

TRAFFIC SIGNALS PROGRAM

INTRODUCTION

Traffic signals determine the right-of-way at an intersection or crossing. They facilitate orderly traffic flow, allow pedestrians to cross, and provide cross-street traffic a chance to cross or enter an intersection. When installed at appropriate locations, traffic signals can increase the capacity of an intersection, reduce the frequency of collisions, and provide better minor street access. Because traffic signals are expensive to install and may induce safety problems if not appropriately placed, the City only installs signals where they will clearly improve safety and make the intersection operate more efficiently. The City typically constructs one or two traffic signals per year through the Capital Improvement Program. There are other traffic signals installed by private development.

GOALS AND POLICIES

The Traffic Signals Program is consistent with the following City of Sacramento 2030 General Plan (adopted March 3, 2009) and 2035 General Plan Update (to be adopted in 2014) goals and policies:

Goal

Comprehensive Transportation System. Provide a transportation system that is effectively planned, managed, operated, and maintained.

Policy:

- Install traffic signals, when appropriate, to improve safety and increase the efficiency of intersections within the City. Evaluate intersections to determine whether measures exist, other than a traffic signal, which would improve safety at the intersections.

Goal

Integrated Pedestrian System. Design a universally accessible, safe, convenient, and integrated pedestrian system that promotes walking.

Policy:

- Install traffic signals, when appropriate, to improve air quality by reducing delay at intersections and to provide safe crossings for pedestrians.

Goal

Multimodal System. Provide expanded transportation choices to improve the ability to travel efficiently and safely to destinations throughout the city and region.

Policies:

- Install traffic signals to make more efficient use of the City's existing street system.
- Support programs that improve traffic flow.

The Traffic Signals Program is consistent with the following City of Sacramento Strategic Plan goals:

1. Improve and expand public safety.

Policy:

The Traffic Signals Program supports Public safety by improving the operation and safety of street intersections for vehicles, bicycles, and pedestrians.

2. Achieve Sustainability and Enhance Livability.

Policy:

The Traffic Signals Program project ranking process supports sustainability and enhanced livability by giving points to projects based on potential pedestrian and bicycle access at intersection.

PROJECT LIST DEVELOPMENT

The City evaluates approximately 10-15 new intersections each year for traffic signals. Locations are solicited through traffic investigations, resident requests, development projects, Councilmember requests, etc. The City also reviews the top ten high collision intersections on an annual basis for potential measures, including a traffic signal, which may mitigate for collisions.

Eligibility Criteria

The Traffic Signal Program involves three phases. Project eligibility is determined during Phases I and II, as presented below:

Phase I - Investigation Review

In Phase I, the following data is collected for locations which have been suggested as candidates for a traffic signal:

Collisions:	A recent three-year compilation of reported collision history differentiating collision types and correctability is developed.
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Traffic Volumes:	Twenty-four hour volume counts with an hourly listing of each approach direction are obtained for the combined minor street volumes, the combined major street approach volumes, and a total for the entire intersection.
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Facilities/Activity Centers:	Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements is collected at the location under study. These persons might not be adequately reflected in the pedestrian volume if the absence of a signal restrains their mobility.
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Pedestrian/Bicycle:	Pedestrian and bicycle counts may be collected if a high number of pedestrians are anticipated to cross the intersection. Also, the width of the major street crossing is recorded.
Existing Controls:	The current type of control (i.e., two-way stop, an all-way stop, etc.) is recorded.
Speed:	The 85th percentile speed is collected for the major and minor streets.

The above data is collected and reviewed to determine whether measures exist, other than a traffic signal, which would mitigate for the concern. If measures are feasible, they are to be implemented and the location monitored for up to three years. The location is placed on the City's Traffic Signal Monitoring List. After the monitoring period, an evaluation of the effectiveness of the measures is conducted. If measures are found to be effective, the location is removed from the Traffic Signal Monitoring List and is no longer considered for the Traffic Signal Program unless conditions change. If measures are not effective, the location is to be evaluated for signal warrants as outlined in Phase II below. The City Traffic Engineer has the discretion to move forward with Phase II prior to the three year period as conditions warrant.

