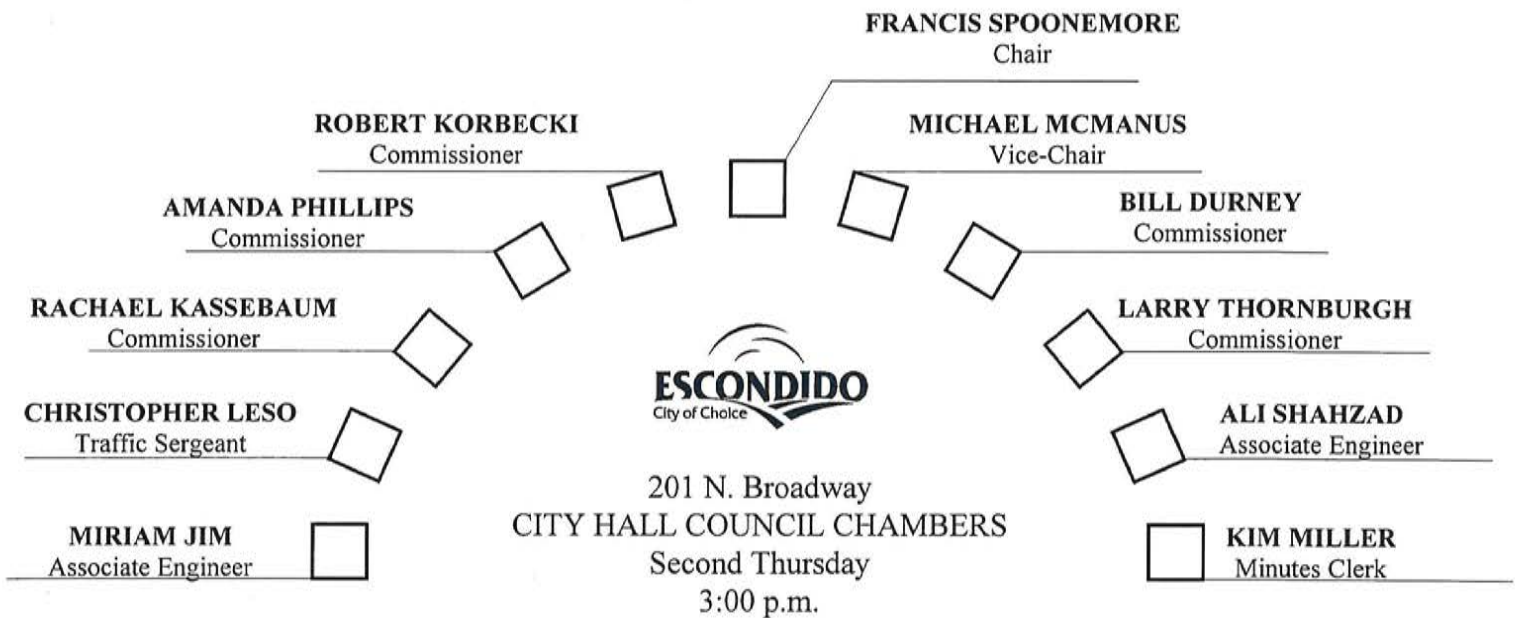


# CITY OF ESCONDIDO

## Transportation & Community Safety Commission



- A. FLAG SALUTE
- B. ROLL CALL AND DETERMINATION OF QUORUM
- C. ORAL COMMUNICATIONS\* (At this time, members of the public are encouraged to speak to the Commission concerning items not already on this agenda. A time limit of three [3] minutes per speaker and a total time allotment of fifteen [15] minutes will be observed.)

