



## MEMORANDUM

**DATE:** September 19, 2017

**TO:** **Sergeant Melvin Oania,**  
**Sacramento County Sheriff's Department**

**FROM:** Cameron Shew, PE, TE  
DKS Associates

**SUBJECT:** Sacramento Automated Red Light Enforcement Audit  
P#17143--000



The purpose of this memorandum is to document the findings of an independent engineering audit of the automated red light enforcement (ARLE) program. DKS Associates (DKS) was hired to ensure that all yellow change intervals for photo-enforced approaches have been programmed in compliance with California Vehicle Code (CVC)<sup>1</sup> and California Manual on Uniform Traffic Control Devices (CA MUTCD)<sup>2</sup>. DKS performed a field review at each location during the week of August 21, 2017. The field review verified that warning signs, striping, and the placement of signal poles and signal heads were in compliance with the CA MUTCD, and observed if any other environmental or geometric conditions were present that might impede a driver's ability to see the traffic signal indication and react appropriately.

## BACKGROUND

This audit reviewed 23 signalized intersections, with automated enforcement on a total of 25 approaches (two intersections had two enforced approaches). **Figure 1** shows all existing ARLE locations in the City of Sacramento and the unincorporated County of Sacramento. As shown in **Table 1**, 13 of these intersections are located in unincorporated Sacramento County, and 10 of these intersections are located in the City of Sacramento. An additional intersection (Auburn Boulevard and Garfield Avenue) in the unincorporated county has photo enforcement equipment, but that system is currently non-operational and not covered under this audit.

The City of Sacramento first implemented automated red light enforcement in 1999, with the County starting their program in 2001. In 2003, the Sacramento County Sheriff's Department took over management of both the

<sup>1</sup> See California Vehicle Code Section 21455.5 (last amended in 2012, effective January 1, 2013) and Section 21455.7 (last amended in 2015, effective January 1, 2016).

<sup>2</sup> See California Manual on Uniform Traffic Control Devices, 2014 Edition Revision 2 (April 7, 2017).



City and County’s programs. The current program operates as a partnership between the Sacramento County Sheriff’s Department (SSD), the California Highway Patrol (CHP), the County of Sacramento, and the City of Sacramento. The Sheriff’s Department has an agreement with Redflex Traffic Systems (Redflex) to install and maintain the automated enforcement equipment. Redflex is paid a fixed amount for installation and maintenance. Redflex’s fees are not based on the number of citations generated, or as a percentage of the revenue generated, in compliance with CVC Section 21455.5(h).

**TABLE 1: LOCATIONS WITH EXISTING AUTOMATED RED LIGHT ENFORCEMENT SYSTEMS**

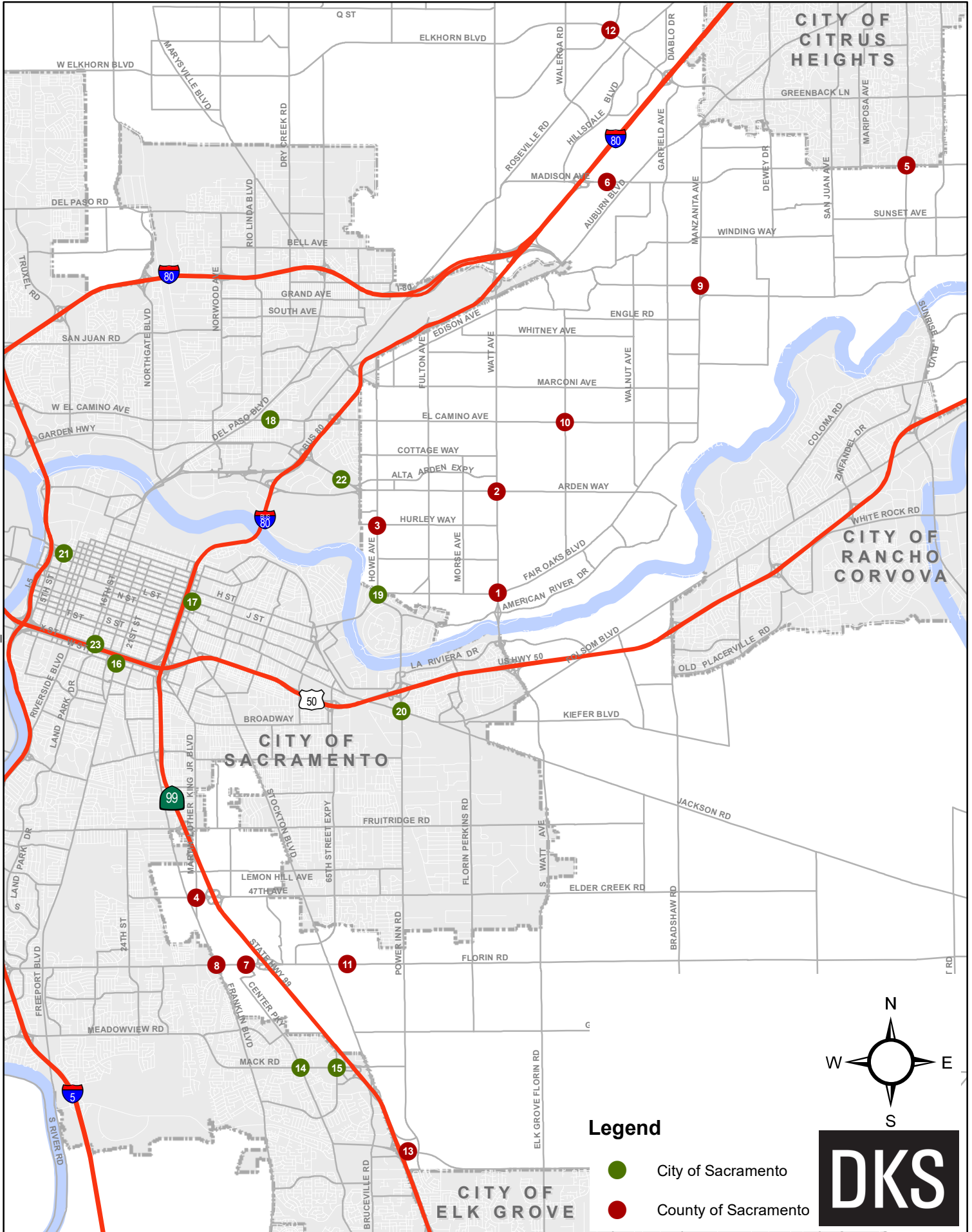
Intersection No.	Jurisdiction	Intersection	Enforced Approach
1	County	Watt Avenue & Fair Oaks Boulevard	NB
			WB
2	County	Watt Avenue & Arden Way	EB
3	County	Howe Avenue & Hurley Way	NB
4	County	Martin Luther King Blvd & 47th Avenue	WB
5	County	Madison Avenue & Sunrise Blvd	EB
6	County	Madison Avenue & Date Avenue	WB
7	County	Florin Road & East Pkwy	EB
8	County	Florin Road & Franklin Blvd	WB
9	County	Manzanita Avenue & Cypress Avenue	SB
10	County	El Camino Avenue & Eastern Avenue	EB
11	County	Florin Road & Lindale Drive	EB
12	County	Elkhorn Blvd & Don Julio Drive	EB
13	County	Hwy 99 NB Off-Ramp & Calvine Road	EB
14	City	Mack Road & Center Pkwy	EB
15	City	Mack Road & Valley Hi Drive/La Mancha Way	WB
16	City	21st St & Broadway	WB
17	City	Alhambra Street & J Street	EB
18	City	El Camino Avenue & Evergreen Street	EB
19	City	Howe Avenue & Fair Oaks Blvd	EB
			SB
20	City	Folsom Blvd & Power Inn Road/Howe Avenue	SB
21	City	5th Street & I Street	WB
22	City	Arden Way & Challenge Way	EB
23	City	16th Street & W Street	NB

