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TECHNICAL MEMORANDUM

I-5 Avenida Pico to SD County Line PSR/PDS

Weekend Data Review

Date:	February 21, 2018	Project #:19385
To:	Carolyn Mamaradlo, OCTA	
From:	Neelam Dorman & Tim Erney, Kittelson & Associates, Inc.	
cc:	Karen Chapman, TYLin International	

This memorandum documents initial results of the weekend data collection and analysis prepared by Kittelson & Associates, Inc. (KAI), with input from the Orange County Transportation Authority (OCTA), for existing mainline for the Project Study Report/Project Development Support (PSR/PDS) for improvements to Interstate 5 (I-5) between Avenida Pico and Cristianitos Road/San Diego County Line.

Existing Weekday Conditions Freeway Mainline Data and V/C Analysis

Since the study area experiences high demand during recreational travel outside of standard weekday morning and evening commute week hours, a supplemental weekend conditions analysis was conducted for the project.

Additional freeway mainline data was collected through PeMS for I-5 (between Avenida Calafia andCristianitos Road). Data was collected per the following methodology to determine weekend condition
trends:

- Collect PeMS freeway mainline data for all weekdays in March, one month to represent summer conditions (July), and one month to represent fall conditions (October)
- Collect data for Fridays, Saturdays, Sundays, and Mondays for non-holiday weekends
- Determine peak hour volumes per direction for each day (Friday – Monday) and average to develop the overall weekend peak hour volume

Given that recreational weekend traffic could carry over to Fridays and Mondays (e.g. weeks with Friday or Monday holidays), initial data collection was conducted for the full Friday to Monday period. A review of the data collected for the AM and PM peak hours on Fridays and Mondays generally showed a higher demand for Monday volumes during the AM peak hour as compared to the typical weekday AM peak hour, and higher demand for the PM peak hour for Friday as compared to the typical weekday PM peak hour. Overall, the peak hour demand for Saturdays and Sundays were higher than

those for Fridays and Mondays; therefore, the analysis was focused on the Saturday and Sunday data set.

A volume-to-capacity (V/C) analysis was conducted to gauge the performance for the study mainline segments for weekend conditions. A lane capacity of 1,950 passenger cars per hour per lane was applied for general purpose (mixed-flow) lanes and HOV lanes as defined by OCTA. A V/C ratio is a comparison of an amount of traffic on a road with the capacity of that road. A V/C ratio is expressed as a decimal, with values less than 1.00 indicating that volume is less than capacity and values more than 1.00 indicating that volume exceeds capacity. As values approach 1.00, congestion becomes more severe, with values more than 1.00 indicating severe congestion.

Table 1 and Table 2 present the results of the V/C analysis for the study segment. As shown, the weekend peak hour volumes (on average) are between 20% and 34% higher than weekday peak hour volumes. The volumes for both northbound and southbound are also similar between the three seasons with March having the highest northbound volume and July the highest southbound volume. The V/C analysis results are approximately 0.16 and 0.17 higher for weekend conditions as compared to weekday conditions; however, the study segment is operating under capacity (i.e., V/C ratio of less than 1.0) for all three seasons.

Table 1: Existing Freeway Weekend Peak Hour V/C Analysis - Northbound

NB-11: Between Cristianitos Road On-Ramp and Avenida Mendicino Off-Ramp						
Month[1]	Weekend Peak Hour[2]	Weekend Peak Hour Volume	Weekday Peak Hour Volume[3]	% Difference Weekend vs Weekday	Weekend Peak Hour V/C[4]	Weekday Peak Hour V/C[4]
March	11 AM	5,396	4,023	34%	0.69	0.52
July	10 AM	5,275		31%	0.68	
October	10 AM	5,308		32%	0.68	

Notes:
1: Data collected for non-holiday Saturday and Sunday for each representative season
2: Weekend peak hour (Saturday and Sunday average)
3: Weekday AM Peak Hour has the highest volume between AM/PM peak hours. Data only available for March weekday conditions.
4: Capacity of 1,950 vehicles per hour per lane

Table 2: Existing Freeway Weekend Peak Hour V/C Analysis - Southbound

SB-10: Between Cristianitos Road On-Ramp and Avenida Califia Off-Ramp						
Month[1]	Weekend Peak Hour[2]	Weekend Peak Hour Volume	Weekday Peak Hour Volume[3]	% Difference Weekend vs Weekday	Weekend Peak Hour V/C[4]	Weekday Peak Hour V/C[4]
March	11 AM	5,576	4,463	25%	0.71	0.57
July	10 AM	5,696		28%	0.73	
October	11 AM	5,372		20%	0.69	

Notes:
1: Data collected for non-holiday Saturday and Sunday for each representative season
2: Weekend peak hour (Saturday and Sunday average)
3: Weekday PM Peak Hour has the highest volume between AM/PM peak hours. Data only available for March Weekday conditions.

