM time-of-day and production-attraction to origin-destination factors should be applied to establish consistency with OCTAM. For subarea model applications, “peaking factors” could be applied based on traffic counts reflecting local peak-hour traffic characteristics. Toll facility assignment procedures should be considered during the development of the subarea model assignment procedure. Toll assignment procedures should be documented clearly for consideration during the certification review process.

3.5.1 Post-Assignment Model Adjustment Methodology

Traffic counts used to verify the trip assignment model should be substantiated for accuracy and rationalized for continuity before they are used in the trip assignment calibration/validation process. It should be recognized that traffic counts themselves have daily and seasonal fluctuations and could vary by as much as fifteen percent (15%) within a given day.

During the model base year validation process, it is common practice to calibrate the network model volumes with actual traffic counts. Some of the network calibration process includes verifying proper network access from zone centroid connectors, capacity assumptions, network speeds, as well as zonal productions and attractions. Caution must be exercised when making these network adjustments to avoid introducing biases in the network that might adversely affect future year forecasts. In spite of these adjustments, there may still be a need to adjust the “raw” model output to account for atypical network conditions and minor model aberrations.

The *Transportation Research Board National Cooperative Highway Research Program Report 255* (TRB NCHRP, 1991) established guidelines and procedures for adjusting transportation model outputs and developed criteria for acceptable levels of modeling accuracy. Specific model adjustment procedures following the NCHRP Report 255 guidelines should be fully documented if they are applied in the subarea model.

OCTAM incorporates a post-assignment model adjustment procedure that is consistent with the NCHRP 255. In adjusting the OCTAM future year forecast, the methodology compares the traffic assignment of the base year model with the forecast year model, and applies either their absolute difference or ratio, to the base year count data. If the link volume of the base year model is less than the base year count, the incremental difference between the base year and future year model is applied to the base year count volume, otherwise the ratio of base year and future year model is used.

3.5.2 OCTAM Availability

If a local agency requires special OCTAM model runs, this can be accommodated in one of two ways. One, the local agency, in collaboration with OCTA, would develop a work plan and general schedule agreeable by both parties. The work efforts could range from local staff doing most of the work, under OCTA oversight, to OCTA doing the work with local staff support, or combination thereof.

Alternatively, the local agency requesting the model runs could contract directly with a consultant for services required. OCTA will also consider other proposals for making OCTAM more accessible to local agencies.

OCTA typically maintains base year and horizon year models. While interim year models and networks are not typically maintained, demographic data exists for the development of interim year forecasts.

4. OPTIONAL MODELING METHODOLOGY

The methodology presented in Chapter 3 is an integrated subarea modeling approach that promotes consistency with the OCTAM regional model. The methodology captures the full spectrum of the OCTAM capabilities, including use of the most current travel surveys and transportation data in the region. Implementing the methodology in Chapter 3 should help facilitate the consistency determination described in Chapter 5.

However, this manual acknowledges that there are many ways in which subarea models can be constructed. This Chapter sets general guidelines and requirements for an optional subarea modeling methodology.

4.1 General Consistency Requirements

Subarea models would be considered consistent with OCTAM provided that they meet criteria established in Chapter 5. A subarea model certification process has been established in Chapter 6.

4.2 Input Assumptions

Model input data must be consistent with the requirements set forth in Chapter 2.

A subarea model's base (existing) year can potentially be different than the base year in OCTAM. This can be accommodated as long as the comparison between the models is reasonable.

4.3 Model Structure

OCTAM is based on the traditional sequential modeling approach, therefore, it is recommended that subarea models be structured under this modeling framework. However, since there are many combinations of model structures within this framework, each subarea model structure will be evaluated on a case-by-case basis. In addition, consideration has been given to development of activity-based transportation models within the SCAG region. It is recommended that subarea models remain consistent with the current state of the modeling practices employed by OCTA at the time of subarea model development, although flexibility is provided in the structure of subarea model given the criteria established in Chapter 5 is satisfied.

5. CONSISTENCY DETERMINATION

Each subarea model under consideration for consistency determination with OCTAM is required to satisfy the guidelines and criteria established in this chapter. Variances and final consistency determination will be made by OCTA with an appeal process as described in Chapter 6. Deviations from the established criteria will not necessarily result in an inconsistency finding with OCTAM. Deviations from the regional model may exist that can be sufficiently justified. OCTA remains flexible in reviewing consistency reports and will accept deviations from established criteria where warranted and appropriately documented. **Appendix F** provides a detailed checklist that OCTA uses to determine consistency with OCTAM.