Note: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound

# Figure 1

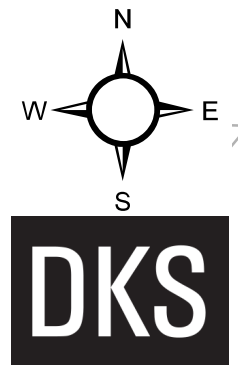
## Map of ARLE Locations

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### Legend

- City of Sacramento
- County of Sacramento





## LEGISLATION

Automated red light enforcement is authorized by CVC Section 21455.5, which also defines a number of requirements for the ARLE system, including:

- Establishing guidelines for the selection of ARLE locations
- Ensuring that the equipment is regularly inspected
- Certifying that the equipment is properly installed and calibrated, and is operating properly
- Provided at least the minimum yellow light change interval, in accordance with the CA MUTCD
- Overseeing the establishment or change of signal phases and the timing thereof
- Warning signs posted within 200 feet of an intersection for all approaches that are photo enforced
- Regularly inspecting and maintaining warning signs

## GUIDELINES

CVC Section 21455.5 requires that a government agency operating an ARLE program develop guidelines for the selection of ARLE locations. The joint program involving both the City and County of Sacramento, and operated by the Sacramento County Sheriff's Department, has developed such guidelines. Candidate locations are identified based on collision data from the Statewide Integrated Traffic Records System (SWITRS), law enforcement and public input, and input from the City of Sacramento Public Works Department or the Sacramento County Department of Transportation. Both agencies maintain a database of candidate locations for ARLE deployment, based on a high frequency of collisions involving red light running. Once an intersection is flagged as a concern, detailed collision data is analyzed to determine if the crashes would be susceptible to correction by an ARLE system. If a high number of crashes identify red light violations as the primary collision factor (PCF), Redflex will be authorized to conduct a 12-hour video survey of the intersection. The video is reviewed to determine the frequency and severity of violations occurring on a typical day. The City or County transportation department is then contacted to determine if any other countermeasures should be considered. If installation of the ARLE system is the preferred countermeasure, the recommendation is forwarded to the program stakeholders (City DOT, County DOT, CHP, and Sacramento Sheriff) for final approval.

## INSPECTION AND CALIBRATION

Redflex is responsible for ensuring that the equipment is regularly inspected, and certifying that the equipment is properly installed and calibrated, and is operating properly. Under CVC Section 21455.5, both of these functions are authorized to be contracted out to the manufacturer or supplier of the automated traffic enforcement system. Redflex technicians conduct monthly maintenance of each ARLE system, including verifying proper operation of the loops, cameras, and communication systems. The Sacramento County Sheriff's deputies and California Highway Patrol officers who issue citations also conduct periodic reviews of the intersections, and have the capability to remotely monitor the video feeds.



## MINIMUM YELLOW CHANGE INTERVALS

The standard for minimum yellow change intervals is defined by the CA MUTCD Section 4D.26:

*A yellow change interval should have a **minimum duration of 3 seconds** and a **maximum duration of 6 seconds**. The minimum yellow change interval for **through** traffic movement shall be determined by using the 85th percentile speed of free-flow traffic rounded up to the next 5 mph increment. Where the posted or prima facie speed limit is higher than the rounded value, use the posted or prima facie speed limit for determination of the minimum yellow change interval for the through traffic movement. See Table 4D-102(CA) sub-heading “a”*

The minimum yellow change interval for a protected **left turn** phase is 3.0 seconds. (Note that the values in Table 4D-102(CA)(a) are only applied to through movements.) However, both the City and the County provide a minimum 3.5 second interval for left turn phases, exceeding the State-required minimum.

The minimum yellow times for **through** movements are based on the 85th percentile speed (as measured through speed surveys) and the values in Table 4D-102(CA)(a), which are reproduced below in **Table 2**. If 85th percentile speed data is not available, the CA MUTCD provides a procedure by which the 85th percentile speed can be estimated from the posted speed limit, using the values in Table 4D-102(CA)(b). However, since both the City and County have field-measured 85th percentile speed data, Table 4D-102(CA)(b) does not apply.

The City of Sacramento uses the rounded-up 85th percentile speed as a minimum. The County uses the rounded-up 90th percentile speed as a minimum, which results in even longer yellow intervals than the State-required minimums. Exceeding the minimum required yellow time is allowed per CVC 21455.7(c), and is more favorable to the driver in the event of a potential violation. Both the City and the County provide longer yellow intervals than the required minimums at some locations, based on engineering judgment and field conditions.

**TABLE 2: MINIMUM YELLOW INTERVALS**

SPEED (Determined by 85th Percentile Speed)	MINIMUM YELLOW INTERVAL
mph	Seconds
25 or less	3.0
30	3.2
35	3.6
40	3.9
45	4.3
50	4.7
55	5.0
60	5.4
65	5.8

Source: CA MUTCD, Table 4D-102(CA) (a)



**Table 3** shows the minimum yellow change intervals that are required at each intersection, per the CA MUTCD. Both the City and County provided DKS with their most recent speed surveys, from which the posted speed limit, 85th percentile speed, and 90th percentile speed (for the County only) were noted. For each enforced approach, the minimum yellow time required under the provisions of CVC 21455.7 was determined by DKS in the “State Minimum Yellow” column. This is 3.0 seconds for a left turn phase, or based on the 85th percentile speed for the through phase.

The City and the County provided DKS with their most recent signal timing sheets, which show how the signal controller is programmed. The yellow change interval programmed in the signal controller is shown in the “Programmed Yellow” column. This value must equal or exceed the State minimum yellow. All of the City and County signals meet or exceed the yellow change interval requirements per CVC 21455.7.

Red-clearance intervals refer to a period of time after the yellow signal indication for a phase has turned red, and before the next conflicting signal indication turns green. Red clearance is not required by the CA MUTCD, but is sometimes utilized as an additional safety buffer against red light violators. While not relevant to this audit, red clearance times are provided for informational purposes.

## **RIGHT TURNS ON RED (RTOR)**

Unless otherwise posted, it is legal to make a right turn on red after coming to a full and complete stop behind the limit line. Automated enforcement is present for most of the right turn movements on the enforced approaches. That is, if a driver does not come to a full and complete stop before turning right on a red signal indication, a citation may be issued. None of the enforced approaches have a separate right turn phase (i.e. a green right turn arrow). Therefore, the yellow interval provided for enforced right turn movements is the same as the yellow interval for the corresponding through movement. Since the yellow intervals are based off of the 85th percentile speed for through traffic, and right turns are made at a slower speed than through traffic, the yellow intervals provided for right turning traffic are adequate and meet the State-required minimum.

## **SIGNAL TIMING**

The City of Sacramento Public Works Department and the Sacramento County Department of Transportation (SACDOT) are responsible for overseeing signal timing in their respective jurisdictions. Both agencies regularly review their signal phasing and timing, and make adjustments when warranted. Signal timing is typically adjusted in response to changes in traffic volumes, traffic speeds, new development, changes in the roadway network, or to better accommodate bicyclists and pedestrians.



**TABLE 3: MINIMUM YELLOW CHANGE INTERVALS**

No.	Agency	Intersection	Enforced Approach	Speed			Enforced Movement(s)		State Minimum Yellow	Programmed Yellow	All-Red (Optional)
				Posted	85th	90th	Direction	Phase			
1	County	Watt Avenue & Fair Oaks Boulevard	NB	40	60	60	NBL	1	3.0	3.5	2.0
							NBT/NBR	6	5.4	5.4	1.1
			WB				WBL	7	3.0	3.5	2.0
							WBT/WBR	4	5.0	5.0	1.0
2	County	Watt Avenue & Arden Way	EB	40	50	50	EBL	3	3.0	3.5	2.0
							EBT/EBR	8	4.7	4.8	0.9
3	County	Howe Avenue & Hurley Way	NB	40	50	50	NBL	1	3.0	3.5	2.0
							NBT/NBR	6	4.7	4.8	0.5
4	County	Martin Luther King Blvd & 47th Avenue	WB	40	50	55	WBL	5	3.0	3.5	1.9
							WBT	2	4.7	5.0	0.2
5	County	Madison Avenue & Sunrise Blvd	EB	45	55	55	EBL	3	3.0	3.5	2.0
							EBT/EBR	8	5.0	5.0	1.1
6	County	Madison Avenue & Date Avenue	WB	45	45	50	WBL	5	3.0	3.5	1.1
							WBT/WBR	2	4.3	4.8	0.0
7	County	Florin Road & East Pkwy	EB	40	40	40	EBT/EBR	6	3.9	4.6	0.0
8	County	Florin Road & Franklin Blvd	WB	40	50	50	WBL	5	3.0	3.5	1.6
							WBT/WBR	2	4.7	4.8	0.6
9	County	Manzanita Avenue & Cypress Avenue	SB	40	45	45	SBT/SBR	2	4.3	4.6	0.0
10	County	El Camino Avenue & Eastern Avenue	EB	40	50	50	EBL	1	3.0	3.5	1.6
							EBT/EBR	6	4.7	4.8	0.3
11	County	Florin Road & Lindale Drive	EB	40	50	55	EBL	1	3.0	3.5	1.6
							EBT/EBR	6	4.7	5.0	0.6
12	County	Elkhorn Blvd & Don Julio Drive	EB	45	55	55	EBL	1	3.0	3.5	2.0
							EBT/EBR	6	5.0	5.0	0.2