*The Brown Act provides an opportunity for the members of the public to directly address the Commission on any item of interest to the public, before or during the Commission's consideration of the item. If you wish to speak regarding an agenda item, please fill out a speaker's slip and give it to the minute's clerk who will forward it to the Chairman.*

*If you wish to speak concerning an item not on the agenda, you may do so under "Oral Communications" which is listed on the agenda.*

*The City of Escondido recognizes its obligation to provide equal access to public meetings to those qualified individuals with disabilities. Please contact the Human Resources Department (839-4643) with any requests for reasonable accommodation, to include sign language interpreter, at least twenty-four (24) hours prior to the meeting.*

D. APPROVAL OF MINUTES OF JANUARY 10<sup>th</sup>, 2019 MEETING

E. CONSENT ITEMS – None.

F. NEW BUSINESS

1. Audible Pedestrian Signal (APS) Ranking for Requested Locations

Source: Staff  
Recommendation: Approval  
Previous action: None.

2. 2018/2019 Traffic Management Project List (TMPL) Preliminary List of Projects

Source: Staff  
Recommendation: Approval  
Previous action: None

3. Escondido High School Traffic Safety and Signal Warrant Report & Accident Data

Source: Staff  
Recommendation: Information  
Previous action: None

4. Traffic Signal Installation and Left Turn Phasing Preliminary Priority List

Source: Staff  
Recommendation: Approval  
Previous action: 2012 Staff Report Recommendations to City Council

G. OLD BUSINESS

1. An overview of various projects involving the City.

Source: Staff

Written or verbal reports may be presented on the following topics:

- a. Traffic Signals in Design: Felicita/Escondido Blvd LTP signal modification – Design in progress, awaiting ATP Fund Authorization.
- b. Traffic Signals – approved: El Norte/Bike Path crossing near bridge over flood control channel (95% plancheck in progress). Citracado/Centre City (pending funding availability)
- c. Traffic Signals - Under Construction: Hotel Traffic Signal on La Terraza Blvd. El Norte/Fig & East Valley Pkwy/Date – Project Bid Awarded, preliminary Notice to proceed to contractor issued for Traffic Signal hardware procurement. Woodward/Broadway, Quince/Creek Crossing & Children’s Museum for Missing Link. Harmony Grove/Enterprise (Exeter) Signal Mod.
- d. Completed construction: Modification: Fig/Lincoln Pkwy.; and Lake Wohlford/East Valley Pkwy. and Beven/East Valley Pkwy. (Mod.)
- e.

H. SCHOOL AREA SAFETY

- a. Escondido High School field review of Traffic Management Plan with Principal, Escondido Police Dept. and Amanda Phillips regarding routing of drop-off /pick-up as portion of plan was implemented.
- b. Del Dios Academy – Bond Improvements. Design, contractor on board, drop off/pick-up and parking lot improvements.

I. COUNCIL ACTION\* (A briefing on recent Council actions on Commission related items.)

- a. NONE

J. ORAL COMMUNICATIONS\* (At this time, members of the public are encouraged to speak to the Commission.)

K. TRANSPORTATION COMMISSIONERS\* (Commissioners may bring up questions or items for future discussion.)

L. ADJOURNMENT

\*In order for the Transportation Commission to take action or conclude discussion, an item must appear on the agenda which is posted 72 hours in advance of the meeting. Therefore, all items brought up under the categories marked with an asterisk (\*) can have no action. Such items can be referred to staff or scheduled for a future agenda.

**AVAILABILITY OF SUPPLEMENTAL MATERIALS AFTER AGENDA POSTING:** Any supplemental writings or documents provided to the Commission regarding any item on this agenda will be made available for public inspection in the Engineering Office located at 201 N. Broadway during normal business hours, or in the Council Chambers while the meeting is in session.

## CITY OF ESCONDIDO

### MINUTES OF THE REGULAR MEETING OF THE TRANSPORTATION AND COMMUNITY SAFETY COMMISSION

**January 10, 2019**

The regular meeting of the Escondido Transportation and Community Safety Commission was called to order at 3:04 p.m., Thursday, by Vice Chair McManus, in the City Council Chambers, 201 North Broadway, Escondido, California.