In the traditional four-step sequential modeling process, each modeling step is developed and validated independently. Consistency comparison between OCTAM and the subarea models shall also be done for each step of the modeling process. However, the OCTAM trip generation and trip distribution models are based on person trips, and most subarea models are based on vehicle trips, therefore, direct comparison cannot be made with these modeling components. Instead, the trip generation and trip distribution components of the subarea models shall be compared with vehicle trips from the OCTAM mode choice model. The subarea trip generation model shall be compared with the OCTAM mode choice vehicle trip end summaries (productions and attractions) and the trip distribution model would be compared directly with the OCTAM vehicle trip table (mode choice output). If, however, person trips are used in the subarea model, then comparisons shall be made at the appropriate corresponding modeling steps.

Subarea consistency will be established by comparing OCTAM and the subarea model for each modeling step. This information will be used as a reference point for consistency findings and to provide a basis for comparing changes in the subarea modeling assumptions and input data. Consistency comparisons shall be made for both the OCTAM base year and horizon year projections.

Base Year Consistency Comparison

1. Convert OCTAM base year trip tables to the subarea zone structure and assign to the subarea network.
   - *Compare results as specified in **Section 5.4**.*

   Intent: This comparison is to insure that there are no procedural and/or technical issues in the data conversion and application process.

2. Apply subarea trip generation procedure to OCTAM base year socioeconomic data
   - *Compare results between OCTAM and Subarea trip generation models as specified in **Section 5.1**.*

Intent: This comparison will illustrate differences in results between the subarea and OCTAM trip generation programs/methodologies, and help reconcile significant differences, if any. It should be noted that the base year may vary between subarea models and OCTAM. Subarea models have the discretion to identify an appropriate base year considering issues such as date of traffic counts or traffic count program and land use database information. For this task, differing base years between OCTAM and subarea models will not be an issue as the purpose of this task is to apply the subarea trip generation procedure to the OCTAM base year socioeconomic data.

3. Apply subarea trip generation procedure to local land use/socioeconomic data and run the entire subarea model set.
   - *Compare results as specified in the following sections.*

   Intent: This comparison will show the impact of differences between the OCTAM and the subarea model using local land use/socioeconomic data.

Future Year Projections

Consistency procedures similar to the base year comparisons shall be made to benchmark future year projections.

5.1 Trip Generation

The trip generation methodology and supporting computer programs shall be fully documented as described in **Section 5.5**. Trip generation shall be compared at two geographical levels: the primary modeling area and the entire modeling area. **Table 5-1** provides a format for comparing trip generation between OCTAM and the subarea model for the primary modeling area. **Table 5-2** compares OCTAM and subarea trip generation by RSAs and CAAs. This comparison is only necessary for RSAs and CAAs that are impacted by the subarea trip generation process. The trip productions and trip attractions of the subarea model should be considered consistent with OCTAM if the Base Year is within ten percent (10%) of the OCTAM trip productions and attractions summaries. As previously noted, any deviations greater than ten percent must be justified and documented thoroughly. The ten percent threshold, which is an industry standard often applied to the comparison of daily screenline forecast volume to count volume, has been assumed as a reasonable target for comparison to OCTAM model output for consistency purposes.

It should be noted that the subarea model base year may differ from the OCTAM base year. A base year variance requires consideration regarding comparisons to the OCTAM base year for each model component. Subarea model documentation should discuss potential impacts to the comparison results considering different model base years. Comparisons of State Highway System or local circulation system historical daily traffic count data can provide some insight as to potential changes that may arise from comparisons amongst differing base years.

Subarea models may require consideration of special generators in the trip generation process. OCTAM incorporates special generators for the following facilities:

- Huntington State Beaches
- John Wayne Airport
- University of California at Irvine

Various other trip generators may require a specialized approach to accurately forecast trip activity. Subarea models should clearly document any special generators incorporated into the subarea model trip generation component and justify special generator trip rate assumptions.

Table 5-1 Trip Generation Comparison (Primary Modeling Area)

OCTAM TAZ	**SUBAREA TAZ**	**OCTAM**		**SUBAREA MODEL**		**% DIFFERENCE**	
		PROD.	**ATTR.**	**PROD.**	**ATTR.**	**PROD.**	**ATTR.**
1500	100	7000	5750	2500	2000		
	101			2000	1500		
	102			3000	2500		
Subtotal		7000	5750	7500	6000	7.1%	4.3%
1550	103	5050	4500	2150	1975		
	104			3000	2650		
Subtotal		5050	4500	5150	4625	2.0%	2.8%

EXAMPLE

Table 5-2 Trip Generation Comparison (RSAs and CAAs Impacted by Change)

RSA	**CAA**	**OCTAM**		**SUBAREA**		**% DIFFERENCE**	
		PROD.	**ATTR.**	**PROD.**	**ATTR.**	**PROD.**	**ATTR.**

5.2 Trip Distribution

The trip distribution modeling methodology and supporting computer programs shall be fully documented as described in **Section 5.5**. **Table 5-3** through **Table 5-5** provide a format for comparing the subarea vehicle trip table with OCTAM. The subarea trip distribution model should be considered consistent with OCTAM if all trip interchanges in **Table 5-5** are within ten percent (10%). As previously noted, any deviations greater than ten percent must be justified and documented thoroughly.