No.	Agency	Intersection	Enforced Approach	Speed			Enforced Movement(s)		State Minimum Yellow	Programmed Yellow	All-Red (Optional)
				Posted	85th	90th	Direction	Phase			
13	County	Hwy 99 NB Off-Ramp & Calvine Road	EB	45	50	50	EBT	6	4.7	4.7	0.0
14	City	Mack Road & Center Pkwy	EB	45	50		EBL	5	3.0	3.5	0.1
							EBT/EBR	2	4.7	4.7	0.5
15	City	Mack Road & Valley Hi Drive/La Mancha Way	WB	45	50		WBL	5	3.0	3.5	1.3
							WBT/WBR	2	4.7	4.7	1.0
16	City	21st St & Broadway	WB	25	35		WBL	5	3.0	3.6	0.0
							WBT/WBR	2	3.6	3.6	0.0
17	City	Alhambra Street & J Street	EB	30	35		EBL/EBT/EBR	1	3.6	3.7	0.0
18	City	El Camino Avenue & Evergreen Street	EB	35	40		EBL	1	3.0	3.5	0.0
							EBT/EBR	5	3.9	3.9	0.5
19	City	Howe Avenue & Fair Oaks Blvd	EB	40	45		EBL	1	3.0	3.5	1.0
							EBT/EBR	6	4.3	4.3	0.7
			SB	40	45		SBL	7	3.0	3.5	0.5
							SBT	4	4.3	4.3	0.7
20	City	Folsom Blvd & Power Inn Road/Howe Avenue	SB	40	45		SBL	3	3.0	3.5	1.9
							SBT	8	4.3	4.3	1.0
21	City	5th Street & I Street	WB	25	30		WBT/WBR	4	3.2	3.5	0.0
22	City	Arden Way & Challenge Way	EB	40	45		EBL	2	3.0	3.5	1.2
							EBT/EBR	6	4.3	4.3	0.4
23	City	16th Street & W Street	NB	30	40		NBL/NBT	4	3.9	3.9	0.0

Note: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, T = Through, L = Left Turn, R = Right Turn





## VERIFICATION OF PROGRAMMED YELLOW TIMES

To ensure that the yellow intervals shown in the traffic signal timing sheets are operating correctly in the field, DKS requested data from Redflex for all red light running incidents on July 31, 2017, as well as supplemental data from earlier in 2017. Redflex's system measures the length of time during which yellow signal face is illuminated; this measurement is independent of the signal controller. The mean and standard deviation of the measured yellow times were computed, and compared to the programmed yellow time. In all cases, the actual measured yellow times meet or exceed the programmed yellow times, as shown in **Table 4**.

**TABLE 4: VERIFICATION OF PROGRAMMED YELLOW TIMES**

No.	Agency	Intersection	Enforced Approach	Enforced Movement(s)		Programmed Yellow	Measured Yellow	Std. Dev.
				Direction	Phase			
1	County	Watt Avenue & Fair Oaks Boulevard	NB	NBL	1	3.5	3.52	0.000
				NBT/NBR	6	5.4	5.43	0.009
			WB	WBL	7	3.5	3.51	0.007
				WBT/WBR	4	5.0	5.04	0.007
2	County	Watt Avenue & Arden Way	EB	EBL	3	3.5	3.55	0.004
				EBT/EBR	8	4.8	4.84	0.005
3	County	Howe Avenue & Hurley Way	NB	NBL	1	3.5	3.52	0.008
				NBT/NBR	6	4.8	4.82	0.007
4	County	Martin Luther King Blvd & 47th Avenue	WB	WBL	5	3.5	3.52	0.000
				WBT	2	5.0	5.03	0.005
5	County	Madison Avenue & Sunrise Blvd	EB	EBL	3	3.5	3.53	0.011
				EBT/EBR	8	5.0	5.03	0.005
6	County	Madison Avenue & Date Avenue	WB	WBL	5	3.5	3.52	0.005
				WBT/WBR	2	4.8	4.84	0.005
7	County	Florin Rd & East Pkwy	EB	EBT/EBR	6	4.6	*	*
8	County	Florin Road & Franklin Blvd	WB	WBL	5	3.5	3.52	0.007
				WBT/WBR	2	4.8	4.83	0.013
9	County	Manzanita & Cypress	SB	SBT/SBR	2	4.6	4.65	0.010
10	County	El Camino Avenue & Eastern Avenue	EB	EBL	1	3.5	3.51	0.005
				EBT/EBR	6	4.8	4.82	0.008
11	County	Florin Road & Lindale Drive	EB	EBL	1	3.5	3.52	0.000
				EBT/EBR	6	5.0	5.02	0.000
12	County	Elkhorn Blvd & Don Julio Drive	EB	EBL	1	3.5	3.52	0.006
				EBT/EBR	6	5.0	5.01	0.004
13	County	Hwy 99 NB Off-Ramp & Calvine Road	EB	EBT	6	4.7	4.71	0.008



No.	Agency	Intersection	Enforced Approach	Enforced Movement(s)		Programmed Yellow	Measured Yellow	Std. Dev.
14	City	Mack Road & Center Pkwy	EB	EBL	5	3.5	3.55	0.000
				EBT/EBR	2	4.7	4.75	0.005
15	City	Mack Rd & Valley Hi Dr/La Mancha Way	WB	WBL	5	3.5	3.52	0.009
				WBT/WBR	2	4.7	4.72	0.006
16	City	21st St & Broadway	WB	WBL	5	3.6	3.74	0.006
				WBT/WBR	2	3.6	3.72	0.010
17	City	Alhambra Street & J Street	EB	EBL/EBT/EBR	1	3.7	3.73	0.005
18	City	El Camino Avenue & Evergreen Street	EB	EBL	1	3.5	3.55	0.000
				EBT/EBR	5	3.9	3.95	0.003
19	City	Howe Avenue & Fair Oaks Blvd	EB	EBL	1	3.5	3.55	0.004
				EBT/EBR	6	4.3	4.35	0.005
			SB	SBL	7	3.5	3.51	0.004
				SBT	4	4.3	4.32	0.005
20	City	Folsom Blvd & Power Inn Rd/Howe Avenue	SB	SBL	3	3.5	3.53	0.038
				SBT	8	4.3	4.31	0.006
21	City	5th Street & I Street	WB	WBT/WBR	4	3.5	3.52	0.005
22	City	Arden Way & Challenge Way	EB	EBL	2	3.5	3.51	0.007
				EBT/EBR	6	4.3	4.31	0.005
23	City	16th Street & W Street	NB	NBL/NBT	4	3.9	3.92	0.006

Note: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, T = Through, L = Left Turn

\* The programmed yellow was increased from 4.3 to 4.6 seconds on August 31, 2017. Both the previous and current yellow change intervals meet or exceed the requirements of CVC 21455.7 and the CA MUTCD.