Phase II– Signal Warrant Review

If no feasible measure exists, or the City Traffic Engineer advances the project, the location is evaluated in Phase II. In Phase II, the information from Phase I and updated data is used to determine which locations meet one or more of the following eight Caltrans traffic signal warrants:

<u>Warrant-1</u> Eight-Hour Vehicular Volume	The Eight Hour Vehicular Volume signal warrant is intended for application where (A) a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal or (B) where the traffic volume on a major street is so heavy that the traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing a major street.
<u>Warrant-2</u> Four-Hour Vehicular Volume	The Four Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.
<u>Warrant-3</u> Peak Hour	The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor street traffic suffers undue delay when entering or crossing the major street.

<u>Warrant-4</u> Pedestrian Volume	The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.
<u>Warrant-5</u> School Crossing	The School Crossing signal warrant is intended for application where the fact that school children cross the major street is the principal reason to consider installing a traffic signal.
<u>Warrant-6</u> Crash Experience	The Crash Experience Signal warrant conditions are intended for application where the severity and frequency of crashers are the principal reasons to consider installing a traffic control signal.
<u>Warrant-7</u> Coordinated Signal System	The Coordinated Signal System warrant is intended to provide traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles, thus providing progressive movement through the corridor
<u>Warrant-8</u> Roadway Network	The Roadway Network warrant conditions are intended to provide a traffic control signal to encourage concentration and organization of traffic flow on a roadway network.

If the location meets traffic signal warrants, the location is evaluated to determine the preliminary feasibility of a traffic signal at this location. Some examples of infeasibility include impacts to hollow sidewalks, requires major roadway widening, insufficient right of way, etc. A roundabout evaluation is conducted concurrently to determine whether a roundabout can be installed at the location in lieu of a traffic signal. If found to be infeasible, the location is no longer considered in the Traffic Signal Program.

It should be noted that the satisfaction of a traffic signal warrant does not in itself require the installation of a traffic signal. Candidate locations will be reevaluated for signal warrants every three years, or when conditions warrant, and may be removed from the Traffic Signal Program list if the location no longer meet warrants.

PROJECT RANKING PROCESS

Phase III

Once a location is determined to be feasible, the following criteria are applied to rank the eligible locations. The maximum possible score is 100 points.

1. Collisions.....(Max. Points: 55)

The collision rate of the intersection is compared to the single highest collision rate of all the intersections being evaluated. The collision rate per million vehicle miles is calculated using the following equation:

$$\text{Collision Rate} = \frac{\text{Total weighted correctable collisions in a 3 year period} \times 1,000,000}{3 \times 365 \times \text{total volume of entering vehicles per day}}$$

Collisions used to calculate the collision rate are those that occurred within 100 feet of the intersection which are susceptible to correction by signalization. Correctable collision types are violations for traffic signals and signs, vehicle, pedestrian and bicycle right of way violations, etc.

The collision rate also factors in the severity of the collision by using an Equivalent Property Damage Only (EPDO) weighting. It attaches greater importance, or weight, to collisions resulting in an injury or fatality, and less importance to property damage only collisions. The weighting of collision types are as follows:

<u>Type of Collision</u>	<u>Equivalent Weight</u>
Fatal	9.5
Injury	3.5
Property Damage Only	1

Collision points are assigned as follows:

$$\frac{\text{3 Yr Average Correctable Collision Rate of Project}}{\text{Single Highest 3 Yr Average Correctable Collision Rate of Projects Considered}} \times 55 = \underline{\hspace{2cm}}$$

2. Pedestrians..... (Max. Points: 12)

(A) Pedestrian Crossing

(Points: 10)

Points are assigned based on the average daily traffic (ADT) volumes of the major street and the crossing distance of the major street, as presented below:

MAJOR STREET WIDTH (FEET)

MAJOR STREET ADT	<40	41-50	51-60	61-70	71-80	>81
<4,000	0	1	2	3	4	5
4,001-7,000	1	2	3	4	5	6
7,001-14,000	2	3	4	5	6	7
14,001-21,000	3	4	5	6	7	8
21,001-27,000	4	5	6	7	8	9
>27,001	5	6	7	8	9	10

(B) Activity Centers

(Points: 2)

One point is assigned for each of the following activity centers which generate pedestrian traffic. The activity center must be located within 300 feet of the candidate traffic signal location. The maximum number of points is two points. Examples include:

- Schools
- Parks
- Libraries
- Employment Centers
- Stadiums
- Arenas
- Senior Centers
- Commercial Centers
- Light Rail Lines
- Hospitals
- High Density Residential

3. Bicycle Master Plan..... (Max. Points: 5)

5 points are given if a street is identified in the City/County Bikeway Master Plan.