This comparison shall be made with the final subarea trip table for both the base year and horizon year projections. The purpose of this comparison is to evaluate and understand differences, if any, between OCTAM and the subarea model.

Table 5-3 Trip Distribution Summary (Subarea Model)

[PROD↓][ATTR→]	RSA - A	RSA - B	RSA - C	RSA - D	RSA - E	RSA - F	RSA - G	RSA - H	RSA - I	RSA - J	TOTAL PRODUCTIONS
RSA - A											
RSA - B											
RSA - C											
RSA - D											
RSA - E											
RSA - F											
RSA - G											
RSA - H											
RSA - I											
RSA - J											
TOTAL ATTRACTIONS											

Table 5-4 Trip Distribution Summary (OCTAM)

[PROD↓][ATTR→]	RSA - A	RSA - B	RSA - C	RSA - D	RSA - E	RSA - F	RSA - G	RSA - H	RSA - I	RSA - J	TOTAL PRODUCTIONS
RSA - A											
RSA - B											
RSA - C											
RSA - D											
RSA - E											
RSA - F											
RSA - G											
RSA - H											
RSA - I											
RSA - J											
TOTAL ATTRACTIONS											

Table 5-5 Trip Distribution Summary (% Difference)

[PROD↓][ATTR→]	RSA - A	RSA - B	RSA - C	RSA - D	RSA - E	RSA - F	RSA - G	RSA - H	RSA - I	RSA - J	TOTAL PRODUCTIONS
RSA - A											
RSA - B											
RSA - C											
RSA - D											
RSA - E											
RSA - F											
RSA - G											
RSA - H											
RSA - I											
RSA - J											
TOTAL ATTRACTIONS											

5.3 Mode Choice (If Applicable)

The mode choice modeling methodology and supporting computer programs shall be fully documented as described in Section 5.5. The mode choice model outputs shall be summarized by RSAs, as well as by the primary modeling area. Comparison shall be made between the subarea model and OCTAM. **Table 5-6** through **Table 5-8** provide a format for this comparison. The subarea mode choice model (or factored modal shares) should be considered consistent with OCTAM if all modal trips are within ten percent (10%). As previously noted, any deviations greater than ten percent must be justified through clear documentation.

Note: This comparison is not required if the subarea modeling methodology in Chapter 3 is followed.

Table 5-6 Mode Choice Model Summary (Subarea Model)

ZONE	VEHICLE OCCUPANCY			TRANSIT	NON-MOTORIZED
	SINGLE	2-PERSON	3 OR MORE		
PRIMARY					
RSA - A					
RSA - B					
RSA - C					
RSA - D					
RSA - E					
RSA - F					
RSA - G					
RSA - H					
RSA - I					
RSA - J					
TOTAL					

Table 5-7 Mode Choice Model Summary (OCTAM)

ZONE	VEHICLE OCCUPANCY			TRANSIT	NON-MOTORIZED
	SINGLE	2-PERSON	3 OR MORE		
PRIMARY					
RSA - A					
RSA - B					
RSA - C					
RSA - D					
RSA - E					
RSA - F					
RSA - G					
RSA - H					
RSA - I					
RSA - J					
TOTAL					

Table 5-8 Mode Choice Model Summary (% Difference)

ZONE	VEHICLE OCCUPANCY			TRANSIT	NON-MOTORIZED
	SINGLE	2-PERSON	3 OR MORE		
PRIMARY					
RSA - A					
RSA - B					
RSA - C					
RSA - D					
RSA - E					
RSA - F					
RSA - G					
RSA - H					
RSA - I					
RSA - J					
TOTAL					

5.4 Trip Assignment

The trip assignment modeling methodology and application of supporting computer programs shall be fully documented as described in **Section 5.5**. Trip assignment consistency findings shall be based screenlines, as described in **Section 5.4.1**. Screenline comparisons shall compare OCTAM post-assignment model adjusted forecast traffic volumes to the subarea model forecast volumes. A clear distinction as to whether the subarea model forecast volumes have been adjusted must be provided. If a post-assignment model adjustment process is applied to subarea assignment results, the adjusted volumes shall be compared to OCTAM.