## FIELD REVIEW

DKS performed a field review at each location during the week of August 21, 2017. Per a request from the Sacramento County Sheriff's Department, the field review checked the following elements:

- Advance Warning Signs: Was a SR-56(CA) sign posted in advance of the intersection?
- Distance to Sign: How far in advance of the limit line was the sign posted?
- Warning Sign on Signal Pole: Was a SR-56(CA) sign posted on the traffic signal pole?
- Curves: Is there a significant horizontal or vertical curve with the potential to obstruct signal visibility?
- Signal Visibility: Does approaching traffic have a continuous view of at least two signal faces for the minimum sight distance shown in MUTCD Table 4D-2?
- Lateral Position of Signal Faces: Do signal faces meet the lateral position requirements in the CA MUTCD Section 4D.13 (20 degree cone of vision)?



- Longitudinal Position: Do signal faces meet the longitudinal position requirements in the CA MUTCD Section 4D.14 (40-180 feet from the stop line)?
- Lateral Offset: Do signal faces meet the lateral offset requirements in the CA MUTCD Section 4D.16 (2 feet from curb/shoulder)?
- Recommended Number and Location of Signal Faces: Does the number and location of primary through signal faces on each approach meet the recommendations in the CA MUTCD Table 4D-1?
- Condition of pavement markings: Are pavement markings (especially the stop bar) in good condition, and visible to approaching drivers?
- Condition of loops: Do the loops used for the photo enforcement system appear to be in good condition (free of obvious damage)?

Field review data is summarized in **Table 5**. A superscript note is added where there are potential opportunities for improvement. Locations recommended for improvements are discussed below and shown in **Figure 2**.

### **SR-56(CA) Warning Signs**

CVC 21455.5(a)(1) requires that a SR-56(CA) sign be posted within 200 feet of the intersection and visible to approaching traffic. It is not specified where this sign should be posted, and signs were noted to be posted both in advance of the intersection (on the side of the roadway), and on the traffic signal pole itself. Of the 25 enforced approaches, 22 approaches have an advance warning sign (posted on the side of the road, on the block approaching the signal), and 5 of the 25 approaches had a warning sign posted on traffic signal pole itself.

While both types of locations (advance signs and on the pole) meet the CVC requirements, it is recommended to install advance signs on every photo-enforced approach for consistency, to increase driver awareness, and further deter red light running. It is noted to be a common practice in the Sacramento region to install advance warning signs on non-photo enforced approaches at ARLE intersections to promote awareness of the program and deter red light running.

#### ***Recommendations***

1. **Florin Road & Lindale Drive, Signing** – Consider providing a SR-56(CA) warning sign within 200 feet upstream of the stop bar on the eastbound Florin Road approach to Lindale Drive. A new sign post will likely be required.
2. **Hwy 99 NB Off-Ramp & Calvine Road, Signing** – Consider providing a SR-56(CA) warning sign within 200 feet upstream of the stop bar on the eastbound Calvine Road approach to the SR-99 Northbound Off-Ramp signal. A luminaire pole located 180 feet from the stop bar appears to be a suitable location.
3. **El Camino Avenue & Evergreen Street, Signing** – Consider providing a SR-56(CA) warning sign within 200 feet upstream of the stop bar on the eastbound El Camino Avenue approach to Evergreen Drive. There is currently a non-standard sign similar to an SR-58(CA) located approximately 120 feet from the stop bar. It is recommended to remove the non-standard sign, and replace it with an SR-56(CA) sign on the same pole.



**TABLE 5: FIELD REVIEW DATA**

No.	Agency	Intersection	Enforced Approach	Field Review										
				Date	Advance Warning Sign	Distance to Sign	Warning Sign on Signal Pole	Lateral Position Compliant	Longitudinal Position Compliant	Lateral Offset Compliant	Curve	Adequate Sight Distance for Signal Visibility	Pavement Markings in Good Condition	Loops in Good Condition
1	County	Watt Avenue & Fair Oaks Boulevard	NB	8/21/2017	Yes	130	No	Yes	Yes	Yes	No	No <sup>4</sup>	Yes	Yes
			WB		Yes	125	No	Yes	Yes	Yes	No	Yes	Yes	Yes
2	County	Watt Avenue & Arden Way	EB	8/22/2017	Yes	70	No	Yes	Yes	Yes	No	Yes	Yes	Yes
3	County	Howe Avenue & Hurley Way	NB	8/23/2017	Yes	165	No	Yes	Yes	Yes	No	Yes	Yes	Yes
4	County	Martin Luther King Blvd & 47th Avenue	WB	8/24/2017	Yes	185	No	Yes	Yes	Yes	No	Yes	Yes	Yes
5	County	Madison Avenue & Sunrise Blvd	EB	8/24/2017	Yes	160	No	Yes	Yes	Yes	No	Yes	Yes	Yes
6	County	Madison Avenue & Date Avenue	WB	8/23/2017	Yes	165	No	Yes	Yes	Yes	No	Yes	Yes	Yes
7	County	Florin Road & East Pkwy	EB	8/24/2017	Yes	100	No	Yes	Yes	Yes	No	Yes	Yes	Yes
8	County	Florin Road & Franklin Blvd	WB	8/24/2017	Yes	155	No	Yes	Yes	Yes	No	Yes	Yes	Yes
9	County	Manzanita Avenue & Cypress Avenue	SB	8/23/2017	Yes	50	No	Yes	Yes	Yes	No	Yes	Yes	Yes
10	County	El Camino Avenue & Eastern Avenue	EB	8/23/2017	Yes	85	No	Yes	Yes	Yes	No	No <sup>5</sup>	Yes	Yes
11	County	Florin Road & Lindale Drive	EB	8/24/2017	No <sup>1</sup>		Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
12	County	Elkhorn Blvd & Don Julio Drive	EB	8/23/2017	Yes	170	No	Yes	Yes	Yes	Yes	No <sup>6</sup>	Yes	Yes
13	County	Hwy 99 NB Off-Ramp & Calvine Road	EB	8/24/2017	No <sup>2</sup>		Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
14	City	Mack Road & Center Pkwy	EB	8/24/2017	Yes	195	No	Yes	Yes	Yes	No	Yes	Yes	Yes
15	City	Mack Road & Valley Hi Drive/La Mancha Way	WB	8/24/2017	Yes	155	No	Yes	Yes	Yes	No	Yes	Yes	Yes



No.	Agency	Intersection	Enforced Approach	Field Review										
				Date	Advance Warning Sign	Distance to Sign	Warning Sign on Signal Pole	Lateral Position Compliant	Longitudinal Position Compliant	Lateral Offset Compliant	Curve	Adequate Sight Distance for Signal Visibility	Pavement Markings in Good Condition	Loops in Good Condition
16	City	21st St & Broadway	WB	8/28/2017	Yes	130	No	Yes	Yes	Yes	No	Yes	Yes	Yes
17	City	Alhambra Street & J Street	EB	8/21/2017	Yes	120	No	Yes	Yes	Yes	No	Yes	Yes	Yes
18	City	El Camino Avenue & Evergreen Street	EB	8/28/2017	No <sup>3</sup>	120	Yes	Yes	Yes	Yes	No	Yes <sup>7</sup>	Yes	Yes
19	City	Howe Avenue & Fair Oaks Blvd	EB	8/21/2017	Yes	90	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
			SB		Yes	75	No	Yes	Yes	Yes	No	Yes	Yes	Yes
20	City	Folsom Blvd & Power Inn Road/Howe Avenue	SB	8/21/2017	Yes	100	No	Yes	Yes	Yes	No	Yes	Yes	Yes
21	City	5th Street & I Street	WB	8/28/2017	Yes	175	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
22	City	Arden Way & Challenge Way	EB	8/28/2017	Yes	125	No	Yes	Yes	Yes	No	Yes	Yes	Yes
23	City	16th Street & W Street	NB	8/28/2017	Yes	35	No	Yes	Yes	Yes	No	Yes	Yes	Yes

