MEMORANDUM

YORBA LINDA BOULEVARD TRAFFIC OPERATIONS STUDY

Date: January 24, 2024

To: Sheila Amparo, PE

From: Bill Zimmerman, Traffic Engineer

Subject: Traffic Operations Study

As part of the Yorba Linda Widening Project, the BKF Engineers design team received a request from the City of Yorba Linda to evaluate the traffic operations at the intersections of Yorba Linda Boulevard at Imperial Highway and Yorba Linda Boulevard at Lakeview Avenue. The City requested an evaluation of the intersection operations at these two locations to:

- Determine if a dedicated eastbound right-turn lane is required for Yorba Linda Boulevard and Imperial Highway.
- Determine if removing the northbound right-turn overlap at the Yorba Linda Boulevard and Lakeview Avenue intersection would affect operations.

BACKGROUND

Yorba Linda Boulevard is a six-lane (three lanes in each direction) major arterial with a posted speed limit of 40 MPH. It has a curb-to-curb street width of approximately 84 feet. The lane geometrics for both directions consists of three thru lanes in each direction with separate left-turn lanes at each intersection and a dual right-turn lane westbound at Imperial Highway. Parking is not allowed on the street and there is a raised concrete median that separates each direction of traffic.

Imperial Highway is classified as a Smart Street with six-lanes north of Yorba Linda Boulevard and four-lanes south of Yorba Linda Boulevard. North of Yorba Linda Boulevard, the posted speed limit is 45 MPH while south of Yorba Linda Boulevard, the posted speed limit is 60 MPH. North of Yorba Linda Boulevard, the curb-to-curb street width is approximately 90 feet, with three lanes in both directions with a dual left-turn lane and a shared thru/right-turn lane at the intersection. South of the intersection it is approximately 84 feet, with two lanes in each direction with a left-turn lane and a shared thru/right-turn lane at the intersection. Parking is not allowed on the street and there is a raised concrete median that separates each direction of traffic.

W.G. Zimmerman Engineering, Inc.
7812 Edinger Avenue, Suite 302
Huntington Beach, CA 92647
(714) 799-1700 | (714) 333-4712 Fax

Lakeview Avenue is a four-lane (two lanes in each direction) facility with a posted speed limit of 35 MPH. North of Yorba Linda Boulevard, Lakeview Avenue has a curb-to-curb width of 70 feet and is classified as a Secondary Arterial and south of the intersection it is classified as a Primary Arterial. The lane geometrics consists of 2 lanes in each direction with dual-left turns northbound and southbound at the intersection. Parking is not allowed on the street and there is Class II Bike Lane north of the intersection.

METHODOLOGY

Counts Unlimited collected peak hour (AM & PM) turning movement counts at each intersection on November 30, 2022.

Analysis

- **Existing Traffic Operations**

  Field Review will be conducted to confirm existing analysis the week of January 16th, 2023. The results will be updated in this memo.

  Yorba Linda Boulevard and Imperial Highway:

  The traffic signal operates on a 130 second cycle for both the AM and PM peak hours based upon information provided by the City. In the eastbound direction of Yorba Linda Boulevard, the combined thru and right-turn volume is 619 (358 thru and 261 right) vehicles in the AM peak period and 946 (639 thru and 307 right) vehicles in the PM peak period. The westbound direction has separate right-turn lanes reducing the right-turn movements on the thru traffic movements.

  Imperial Highway northbound traffic combine thru and right-turn of 1,088 vehicles (872 thru and 216 right) in the AM peak period. In the PM peak period, the combined thru and right-turn movements is 1,195 (991 thru and 204 right) vehicles. In the southbound direction the AM peak period combined thru and right-turn movement is 1,000 (960 thru and 40 right) vehicles. The PM peak period combined thru and right-turn is 953 (882 thru and 71 right) vehicles. Imperial Highway northbound experiences large right turn movements because of a grade separation over Lakeview Avenue and without a direct connection.

  Yorba Linda Boulevard and Lakeview Avenue:

  The traffic signal operates on a 130 second cycle for both the AM and PM peak hours based upon information provided by the City. The existing westbound left-turn lane on Yorba Linda Boulevard provides a break in the median to allow vehicles to turn left into the Firestone Village Shopping Center. This does create an issue for vehicles turning left at the intersection causing a delay for vehicles to reach the intersection. In addition, the left

turn pocket is short, causing the left running vehicles spill over into the number one thru lane impacting the overall intersection operations.

Northbound Lakeview Avenue traffic has a separate right-run lane with 190 vehicles in the AM peak period and 257 vehicles in the PM peak period.

Westbound Yorba Linda Boulevard has 260 (plus 12 vehicles turning left into the Firestone Village Plaza from the break in the median) vehicles in the AM peak period and 201 (plus 7 vehicles turning left into the Firestone Village Plaza) vehicles in the PM peak period.