4. Average Daily Traffic (ADT) Volumes (Max. Points: 10)

Points are assigned based on a comparison of the average daily traffic (ADT) volumes on the intersecting streets, as presented below:

MINOR STREET ADT

MAIN STREET ADT	<1,000	1,001-2,000	2,001-3,000	3,001-4,000	4,001-5,000	>5,000
<4,000	0	1	2	3	4	5
4,001-7,000	1	2	3	4	5	6
7,001-14,000	2	3	4	5	6	7
14,001-21,000	3	4	5	6	7	8
21,001-27,000	4	5	6	7	8	9
>27,000	5	6	7	8	9	10

5. Peak Hour Traffic Volumes..... (Max. Points: 10)

Points are assigned based on a comparison of side street traffic volume to main street traffic volume during the peak hour, as presented below:

MINOR STREET PEAK HOUR VOLUME

MAJOR STREET PEAK HOUR VOLUME	<100	101-200	201-300	301-400	>400
<400	0	0	1	2	3
400-600	0	1	2	3	4
601-800	1	2	3	4	5
801-1,000	2	3	4	5	6
1,001-1,200	3	4	5	6	7
1,201-1,400	4	5	6	7	8
1,401-1,600	5	6	7	8	9
>1,601	6	7	8	9	10

6. Speed (Max. Points: 5)

Points are assigned in this category to account for the difficulty that motorists, bicyclists, and pedestrians may have judging gaps in traffic on high-speed streets. More points are assigned for the higher-speed streets, as presented below:

<u>85th Percentile Posted Speed (mph)</u>	<u>Points</u>
50+	5
40-49	4
35-39	3
30-34	2
25-29	1
<25	0

Zero points are assigned if the intersection has an all way stop.

7. Special Conditions (Max. Points: 3)

Points are assigned based on special or unique conditions related to the benefits or drawbacks of signalizing a particular intersection. Some considerations include distance to a heavy rail crossing, proximity to fire stations, beneficial coordination with adjacent signals, restricted sight distance, etc. The number of points is determined by the City Traffic Engineer.

SUMMARY

Table D-1 presents the final point total and ranking of the traffic signal projects. Table D-2 presents intersections where mitigating measures have been implemented and the intersection is being monitored. Figure D-1 shows the approximate locations of the projects.

There were four new intersections added to the traffic signal list:

- 65th Street/11th Avenue
- El Camino Avenue/Albatross Way
- El Camino Avenue/Clay Street
- Florin Road/25th Street

There was one intersection that was moved from the 2010 monitoring list to the traffic signal list. The intersection is:

- J Street/18th Street

There was one intersection removed from the traffic signal list because the location is an intersection between a City street and a private driveway. The City is not responsible for installing a traffic signal at this location. The intersection is:

- Center Parkway/CRC Driveway

There were eight intersections from the 2010 list that received funding. They are:

- Center Parkway/Arroyo Vista Drive
- El Camino Avenue/Boxwood Street
- Franklin Boulevard/Boyce Drive
- Freeport Boulevard/Claudia Drive
- Fruitridge Road/58th Street
- Norwood Avenue/Fairbanks Avenue
- Rio Linda Boulevard/Acacia Drive
- Riverside Boulevard/Park Riviera Drive (N)

There were seven intersections from the 2010 list that were removed from the traffic signal list. These locations no longer meet traffic signal warrants. They are:

- 24th Street/53rd Avenue
- 29th Street/R Street
- Azevedo Drive/Bannon Creek Drive
- Broadway/53rd Street
- Campus Commons Drive/University Avenue
- Capitol Avenue/24th Street
- South Land Park Drive/35th Avenue

There were eleven intersections on the traffic signal monitoring list at which measures were implemented and found to be effective. These locations are no longer considered for the Traffic Signals Program unless conditions change. They are:

- 14th Avenue/73rd Street
- 14th Avenue/Business Drive
- Broadway/14th Street
- Center Parkway/Bamford Drive (N)/Loorz Court
- Center Parkway/Bamford Drive (S)
- Center Parkway/Tangerine Avenue
- K Street/20th Street
- Rio Linda Boulevard/Carmelita Avenue
- Rio Linda Boulevard/Ford Road
- Rio Linda Boulevard/Jessie Avenue
- Valley High Drive/Wyndham Drive