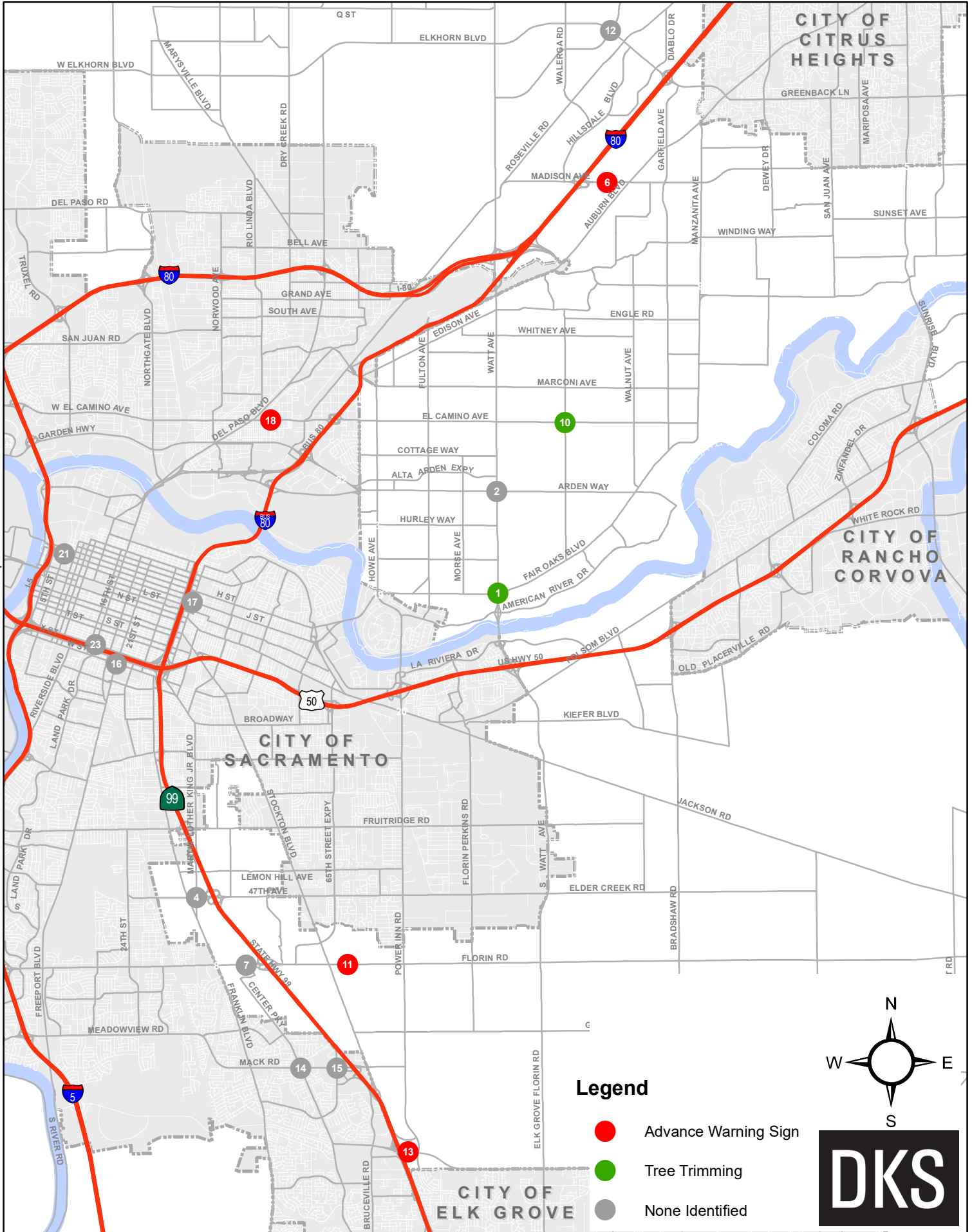
<sup>1,2,3</sup> See page 11 for recommendations 1-3.

<sup>4,5,6</sup> See pages 15 and 16 for recommendations 4-6.

<sup>7</sup> Based on the 85th percentile speed of 40 mph, Table 4D-2 identifies a need for 390 feet of continuous signal visibility. Approximately 280 feet of sight distance is available at this location, with the obstruction from the business sign. It should be noted that the distances in Table 4D-2 are derived from the stopping sight distance, plus an assumed queue length for a short signal cycle. Table 4D-101(CA) indicates that for 40 mph, 230 feet is required for a driver to perceive the yellow and decelerate to a stop. Long queues were not observed at this location and the 50 second maximum green programmed for the eastbound through movement generally clears all queues before gapping out. Therefore, the City has determined sight distances identified in Table 4D-2 to be longer than apply for this location and the available sight distance provides adequate signal visibility

# Figure 2 Recommended Improvements

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## Sight Distance

The CA MUTCD Section 4D.12 states that drivers should have a continuous view of at least two signal faces for the minimum sight distance shown in MUTCD Table 4D-2, which is shown below in **Table 6**. This range of continuous visibility should be provided unless precluded by a physical obstruction. Obstructions can include horizontal or vertical curves, or roadside objects such as trees, shrubs, and signs. If approaching traffic does not have a continuous view of at least two signal faces for the minimum sight distance shown in Table 4D-2, obstructions should be removed, if practical, or a sign should be installed to warn approaching drivers of the traffic signal.

**TABLE 6: MINIMUM SIGHT DISTANCE FOR SIGNAL VISIBILITY (CA MUTCD TABLE 4D-2)**

85th-Percentile Speed	Minimum Sight Distance (feet)
20	175
25	215
30	270
35	325
40	390
45	460
50	540
55	625
60	715

Source: CA MUTCD, Table 4D-2

### Recommendations

- 4. Watt Avenue & Fair Oaks Boulevard, Tree Trimming** – The 85th percentile speed of 60 mph on Watt Avenue requires a sight distance of 715 feet. This is near where the ramp from American River Drive merges into Watt Avenue. From this distance, only the one overhead-mounted signal face is visible from the right lane. Foliage obscures the line of sight to the second primary face on the side of the signal pole. It is recommended to trim the portion of the trees within the public right of way to improve the sight line. Furthermore, Table 4D-1 (discussed in the next section) recommends that two overhead-mounted through signal faces be provided on a three lane approach, if the signal were to be reconstructed. If an additional overhead signal face were provided, the sight distance requirement would likely be met regardless of roadside trees.
- 5. El Camino Avenue & Eastern Avenue, Tree Trimming** – The 85th percentile speed of 50 mph on El Camino Avenue requires a sight distance of 540 feet. This is near the easterly curb return with Cathay Way. From this distance, only the one overhead-mounted signal face is visible from the right lane. The line of sight to both the second primary signal face (on the side of the signal pole) and the supplemental signal face (on the near side corner) is obstructed by trees overhanging the sidewalk. It is recommended to trim the portion of the trees within the public right of way in improve the sight line.



6. **Elkhorn Blvd & Don Julio Drive, Warning Sign** – The 85th percentile speed of 55 mph on Elkhorn Boulevard requires a sight distance of 625 feet. This point is located along a horizontal curve. From this distance, only the supplemental signal face on the northwest corner (mounted to the westbound signal pole) is visible from the right lane. The line of sight is obstructed by trees, a wall, and residential structures. There are no practical improvements that can be made to improve the sight line without severely impacting residential properties. Therefore, it is recommended to install a W3-3 sign in accordance with CA MUTCD Section 2C.36.

## Number and Location of Signal Faces

The CA MUTCD Section 4D.11 provides recommendations for the number and location of signal faces at intersections with high speeds and excessive red light violations.

*If the posted or statutory speed limit or the 85th-percentile speed on an approach to a signalized location is **45 mph or higher**, signal faces should be provided as follows for **new or reconstructed** signal installations, where there is a **documented pattern of excessive red signal violations** (see Figure 4D-3):*

- A. *The minimum number and location of primary (non-supplemental) signal faces for through traffic should be provided in accordance with Table 4D-1. [Table 7]*
- B. *If the number of overhead primary signal faces for through traffic is equal to the number of through lanes on an approach, one overhead signal face should be located approximately over the center of each through lane.*
- C. *Except for shared left-turn and right-turn signal faces, any primary signal face required by Sections 4D.17 through 4D.25 for an exclusive turn lane should be located overhead approximately over the center of each exclusive turn lane.*
- D. *All primary signal faces should be located on the far side of the intersection.*
- E. *In addition to the primary signal faces, one or more supplemental pole-mounted or overhead signal faces should be considered to provide added visibility for approaching traffic that is traveling behind large vehicles.*
- F. *All signal faces should have backplates.*

The ARLE locations were reviewed, considering the recommendations in Section 4D.11. While all locations have a documented pattern of excessive red signal violations, the recommendations of Table 4D-1 (Table 7 in this document) are only applied to locations with an 85th percentile speed at or above 45 mph. These recommendations need not be implemented immediately, but should be considered if the signal is reconstructed.