**Commissioners present:** Vice Chair McManus, Commissioner Thornburgh, Commissioner Durney, Commissioner Korbecki, Commissioner Phillips and Commissioner Kassebaum.

**Commissioners absent:** Chair Spoonmore. Christopher Leso, Traffic Sergeant

**Staff present:** Julie Procopio, Director of Engineering Services; Owen Tunnell, Assist. City Engineer, Ali Shahzad, Associate Engineer/Traffic Division; Miriam Jim, Associate Engineer, Virpi Kuukka-Ruotsalainen: Dept. Specialist, Michael Kearney, Lieutenant; and Kimberlianne Miller, Minutes Clerk

#### **ORAL COMMUNICATIONS:**

Wendy Anderson spoke in favor of traffic signal for Escondido High school accident. She feels the center turn lane and bike lanes have added complications.

Erika Schwarm thanked staff for recent improvements and PD for motor bike enforcement. She said that traffic conditions were improved by these measures. She spoke in favor of flashing speed limit signage for the beginning of school zone to flash during school hours informing drivers that school is in session. Ms. Schwarm also wants signage to say "No student drop-off or pick up" - instead of "No parking". She is not pushing for a traffic signal at this time.

Lt. Kearney explained that unlicensed drivers are parking in neighboring areas because they can't get a permit to park on school lot without a valid driver's license.

Cindy Spear expressed concern about recent accident and feels that 2,300 students should have a traffic light. She feels that traffic is bad, there is no safe way to turn left from N Broadway and traffic light is the best option.

Robbin Hoeffliger spoke in favor of traffic signal for Escondido High School. She has brought her concerns to school staff last year. She states there is chaos in the parking lot and on the street. Signal is the only way to make the left turn onto school

lot. Ms. Hoeffliger stated that the curb on N Broadway is not painted red so it is not clear where parents can drop off. She does feel that traffic flow has been improved but it can be improved more.

Commissioner Thornburg asked if traffic calming measures were considered. Staff explained that a radar speed sign has been installed and that lanes were recently narrowed to calm traffic and bike lanes and two-way-left-turn-lane were added.

Lt. Kearney explains that the recent improvements have helped but speeding is still a concern, not only for this area but the entire corridor. PD has received complaints from Reidy Creek Elementary and other areas on N Broadway and is conducting enforcement.

**ACTION:** Staff will conduct traffic signal warrant analysis on N Broadway / Escondido High School location. Radar speed sign data will be downloaded. Staff to present findings in April 2019 TCSC.

#### **MINUTES:**

Moved by Vice Chair McManus, seconded by Commissioner Durney, to approve the minutes of the July 12, 2018, meeting. Motion carried unanimously.

**CONSENT ITEMS:** None

**ACTION:** None

#### **NEW BUSINESS:**

##### **1. Audible Pedestrian Signal (APS) Ranking Criteria for Policy**

Ms. Kuukka-Ruotsalainen referenced the staff report and noted staff recommended the Commission approve the City of Escondido Audible Pedestrian Signal (APS) Ranking Criteria for Policy.

Commissioner Thornburg asked staff how many locations can be funded annually. Staff explained one location per year from the ADA funding.

Staff proposed to update request list annually, when funding is available.

Commissioner Korbecki asked if intersection safety criteria could be modified so that more points shall be given if multiple pedestrian accidents at the location. Staff will modify ranking criteria.

## **ACTION:**

Moved by Commissioner Thornburg, seconded by Commissioner McManus to approve ranking criteria with one point added for each pedestrian accident up to three and with ranking for new projects, updated quarterly. Motion carried unanimously.

## **2. Speed Surveys**

Mr. Shahzad referenced the staff report. Staff recommended approval to the City Council of updated Engineering and Traffic Surveys (E&TS) for posted speeds on various street segments Citywide.

Commissioner Kassebaum requested that speed survey information be provided where speed limits are changing or speed was rounded down. Speed Zone Evaluation can be attached to future Staff Reports.