5.4.1 Screenline Validation

For comparison purposes, screenlines will minimally be established at the westerly, easterly, northerly, and southerly extremes of the primary modeling area boundary. In addition, a longitudinal and latitudinal screenline crossing at approximately the center of the primary modeling area shall also be minimally used to compare the subarea model ADT with OCTAM. **Figure 5-1** shows an example of how the screenline locations should be established. The total ADT of each subarea screenline should be within ten percent (10%) of the corresponding OCTAM screenline as defined by industry standards. NCHRP 255 provides more detailed screenline standards based on total screenline traffic flow and these can be referenced as appropriate. As previously noted, any deviations greater than ten percent must be justified and documented thoroughly. **Table 5-9** provides an example of how the screenlines shall be compared. Each circulation system segment that crosses a screenline should be reported in the comparison table. While independent arterials or freeway segments may deviate significantly from OCTAM, the detailed summaries assist OCTA in further refining the regional model to local conditions as warranted.

As the objective in subarea model validation is to compare existing forecast volumes to traffic count volumes, every effort should be made to obtain appropriate existing traffic count volumes across the model screenlines. Traffic counts should correspond to the base year of the subarea model. Subarea models are responsible for the collection of traffic count data but it should be noted that OCTA maintains a traffic count database that is available as necessary to potentially supplement traffic count programs to obtain existing traffic count data to validate subarea models. The screenline validation must clearly note the subarea and OCTAM base years and document potential validation implications associated with a potential base year inconsistency. If adjustments are made to count or forecast volumes to ensure an appropriate comparison between OCTAM and subarea model forecasts, these adjustments must be clearly documented and justified.

5.5 Full Disclosure Documentation

The subarea modeling methodology must be fully documented and include all the information necessary to replicate validation of the base year subarea model by OCTA. All information used for subarea model development and application are to be disclosed for purposes of corroborating model validation. This includes the full subarea model stream, if requested. No “black-box” model will be accepted. Since the current modeling methodology is based on application of independently developed sequential models, each model set must be validated independently. However, aggregate application of the sequential models may require the need to revalidate the models with empirical data using sound statistical procedures. In any event, the validation of the subarea model must be fully documented before any consistency findings can be made.

5.5.1 Computer Files/Programs (For Model Corroboration)

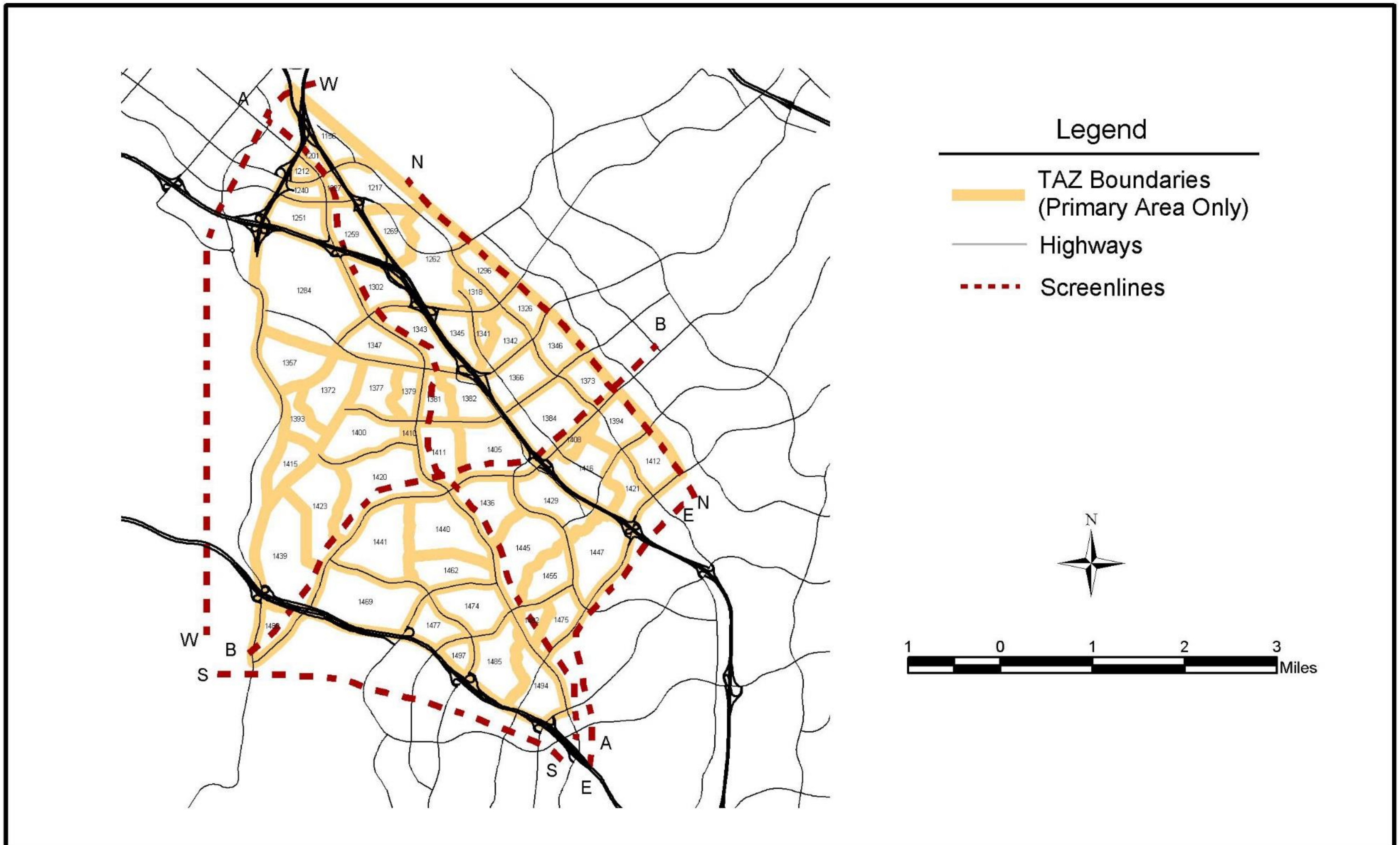
The purpose of this Section is to encourage standardization of subarea modeling procedures as well as the modeling software used in subarea models. Standardization facilitates OCTA review of subarea models and provides an environment to readily share data and software development products between agencies. As noted previously, OCTAM is currently based on the TransCAD modeling software system.