**TABLE 7: RECOMMENDED MINIMUM NUMBER OF PRIMARY SIGNAL FACES FOR THROUGH TRAFFIC ON APPROACHES WITH POSTED, STATUTORY, OR 85TH-PERCENTILE SPEED OF 45 MPH OR HIGHER (CA MUTCD TABLE 4D-1)**

Number of Through Lanes on Approach	Total Number of Primary Through Signal Faces for Approach*	Minimum Number of Overhead-Mounted Primary Through Signal Faces for Approach
1	2	1
2	2	1
3	3	2**
4 or more	4 or more	3**

\* A minimum of two through signal faces is always required (See Section 4D.11). These recommended numbers of through signal faces may be exceeded. Also, see cone of vision requirements otherwise indicated in Section 4D.13.

\*\*If practical, all of the recommended number of primary through signal faces should be located overhead.

Source: CA MUTCD, Table 4D-1

**Table 8** shows the number of through signal faces and the number of overhead signal faces at each location. Cells are shaded to show locations where the approach speed is 45 mph or higher and the actual number of signal faces is less than the recommended number. **Figure 3** shows a map of these locations recommended for additional signal faces, if and when the traffic signal is reconstructed. It should be noted that at most of these locations, the signal has been operational for decades. Older poles and mast arms may not be long enough, or structurally capable of handling an increased load. It would then be necessary to remove and replace the entire signal pole. This would be costly, require temporary traffic control, and possibly trigger requirements for ADA upgrades and other improvements. Hence, the CA MUTCD does not require providing the recommended minimum number of signal faces for currently operational signals.

For informational purposes, Table 8 also shows which signals have backplates, and supplemental, near side signal faces. While not required by the CA MUTCD, near side signal faces are helpful for drivers queued behind large vehicles or trucks, which may block the view of far side signal faces.

**Recommendations**

- Multiple Locations, Additional Overhead Through Signal Faces** – The recommended numbers of total through signal faces and overhead through signal faces should be provided at the shaded intersections in Table 8, if these signals are reconstructed.



**TABLE 8: RECOMMENDED MINIMUM NUMBER OF PRIMARY SIGNAL FACES**

No.	Agency	Intersection	Enforced Approach	Recommended Number and Location of Signal Faces							
				85th Percentile Approach Speed	Approach Lanes	No. of Through Signal Faces (Near and Far Side)	Recom. No. of Primary Through Signal Faces	Near Side Signal Face	Backplate	No. of Overhead Through Signal Faces	Recom. No. of Overhead Through Signal Faces
1	County	Watt Avenue & Fair Oaks Boulevard	NB	60	3	3	3	Yes	Yes	1	2
			WB	55	2	3	2	Yes	Yes	1	1
2	County	Watt Avenue & Arden Way	EB	50	2	3	2	Yes	Yes	1	1
3	County	Howe Avenue & Hurley Way	NB	50	3	3	3	Yes	Yes	1	2
4	County	Martin Luther King Blvd & 47th Avenue	WB	50	2	3	2	Yes	Yes	1	1
5	County	Madison Avenue & Sunrise Blvd	EB	55	3	3	3	Yes	Yes	1	2
6	County	Madison Avenue & Date Avenue	WB	45	3	3	3	Yes	Yes	1	2
7	County	Florin Road & East Pkwy	EB	40	3	3	N/A	Yes	Yes	1	N/A
8	County	Florin Road & Franklin Blvd	WB	50	3	3	3	Yes	Yes	1	2
9	County	Manzanita Avenue & Cypress Avenue	SB	45	3	3	3	Yes	Yes	1	2
10	County	El Camino Avenue & Eastern Avenue	EB	50	2	3	2	Yes	Yes	1	1



No.	Agency	Intersection	Enforced Approach	Recommended Number and Location of Signal Faces							
				85th Percentile Approach Speed	Approach Lanes	No. of Through Signal Faces (Near and Far Side)	Recom. No. of Primary Through Signal Faces	Near Side Signal Face	Backplate	No. of Overhead Through Signal Faces	Recom. No. of Overhead Through Signal Faces
11	County	Florin Road & Lindale Drive	EB	50	3	3	3	Yes	Yes	1	2
12	County	Elkhorn Blvd & Don Julio Drive	EB	55	3	5	3	Yes	Yes	2	2
13	County	Hwy 99 NB Off-Ramp & Calvine Road	EB	50	3	4	3	Yes	Yes	2	2
14	City	Mack Road & Center Pkwy	EB	50	2	3	2	Yes	Yes	1	1
15	City	Mack Road & Valley Hi Drive/La Mancha Way	WB	50	2	3	2	Yes	Yes	1	1
16	City	21st St & Broadway	WB	35	2	3	N/A	Yes	No, on Near Side	1	N/A
17	City	Alhambra Street & J Street	EB	35	2	3	N/A	No	Yes	1	N/A
18	City	El Camino Avenue & Evergreen Street	EB	40	2	2	N/A	No	Yes	1	N/A
19	City	Howe Avenue & Fair Oaks Blvd	EB	45	3	4	3	Yes	Yes	1	2
			SB	45	3	3	3	Yes	Yes	1	2
20	City	Folsom Blvd & Power Inn Road/Howe Avenue	SB	45	3	3	3	Yes	Yes	1	2
21	City	5th Street & I Street	WB	30	4	4	N/A	No	Yes	2	N/A