4: Capacity of 1,950 vehicles per hour per lane

A supplemental analysis was also conducted to determine the frequency of congestion on I-5 (i.e. speeds less than 35 miles per hour[1]) during Weekend Conditions. Hourly speeds were sourced from PeMS, between Avenida Calafia and Cristianitos Road, for non-holidays Fridays, Saturdays, Sundays, and Mondays for July 2016, March 2017, and October 2017. Speeds below 35 miles per hour (MPH) were identified and compared to the total number of weekend hours. Initial analysis shows that speeds are below 35 MPH approximately 6% of weekend hours, predominantly in the northbound direction.

Supporting Studies

Delays in the Project study area along I-5 occur on peak traffic weekends are caused by chokepoints located primarily outside of the study area. This issue was quantified by OCTA in the 2007/08 I-5 Weekend Highway Capacity Study (Weekend Study) using FreQ[2], a traffic simulation modeling software tool. The analysis evaluated weekend traffic conditions and queuing along the I-5 and identified hotspots and chokepoints contributing to traffic congestion. The analysis included data collection efforts for travel times and volumes along I-5 from SR-55 to the San Diego County Line. FreQ models were developed and calibrated for Saturday southbound and Sunday northbound time periods and directions.

The study confirmed peak travel (summer event) weekend delays in South Orange County along I-5 and identified the causes of those delays. For instance, heavy congestion was seen in the southbound direction between Junipero Serra Road and Camino De Estrella. The model showed that this congestion was likely caused by a chokepoint south of Camino De Estrella, near the termination of HOV lanes and where termination of the auxiliary lane from the Pacific Coast Highway interchange. In the northbound direction congestion was likely caused by operational issues at a chokepoint near Camino Capistrano where the northbound HOV lane begins and an auxiliary lane is dropped. This may result in queuing that extends as far back as Camp Pendleton.

Based on the Weekend Study, extension of the HOV to Avenida Pico was expected to relieve both the southbound and northbound peak travel weekend congestion between Avenida Pico and the San Diego County Line. Currently, OCTA is constructing the I-5 South County Improvements Project that will add this additional HOV lane between San Juan Creek Road to Avenida Pico. Based on the 2040 mainline segment analysis results provided in the I-5 HOV Lane Extension PA/ED Traffic Study (May 2010), operations improve north of the Project study area, with the additional HOV lane, at the northbound and southbound chokepoints identified above. These improvements are reported for weekday peak hour conditions; however, similar improvements in operations would also be expected for weekend conditions with the implementation of the I-5 HOV Lane Extension project.

[1] Congested speeds defined as below 35 MPH is consistent with what is calculated in OCTAM.

[2] FreQ is an HCM-based tool that permits efficient analysis of freeway corridors, including hotspots, chokepoints, and geometric features.

To check the validity of the findings from the Weekend Study to today, peak hour volumes on I-5 at the Cristianitos Road interchange from the I-5 Avenida Pico PSR were compared to the I-5 Weekend Highway Capacity Study.

Table 3: Existing Freeway Weekend Peak Hour V/C Analysis - Southbound

	July Peak Volumes at Cristianitos
2007 I-5 Weekend Highway Capacity Study	
Saturday Southbound	6,236
Sunday Northbound	5,612
2017 I-5 PSR	
Saturday Southbound	5,275
Sunday Northbound	5,696

Based on the comparisons, peak volumes at the Cristianitos Road interchange were higher for the Weekend Study in the southbound direction compared to the I-5 Avenida Pico PSR. For the northbound direction, the peak volumes are similar. Therefore, the 2007 Weekend Study findings would remain applicable today as the Project volumes are either higher or similar.

Future Weekend Conditions

Future conditions analysis for weekend conditions was not conducted as future weekend peak hour freeway, ramp and intersection data is not available. In particular, the OCTA travel demand model (OCTAM) does not currently project weekend conditions. In order to accurately determine projections for weekend volumes, OCTA would need to collect survey data to determine demand and create a new model to forecast future volumes. The travel functions for weekend conditions are different from weekday conditions, which are based on work commute, and would require significant effort to determine recreational travel patterns. In addition, the specific demand on managed lanes (for Alternative 3) would also differ from weekday conditions, which would require additional refinement and information gathering to correctly account for in the model. The effort to create a new OCTAM for weekend conditions is significant and beyond the scope of this project. Rough order-of-magnitude estimates for future weekend growth can be conducted; however, this would not be consistent with the level of detail provided for weekday conditions and would be difficult to defend. With the addition of a single lane in each direction, a minimum of 40% more traffic demand could be accommodated.