In order to corroborate modeling results, the input highway network and trip tables used for trip assignment shall be provided in an appropriate format compatible with OCTAM . Other computer files (GIS layer of subarea TAZs, if available) that OCTA deems necessary to corroborate the subarea baseline and benchmark runs must also be provided. Subarea models that use modeling software other than that being applied by the current version of OCTAM may be required to provide sensitivity test runs specified by OCTA for purposes of corroborating the subarea modeling results.

Table 5-9 Trip Assignment Screenline Comparison

SCREENLINE	(1) COUNTS	(2) OCTAM/ SUBAREA	(3) OCTAM	(4) SUBAREA	% DIFFERENCES (1) Vs. (2)	(2) Vs. (3)	(1) Vs. (3)	(1) Vs. (4)	(3) Vs. (4)
TOTAL (Westerly)									
TOTAL (Easterly)									
TOTAL (Northerly)									
TOTAL (Southerly)									
TOTAL (Longitudinal)									
TOTAL (Latitudinal)									

Note: (2) OCTAM/SUBAREA is OCTAM Trip Tables applied to subarea network.



Subarea Model Screenline Locations

Figure 5-1

6. CERTIFICATION PROCESS

All subarea models sanctioned for use in OCTA's mandated programs such as competitive funding programs or MPAH purposes must be certified by OCTA for consistency with OCTAM. Subarea models will retain this certification until newer OCP data are adopted and incorporated in OCTAM. After that time, local agencies have one year to update their subarea model with the latest OCP and OCTAM data or use OCTAM for use in OCTA's mandated programs. OCP data is generally updated every four years (see Notes on page 1-1).

Subarea models that are found consistent with OCTAM, as determined by requirements in Chapter 5, will receive a written certification (or re-certification) of consistency. Subarea models that are found to be inconsistent with OCTAM will be provided with suggestions on how to make the model consistent. The city may request that unresolved or disputed issues be referred to an appeal process. While OCTA may certify that a model is consistent with OCTAM, OCTA does not assume responsibility for subarea model forecasts. Subarea model forecasts that are developed and/or released based on a model that has been refined subsequent to a certification finding and prior to a re-certification finding should not be advertised as output from a model consistent with OCTAM. OCTA may not recognize forecasts from a refined model if refinements have been made subsequent to a finding of consistency.

As noted in Section 1.3, careful consideration should support the decision to develop a subarea model. As OCTAM can be applied for a wide variety of projects, development of a subarea model assumes that a model will provide lasting utility. Maintenance of a local model through the update process noted above requires resources and these should be considered when deciding whether to develop a subarea model.

6.1 Appeal Process

A Technical Review Committee will be established to review disputes on subarea model consistency findings and make recommendations to OCTA. The Technical Review Committee will be comprised of OCTA staff, representatives from two Orange County cities and two modeling consultants representing the private sector if feasible. OCTA will make the selection based on local/regional modeling knowledge and expertise, with concurrence from the Orange County Traffic Forum.