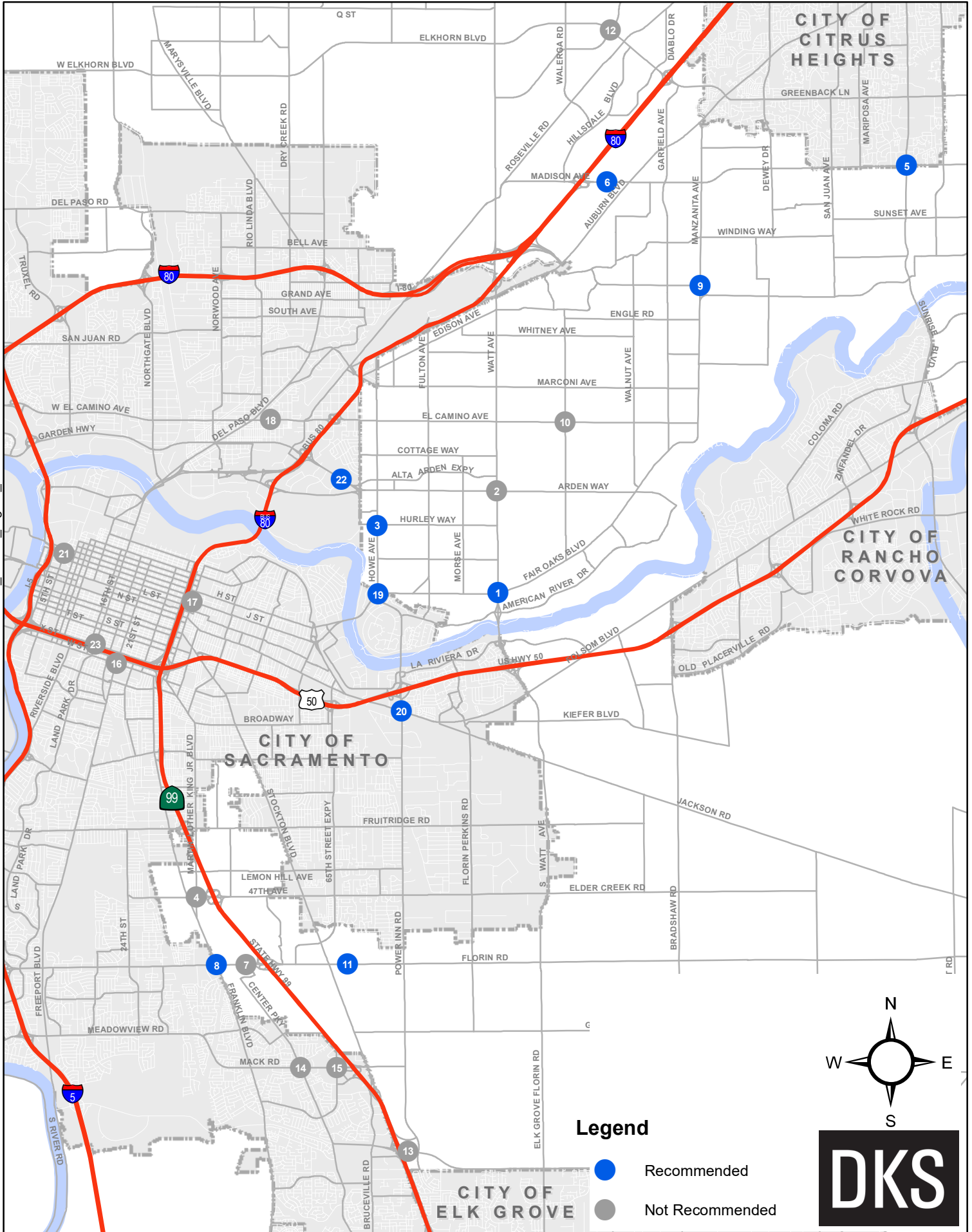


No.	Agency	Intersection	Enforced Approach	Recommended Number and Location of Signal Faces							
				85th Percentile Approach Speed	Approach Lanes	No. of Through Signal Faces (Near and Far Side)	Recom. No. of Primary Through Signal Faces	Near Side Signal Face	Backplate	No. of Overhead Through Signal Faces	Recom. No. of Overhead Through Signal Faces
22	City	Arden Way & Challenge Way	EB	45	4	3	4 or more	Yes	Yes	1	3
23	City	16th Street & W Street	NB	40	3	5	N/A	Yes	Yes	1	N/A

Note: Shaded values indicate recommended improvements that should be implemented if and when the signal is reconstructed.

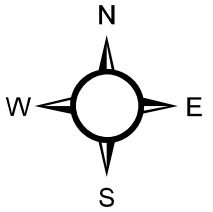
# Figure 3 Locations Recommended for Future Signal Faces

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### Legend

- Recommended
- Not Recommended





## **APPENDIX A: INTERSECTION DATA SHEETS**

## Watt Avenue & Fair Oaks Boulevard

Intersection No:	1	Agency:	County
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Date of Observation:	Monday, August 21, 2017
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### Enforced Direction

#### Northbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	130
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

#### Northbound Thru/Northbound Right

#### Northbound Left

Speed Limit (mph):	40		
85th % Speed (mph):	60		
Min. Yellow (sec):	5.4	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	5.4	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	1.1	Programmed All Red (sec):	2.0

### Enforced Direction

#### Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	125
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

#### Westbound Thru/Westbound Right

#### Westbound Left

Speed Limit (mph):	40		
85th % Speed (mph):	55		
Min. Yellow (sec):	5.0	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	5.0	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	1.0	Programmed All Red (sec):	2.0



# Watt Avenue & Fair Oaks Boulevard

Enforced Direction

Northbound

SR-56(CA) Warning Sign Location



Loops



Enforced Direction

Westbound

SR-56(CA) Warning Sign Location



Loops





# Watt Avenue & Arden Way

Intersection No:	2	Agency:	County
Date of Observation:	Tuesday, August 22, 2017		

## Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	70
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

## Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.8	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.9	Programmed All Red (sec):	2.0

SR-56(CA) Warning Sign Location



Loops



# Howe Avenue & Hurley Way

Intersection No:	3	Agency:	County
Date of Observation:	Wednesday, August 23, 2017		

## Enforced Direction

Northbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	165
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

## Enforced Movement

Northbound Thru/Northbound Right		Northbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.8	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.5	Programmed All Red (sec):	2.0

SR-56(CA) Warning Sign Location



Loops



## Martin Luther King Blvd & 47th Avenue

Intersection No:	4	Agency:	County
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Date of Observation:	Thursday, August 24, 2017
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### Enforced Direction

Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	185
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Westbound Through		Westbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	5.0	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.2	Programmed All Red (sec):	1.9

### SR-56(CA) Warning Sign Location



Loops



DKS

# Madison Avenue & Sunrise Blvd

Intersection No:	5	Agency:	County
Date of Observation:	Thursday, August 24, 2017		

### Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	160
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	45		
85th % Speed (mph):	55		
Min. Yellow (sec):	5.0	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	5.0	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	1.1	Programmed All Red (sec):	2.0

SR-56(CA) Warning Sign Location



Loops



# Madison Avenue & Date Avenue

Intersection No:	6	Agency:	County
Date of Observation:	Wednesday, August 23, 2017		

### Enforced Direction

Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	165
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

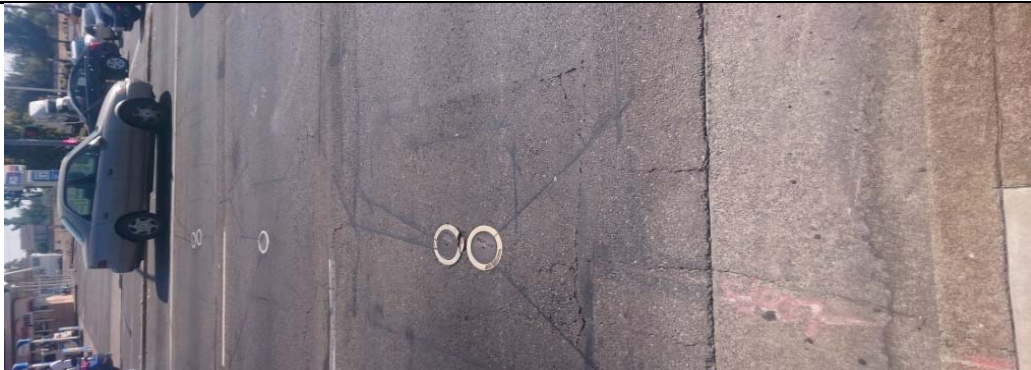
### Enforced Movement

Westbound Thru/Westbound Right		Westbound Left	
Speed Limit (mph):	45		
85th % Speed (mph):	45		
Min. Yellow (sec):	4.3	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.8	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.0	Programmed All Red (sec):	1.1

SR-56(CA) Warning Sign Location



Loops



# Florin Road & East Pkwy

Intersection No:	7	Agency:	County
Date of Observation:	Thursday, August 24, 2017		

## Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	100
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

## Enforced Movement

Eastbound Thru/Right		
Speed Limit (mph):	40	
85th % Speed (mph):	40	
Min. Yellow (sec):	3.9	
Programmed Yellow (sec):	4.6	
Programmed All Red (sec):	0.0	

SR-56(CA) Warning Sign Location



Loops



## Florin Road & Franklin Blvd

Intersection No:	8	Agency:	County
Date of Observation:	Thursday, August 24, 2017		

### Enforced Direction

Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	155
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Westbound Thru/Westbound Right		Westbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.8	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.6	Programmed All Red (sec):	1.6

SR-56(CA) Warning Sign Location



Loops



# Manzanita Avenue & Cypress Avenue

Intersection No:	9	Agency:	County
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Date of Observation:	Wednesday, August 23, 2017
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### Enforced Direction

Southbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	50
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Southbound Thru/Southbound Right

Speed Limit (mph):	40
85th % Speed (mph):	45
Min. Yellow (sec):	4.3
Programmed Yellow (sec):	4.6
Programmed All Red (sec):	0.0

SR-56(CA) Warning Sign Location



Loops





## El Camino Avenue & Eastern Avenue

Intersection No:	10	Agency:	County
Date of Observation:	Wednesday, August 23, 2017		

### Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	85
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.8	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.3	Programmed All Red (sec):	1.6