- **Traffic Count Data Results**

Yorba Linda Boulevard and Imperial Highway collected peak hour traffic data summary is provided below:

YORBA LINDA BOULEVARD AT IMPERIAL HIGHWAY						
Peak Period	**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**
A.M.	53	358	261	166	503	448
P.M.	115	639	307	184	564	464
IMPERIAL HIGHWAY AT YORBA LINDA BOULEVARD						
Peak Period	**Northbound**			**Southbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**
A.M.	256	872	216	391	960	40
P.M.	312	991	204	576	882	71

Yorba Linda Boulevard and Lakeview Avenue collected peak hour traffic data summary is provided below:

YORBA LINDA BOULEVARD AT LAKEVIEW AVENUE						
Peak Period	**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**
A.M.	149	662	200	260 | 12*	914	77
P.M.	207	1160	124	201 | 7*	901	109
LAKEVIEW AVENUE AT YORBA LINDA BOULEVARD						
Peak Period	**Northbound**			**Southbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**
A.M.	170	204	190	71	307	91
P.M.	178	257	257	189	268	127

* Indicates left-turns from the westbound left-turn median opening into Firestone Village

- **SYNCHRO Analysis**

Based on the findings from the data collected, a traffic analysis was performed using a program called SYNCHRO which evaluates the operations for each of the intersections.

- Yorba Linda Boulevard at Imperial Highway

Based on the data, the existing level of service (LOS) for the intersection during the A.M. peak hour is C and for the P.M. peak hour is E. For proposed conditions, an approximate 300 foot right-turn lane was added to see if it would alleviate the right-turn queue delay for the eastbound direction of Yorba Linda Boulevard traffic. The storage length was calculated using standards from Caltrans' Highway Design manual. The LOS for the proposed conditions is B for the A.M. peak hour and D for the P.M. peak hour. Based on criteria from ITE, a right-turn lane may be considered at the intersection when right-turn volumes exceed 300 vehicles per hour and the adjacent mainline volume exceed 300 vehicles per hour per lane.

- Yorba Linda Boulevard at Lakeview Avenue

Based on the data, the existing LOS for the intersection during the A.M. peak hour is B and for the PM peak hour is C. For the proposed conditions, the existing median break was removed along with the right-turn overlap. The proposed condition allows the westbound left-turn lane to have u-turns. The existing 12 AM Peak and 7 PM Peak turning movements into the Firestone Village Center were entered into SYNCHRO model as u-turns. The intersection LOS for the proposed conditions is B for the A.M. peak hour and B for the P.M. peak hour.

Below is a summary of the existing and proposed LOS at both intersections.

LOS Delay range for "D": 35 to 55

Peak Period	YORBA LINDA BOULEVARD AT IMPERIAL HIGHWAY			
	Existing		Proposed	
	ICU – Capacity (%)	Delay (Seconds)	ICU – Capacity (%)	Delay (Seconds)
A.M.	C – 70.6	D – 42.9	B – 63.4 / 63.4 (RTOV)	D – 36.9 / 37.5 (RTOV)
P.M.	E – 84.5	D - 51.9	D – 73.9 / 73.9 (RTOV)	D – 41.6 / 42.2 (RTOV)
Peak Period	**YORBA LINDA BOULEVARD AT LAKEVIEW AVENUE**			
	Existing		**Proposed**	
	ICU – Capacity (%)	**Delay (Seconds)**	**ICU – Capacity (%)**	**Delay (Seconds)**
A.M.	B – 62.9	D – 44.4	B – 56.7	D – 41.2
P.M.	C – 67.9	D – 44.5	B – 63.4	D – 41.2

CONCLUSION

Based on the simulations provided by SYNCHRO, the Imperial Highway intersection addition of the separate right turn and dual left turn lanes in the east and west-bound directions does reduce the overall intersection ICU LOS from "C" in the AM peak hour to "B" and "E" in the PM peak hour to "D".

The SYNCHRO model for the Lakeview Avenue intersection shows that removing the left turn gap and adding dual left turn in both the east and west-bound direction remains at ICU LOS "B" in the AM peak hour and reduces from "C" to "B" in the PM peak hour.

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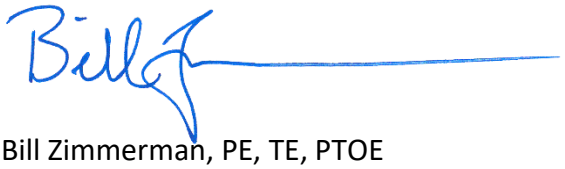
Please call me at (657) 845-9500 should you have any questions regarding this analysis.

Sincerely,



Bill Zimmerman, PE, TE, PTOE
President

WGZE

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