<u>Step 1</u>

The agency/consultant provides OCTA with comprehensive documentation of the subarea model and submits the model for review by OCTA. If necessary, OCTA will meet with the agency/consultant to discuss any modeling/data issues. OCTA will provide a finding of consistency or document specific issues hindering a consistency finding following evaluation of the subarea model. If the subarea model is found to be inconsistent with OCTAM, it shall be modified to be consistent. OCTA will make every effort to provide timely subarea model reviews.

Step 2

The agency/consultant that submitted a subarea model under dispute will be given an opportunity to present their case to the Technical Review Committee. The committee evaluates the issues and makes a recommendation to OCTA. Committee reviews will be performed in a timely fashion in coordination with the subarea model sponsoring agency/consultant.

Step 3

OCTA receives the Technical Review Committee’s recommendation, reevaluates the issues, and makes a final decision on consistency findings.

APPENDIX A

OCTAM Socioeconomic Zonal Variables

OCTAM SOCIOECONOMIC ZONAL VARIABLES
OCTAM 4.0

Total Occupied Dwelling Units (TOCDU): Occupied single-family detached housing units.

Resident Population (RPOP): Total persons living in households excluding institutionalized persons in census-defined group quarters.

Employed Residents (REM): Total employed persons 16 years and over (including part-time workers, self-employed workers and unpaid family workers).

Group Quarters Population (GQPOP): Only persons in non-institutionalized group quarters.

Total Employment (EMP): All employees including military personnel, civilian personnel and self-employed.

Retail Employment (RE): All employees in Retail employment.

Service Employment (SE): All employees in Service employment.

Public School Employment (PSCH): All employees in K-12 public school employment.

Other Employment (OTH): Total Employment excluding Retail, Service Employment, and Public School Employment.

School Enrollment (SEN): Total number of students attending public and private elementary, junior high, and high schools.

University Enrollment (UEN): Total number of students attending major public and private colleges and universities.

Acres: Total acreage of zone.

Median Household Income (MHHINC): Median household income in 2010 dollars.

APPENDIX B

Housing Unit Vacancy By City

Note: The vacancy rates used in Orange County Projections are United States Census data and applied at the census tract level.

HOUSING UNIT VACANCY BY CITY

OCTAM 4.0

CITY	2012 Vacancy	2040 Vacancy
ALISO VIEJO	3.5%	2.6%
ANAHEIM	6.1%	4.2%
BREA	3.5%	2.6%
BUENA PARK	3.8%	3.0%
COSTA MESA	5.2%	4.3%
CYPRESS	2.6%	1.9%
DANA POINT	11.0%	10.0%
FOUNTAIN VALLEY	2.7%	2.0%
FULLERTON	5.2%	4.1%
GARDEN GROVE	3.6%	2.9%
HUNTINGTON BEACH	4.9%	4.0%
IRVINE	5.7%	3.8%
LA HABRA	4.7%	4.2%
LA PALMA	2.8%	2.4%
LAGUNA BEACH	16.2%	15.4%
LAGUNA HILLS	5.2%	5.2%
LAGUNA NIGUEL	4.3%	3.4%
LAGUNA WOODS	13.1%	11.9%
LAKE FOREST	3.2%	2.6%
LOS ALAMITOS	3.3%	2.6%
MISSION VIEJO	3.0%	2.5%
NEWPORT BEACH	12.3%	11.0%
ORANGE	3.9%	3.3%
PLACENTIA	3.0%	2.3%
RANCHO SANTA MARGARITA	3.4%	2.8%
SAN CLEMENTE	7.9%	7.3%
SAN JUAN CAPISTRANO	4.6%	3.9%
SANTA ANA	4.8%	4.0%
SEAL BEACH	10.6%	9.7%
STANTON	4.1%	3.0%
TUSTIN	4.8%	3.7%
Unincorporated	3.8%	3.2%
VILLA PARK	2.0%	1.7%
WESTMINSTER	5.4%	4.6%
YORBA LINDA	3.4%	2.8%
Orange County	5.4%	4.3%

Source: Orange County Projections 2014 Modified

APPENDIX C

Typical Employment Conversion Factors

TYPICAL EMPLOYMENT CONVERSION FACTORS
(June 2001)