SR-56(CA) Warning Sign Location



Loops



## Florin Road & Lindale Drive

Intersection No:	11	Agency:	County
Date of Observation:	Thursday, August 24, 2017		

### Enforced Direction

Eastbound

Advance Warning Sign:	No
Distance to Sign (ft):	0
Warning Sign on Signal Pole:	Yes
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	5.0	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.6	Programmed All Red (sec):	1.6

SR-56(CA) Warning Sign Location



Loops



## Elkhorn Blvd & Don Julio Drive

Intersection No:	12	Agency:	County
Date of Observation:	Wednesday, August 23, 2017		

### Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	170
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	45		
85th % Speed (mph):	55		
Min. Yellow (sec):	5.0	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	5.0	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.2	Programmed All Red (sec):	2.0

### SR-56(CA) Warning Sign Location



Loops



DKS

## Hwy 99 NB Off-Ramp & Calvine Road

Intersection No:	13	Agency:	County
Date of Observation:	Thursday, August 24, 2017		

### Enforced Direction

Eastbound

Advance Warning Sign:	No
Distance to Sign (ft):	0
Warning Sign on Signal Pole:	Yes
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Through

Speed Limit (mph):	45	
85th % Speed (mph):	50	
Min. Yellow (sec):	4.7	
Programmed Yellow (sec):	4.7	
Programmed All Red (sec):	0.0	

### SR-56(CA) Warning Sign Location



Loops



DKS

# Mack Road & Center Pkwy

Intersection No:	14	Agency:	City
Date of Observation:	Thursday, August 24, 2017		

## Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	195
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

## Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	45		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.7	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.5	Programmed All Red (sec):	0.1

### SR-56(CA) Warning Sign Location



### Loops



## Mack Road & Valley Hi Drive/La Mancha Way

Intersection No:	15	Agency:	City
Date of Observation:	Thursday, August 24, 2017		

### Enforced Direction

Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	155
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Westbound Thru/Westbound Right		Westbound Left	
Speed Limit (mph):	45		
85th % Speed (mph):	50		
Min. Yellow (sec):	4.7	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.7	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	1.0	Programmed All Red (sec):	1.3

SR-56(CA) Warning Sign Location



Loops



## 21st St & Broadway

Intersection No:	16	Agency:	City
Date of Observation:	Monday, August 28, 2017		

### Enforced Direction

Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	130
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Westbound Thru/Westbound Right		Westbound Left	
Speed Limit (mph):	25		
85th % Speed (mph):	35		
Min. Yellow (sec):	3.6	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	3.6	Programmed Yellow (sec):	3.6
Programmed All Red (sec):	0.0	Programmed All Red (sec):	0.0

### SR-56(CA) Warning Sign Location



### Loops



DKS

# Alhambra Street & J Street

Intersection No:	17	Agency:	City
Date of Observation:	Monday, August 21, 2017		

## Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	120
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

## Enforced Movement

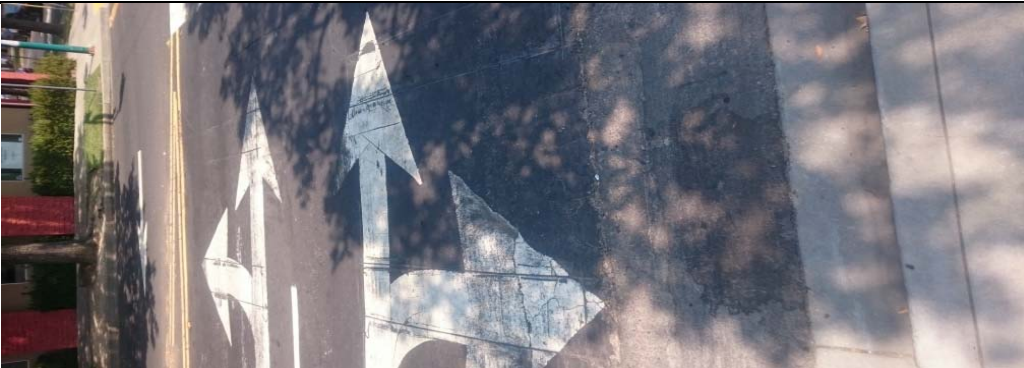
Eastbound Left/Through/Right

Speed Limit (mph):	30	
85th % Speed (mph):	35	
Min. Yellow (sec):	3.6	
Programmed Yellow (sec):	3.7	
Programmed All Red (sec):	0.0	

## SR-56(CA) Warning Sign Location



Loops





# El Camino Avenue & Evergreen Street

Intersection No:	18	Agency:	City
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Date of Observation:	Monday, August 28, 2017
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### Enforced Direction

Eastbound

Advance Warning Sign:	No
Distance to Sign (ft):	120
Warning Sign on Signal Pole:	Yes
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	35		
85th % Speed (mph):	40		
Min. Yellow (sec):	3.9	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	3.9	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.5	Programmed All Red (sec):	0.0

SR-56(CA) Warning Sign Location



Loops



## Howe Avenue & Fair Oaks Blvd

Intersection No:	19	Agency:	City
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Date of Observation:	Monday, August 21, 2017
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### Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	90
Warning Sign on Signal Pole:	Yes
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right

Eastbound Left

Speed Limit (mph):	40		
85th % Speed (mph):	45		
Min. Yellow (sec):	4.3	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.3	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.7	Programmed All Red (sec):	1.0

### Enforced Direction

Southbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	75
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Southbound Thru

Southbound Left

Speed Limit (mph):	40		
85th % Speed (mph):	45		
Min. Yellow (sec):	4.3	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.3	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.7	Programmed All Red (sec):	0.5



# Howe Avenue & Fair Oaks Blvd

Enforced Direction

Eastbound

SR-56(CA) Warning Sign Location



Loops



Enforced Direction

Southbound

SR-56(CA) Warning Sign Location



Loops



## Folsom Blvd & Power Inn Road/Howe Avenue

Intersection No:	20	Agency:	City
Date of Observation:	Monday, August 21, 2017		

### Enforced Direction

Southbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	100
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Southbound Through		Southbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	45		
Min. Yellow (sec):	4.3	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.3	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	1.0	Programmed All Red (sec):	1.9

### SR-56(CA) Warning Sign Location



Loops



# 5th Street & I Street

Intersection No:	21	Agency:	City
Date of Observation:	Monday, August 28, 2017		

## Enforced Direction

Westbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	175
Warning Sign on Signal Pole:	Yes
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

## Enforced Movement

Westbound Thorough/Westbound Right	
Speed Limit (mph):	25
85th % Speed (mph):	30
Min. Yellow (sec):	3.2
Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.0

## SR-56(CA) Warning Sign Location



Loops



## Arden Way & Challenge Way

Intersection No:	22	Agency:	City
Date of Observation:	Monday, August 28, 2017		

### Enforced Direction

Eastbound

Advance Warning Sign:	Yes
Distance to Sign (ft):	125
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Eastbound Thru/Right		Eastbound Left	
Speed Limit (mph):	40		
85th % Speed (mph):	45		
Min. Yellow (sec):	4.3	Min. Yellow (sec):	3.0
Programmed Yellow (sec):	4.3	Programmed Yellow (sec):	3.5
Programmed All Red (sec):	0.4	Programmed All Red (sec):	1.2

### SR-56(CA) Warning Sign Location



### Loops



## 16th Street & W Street

Intersection No:	23	Agency:	City
Date of Observation:	Monday, August 28, 2017		

### Enforced Direction

Northbound Left/Northbound Through

Advance Warning Sign:	Yes
Distance to Sign (ft):	35
Warning Sign on Signal Pole:	No
Lateral Position of Signal Faces MUTCD Compliant:	Yes
Longitudinal Position of Signal Faces MUTCD Compliant:	Yes
Lateral Offset of Signal Pole MUTCD Compliant:	Yes

### Enforced Movement

Northbound Left/Northbound Through

Speed Limit (mph):	30	
85th % Speed (mph):	40	
Min. Yellow (sec):	3.9	
Programmed Yellow (sec):	3.9	
Programmed All Red (sec):	0.0	

### SR-56(CA) Warning Sign Location



### Loops