There were two intersections removed from the traffic signal monitoring list. These locations no longer meet traffic signal warrants. They are:

- Florin Road/Cromwell Way
- K Street/23rd Street

There were four intersections which were evaluated for the high number of collisions during the last 3 years and did not meet traffic signal warrants. They are:

- 24th Street/Casa Linda Drive
- Broadway/25th Street
- J Street/20th Street
- 14th Street/O Street

There were two intersections which were evaluated for the high number of collisions during the last 3 years and were determined not feasible locations for a traffic signal. They are:

- 34th Street/2nd Avenue
- La Riviera Drive/College Town Drive

Seven additional intersections were evaluated and did not meet warrants for a traffic signal. These intersections were the result of a survey conducted as part of the community outreach performed for the program. They are:

- 14th Avenue/62nd Street
- 35th Street/4th Avenue
- Capitol Avenue/18th Street
- Capitol Avenue/20th Street
- Gateway Oaks Drive/Venture Oaks Way
- L Street/18th Street
- P Street/17th Street

One additional intersection was evaluated and was determined not feasible for a traffic signal. This intersection was the result of a survey conducted as part of the community outreach performed for the program.

- Broadway/58th Street

TABLE D-1

YEAR 2014 - TRAFFIC SIGNALS

2014 Rank	2010 Rank	Council District	MAIN STREET	SIDE STREET	Notes	Collisions Score	Ped Score	BMP Score	ADT Score	Peak Hour Score	Speed Score	Special Conditions Score	TOTAL SCORE
Maximum Points in Scoring Category:						55	12	5	10	10	5	3	100
1	4	8, 7	Mack Road	Summersdale Drive		54	10	5	6	7	4	0	86
2	10	8	Meadowview Road	Manorside Drive		55	8	5	5	7	4	0	84
3	New	5, 8	Florin Road	25th Street		40	10	5	7	7	4	0	73
4	7	3	Truxel Road	Millcreek Dr/Waterwheel Drive		48	7	5	4	4	4	0	72
5	6	4	D Street	16th Street		42	5	5	5	7	2	1	67
6	New	2	El Camino Avenue	Clay Street		26	8	5	6	7	4	0	56
7	New	2	El Camino Avenue	Albatross Way		24	8	5	6	7	4	0	54
8	New	4	J Street	18th Street		30	5	5	5	5	2	0	52
9	9	5	Freeport Boulevard	Belleau Wood Ln/Bing Maloney Driveway		19	8	5	4	5	5	1	47
9	14	6	Florin Perkins Road	24th Avenue		20	6	5	4	7	5	0	47
11	12	3	Northgate Boulevard	Sotano Drive/Wisconsin Avenue		13	8	5	5	7	4	0	42
11	11	6	65th Expressway	Jansen Drive		15	7	5	4	7	4	0	42
13	16	6	Power Inn Road	Belvedere Avenue		9	8	5	7	8	4	0	41
13	18	6	Power Inn Road	Alpine Avenue		11	8	5	6	7	4	0	41
15	New	6	65th Street	11th Avenue		0	10	5	5	6	4	0	30
16	17	7	Riverside Boulevard	Park Riviera Drive (S)	1	8	7	5	4	4	0	0	28
17	27	2	Roseville Road	Connie Drive		0	4	5	7	6	5	0	27
18	23	6	Munroe Street	Latham Drive		0	6	5	4	5	3	0	23
19	21	7	Pocket Road	East Shore Drive		0	7	5	2	3	4	0	21
20	33	3	Azevedo Drive	Bannon Creek Drive	1	0	8	5	2	2	0	0	17
20	28	2	Rio Linda Boulevard	Arcade Boulevard	1	0	5	5	4	3	0	0	17
22	32	2	Marysville Boulevard	Bell Avenue	1	0	2	5	5	4	0	0	16
23	34	2	Silver Eagle Road	Mabel Street	1	0	2	5	4	3	0	0	14

"New" in the 2010 Rank Column indicates projects added this year.

NOTES:

1 Intersection is an all way stop

TABLE D-2

YEAR 2014 - INTERSECTION MONITORING LIST

2010 TPG Status	Council District	Main Street	Side Street	Mitigation
8	2	Norwood Avenue	Ford Road	New signal installation at Norwood Avenue and Fairbanks Avenue; monitor impacts.
New	5, 8	Florin Road	Munson Way	Paint median tip and install object markers; monitor impacts.

FIGURE D-1