Land Use Category	Conversion Rates Range	Employment Type (Percentage Ranges)		
		Retail	Service	Other
Commercial	2.25 –2.75 employees/TSF[1]	60% - 90%	10% - 40%	0% – 5%
Office/Office Park	3.00 – 4.00 employees/TSF	0% – 5%	20% – 30%	65% - 80%
R&D/Light Industrial/Business Park	2.50 – 3.50 employees/TSF	0% – 5%	0% - 30%	60% - 100%
Heavy Industrial	2.00 – 2.50 employees/TSF	0%	0%	100%
Warehouse	1.00 – 2.00 employees/TSF	0%	0%	100%
Restaurant	3.00 – 5.00 employees/TSF	100%	0%	0%
Medical Office/Post-Office/Bank	3.50 – 4.50 employees/TSF	0% - 10%	70% - 100%	0% – 20%
Government Office/Civic Center	3.00 – 4.00 employees/TSF	0% – 5%	50% - 70%	25% – 50%
Hospital	2.50 – 3.00 employees/TSF	0%	70% - 80%	20% – 30%
Library/Museum	1.50 – 2.50 employees/TSF	0%	100%	0%
Hotel/Motel	0.75 – 1.25 employees/room	0% - 10%	70% - 80%	10% – 30%
Schools	0.08 – 0.12 employees/student	0%	0%	100%
Golf Course	0.50 – 0.70 employees/acre	0% - 10%	90% - 100%	0%
Developed Park/Athletic Fields	0.20 – 0.40 employees/acre	0%	80% - 100%	0% – 20%
Park	0.05 – 0.10 employees/acre	0%	80% - 100%	0% – 20%
Agricultural	0.01 – 0.05 employees/acre	0%	0%	100%

[1] Thousands of Square Feet

APPENDIX D

Socioeconomic Data Trip Rates

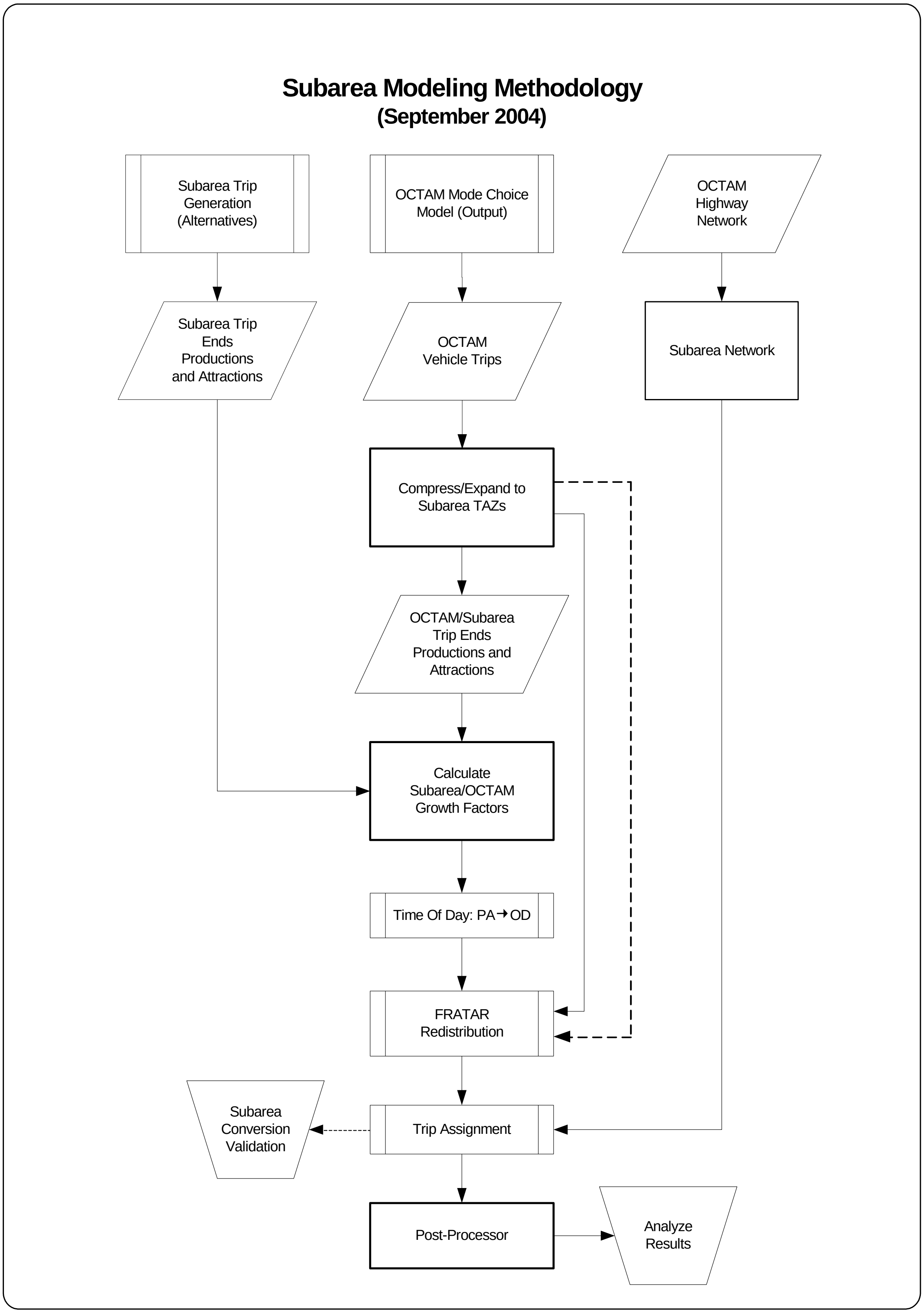
SOCIOECONOMIC DATA TRIP RATES
(June 2001)

VARIABLE	Single Family Residential	Multi Family Residential	Population	Employed Residents	Income (Million $)	Retail Employment	Service Employment	Other Employment	School Enrollment (Student)	Univ./College Enrollment
PRODUCTION TRIP RATES										
HBW	0.00	0.00	0.00	1.27	0.00	0.00	0.00	0.00	0.00	0.00
WBO	0.00	0.00	0.00	0.00	0.00	1.83	1.07	1.01	0.00	0.00
HBO	1.05	0.60	0.24	0.00	13.00	0.00	0.00	0.00	0.00	0.00
HBS	0.89	0.46	0.11	0.00	11.00	0.00	0.00	0.00	0.00	0.00
OBO	0.44	0.43	0.00	0.00	2.00	5.20	1.08	0.24	0.00	0.20
HBUniv	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HBSch	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ATTRACTION TRIP RATES										
HBW	0.10	0.10	0.00	0.00	0.00	1.24	1.24	1.26	0.00	0.00
WBO	0.25	0.25	0.00	0.00	0.00	3.44	0.60	0.54	0.00	0.20
HBO	0.40	0.39	0.00	0.00	1.00	3.46	0.90	0.10	0.00	0.00
HBS	0.00	0.00	0.00	0.00	0.00	5.54	0.00	0.00	0.00	0.00
OBO	0.41	0.45	0.00	0.00	2.00	4.84	1.10	0.20	0.00	0.20
HBUniv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91
HBSch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00
DAILY	**3.54**	**2.68**	**0.54**	**1.27**	**29.00**	**25.55**	**5.99**	**3.35**	**0.88**	**1.51**

Note: These trip rates were developed by Urban Crossroads in corroboration with Austin-Foust Associates and OCTA.

APPENDIX E

Subarea Modeling Methodology (Flow Chart)


Subarea Modeling Methodology
(September 2004)
Subarea Trip Generation (Alternatives)
OCTAM Mode Choice Model (Output)
OCTAM Highway Network
Subarea Trip Ends Productions and Attractions
OCTAM Vehicle Trips
Subarea Network
Compress/Expand to Subarea TAZs
OCTAM/Subarea Trip Ends Productions and Attractions
Calculate Subarea/OCTAM Growth Factors
Time Of Day: PA→OD
FRATAR Redistribution
Subarea Conversion Validation
Trip Assignment
Post-Processor
Analyze Results

APPENDIX F

Subarea Model Consistency Review Checklist

Subarea Model Consistency Review Checklist

City Traffic Analysis Model -- DATE

Consistency Areas	Included	Meets Consistency Requirement	Comments
I. Existing Subarea Infrastructure Verification			
1. Model Input Data Consistency			
a. Zone Structure			
b. Existing Model Network			
c. Future Model Network			
2. Trip Generation Consistency			
a. Subarea TG Procedure with Base Year OCTAM SED			
3. Screenline Comparison To OCTAM*			
a. Existing			
b. Future			
II. Subarea Existing Baseline Model			
1. Socioeconomic Data			
a. Comparison to OCTAM (Primary Modeling Area)			
b. Comparison to OCTAM (External Modeling Area)			
2. Trip Generation			
a. Comparison to OCTAM (Primary Modeling Area)			
b. Comparison to OCTAM (RSAs and CAAs)			
3. Trip Distribution			
a. Comparison to OCTAM			
4. Mode Choice			
a. Comparison to OCTAM			
5. Trip Assignment			
a. Screenline Comparison to OCTAM			
III. Subarea Future Baseline Model			
1. Trip Generation			
a. Comparison to OCTAM (Primary Modeling Area)			
b. Comparison to OCTAM (RSAs and CAAs)			
2. Trip Distribution			
a. Comparison to OCTAM			
3. Mode Choice			
a. Comparison to OCTAM			
4. Trip Assignment			
a. Screenline Comparison to OCTAM			
b. Post-Processing Methodology			
IV. Full Subarea Model Disclosure Documentation			
a. Computer Files/Programs			

*Assignment of OCTAM Trip Tables (disaggregated to the Subarea zone structure) to the Subarea Network