## **ACTION:**

Moved by Durney, seconded by Commissioner Kassebaum, to approve staff's recommendation. Motion carried unanimously.

## **3. Completion of the Escondido Creek Bikeway Missing Link Project**

Ms. Jim referenced the staff report and provided an update on Missing Link Project.

Commissioner Korbecki stated that he likes the green bollards. He asked staff if gates leading to Bikeway are open. Staff explained that gates are closed until project is complete.

Commissioner Thornburg reminded staff to look at edge line striping along Class 1 to confirm that two feet are available as required for Class 1.

## **OLD BUSINESS:**

1. An overview of various projects involving the City
  - a. Traffic Signals in Design: HSIP signals contract awarded (25 weeks for poles). Felicita/Escondido - grant funded.
  - b. Traffic Signals: El Norte Bike path signal approved. Under construction: La Terraza Hotel, CCP/Mission, Escondido Blvd/Lincoln, Broadway/Lincoln and Fig/Lincoln signal modification, Encino/17th, EVP/Lake Wohlford - complete.

Report received.

**SCHOOL AREA SAFETY:**

- a. Escondido High – On-Site circulation in parking lot for Pick-up/Drop-off.
- b. Bond Projects coordination discussion at Quarterly School Zone meeting.

Report received.

**COUNCIL ACTION:** None.

**ORAL COMMUNICATIONS:****TRANSPORTATION COMMISSIONERS:**

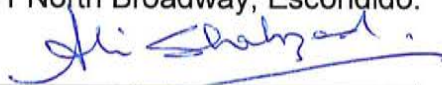
Commissioner Korbecki asked staff about the traffic signal at Via Rancho Parkway. Caltrans expects to implement a new Signal Timing plan in late Spring.

Commissioner Korbecki asked about the accident database Crossroads: does it feed into SWITRS? Lt. Kearney explained that it does.

Commissioner Korbecki asked about the bid process. Low bid process - each project is separately bid.

**ADJOURNMENT:**

Vice Chair McManus adjourned the meeting at 4:08 p.m. The next meeting of the Commission would be held April 11, 2019, at 3:00 p.m. in City Council Chambers, 201 North Broadway, Escondido.

  
\_\_\_\_\_  
Ali Shahzad, Associate Engineer

  
\_\_\_\_\_  
Kim Miller, Minutes Clerk



**CITY OF ESCONDIDO**  
**TRANSPORTATION and**  
**COMMUNITY SAFETY COMMISSION**

**Commission Report of:** April 11<sup>th</sup>, 2019

**Item No.: F1**

**Location:** Citywide

**Initiated By:** City Staff

**Request:** Ranking Analysis for Audible Pedestrian Signals (APS) Citywide.

**Background:**

An Accessible Pedestrian Signal (APS) is a pedestrian pushbutton at a Traffic Signal that communicates to the pedestrian when to cross the street. The APS provides information in non-visual formats, such as audible tones, speech messages, and/or vibrating surfaces. APS improves pedestrian orientation to their travel direction and provides guidance to pedestrians who are blind or visually impaired when crossing the signalized location.

The City of Escondido Policy on the use of audible (accessible) pedestrian signals was adopted and made part of Traffic Engineering Policies in September, 2005. Initiated by the City's ADA Committee, the policy allows qualified individuals or groups to make a request for an audible signal, and requires the Committee to decide whether the request is appropriate, and whether the ADA Budget will allow for the audible signal to be installed. In January, 2019 this policy was revised to include guidelines for prioritization of these requests.

Based on these guidelines, intersections were scored using the Prioritization Tool. The preliminary score was calculated and the relative priority of the requested intersection as compared to other requested intersections was determined. The Request List will be updated quarterly if needed and used to request funding for design and construction of APS. The number of installations may vary annually based on available funds.

City of Escondido has received seven (7) requests from qualified individuals or groups. Several of these requested installation of APS for more than one location. Some of the locations nominated belong to Caltrans.

**Requests and evaluations**

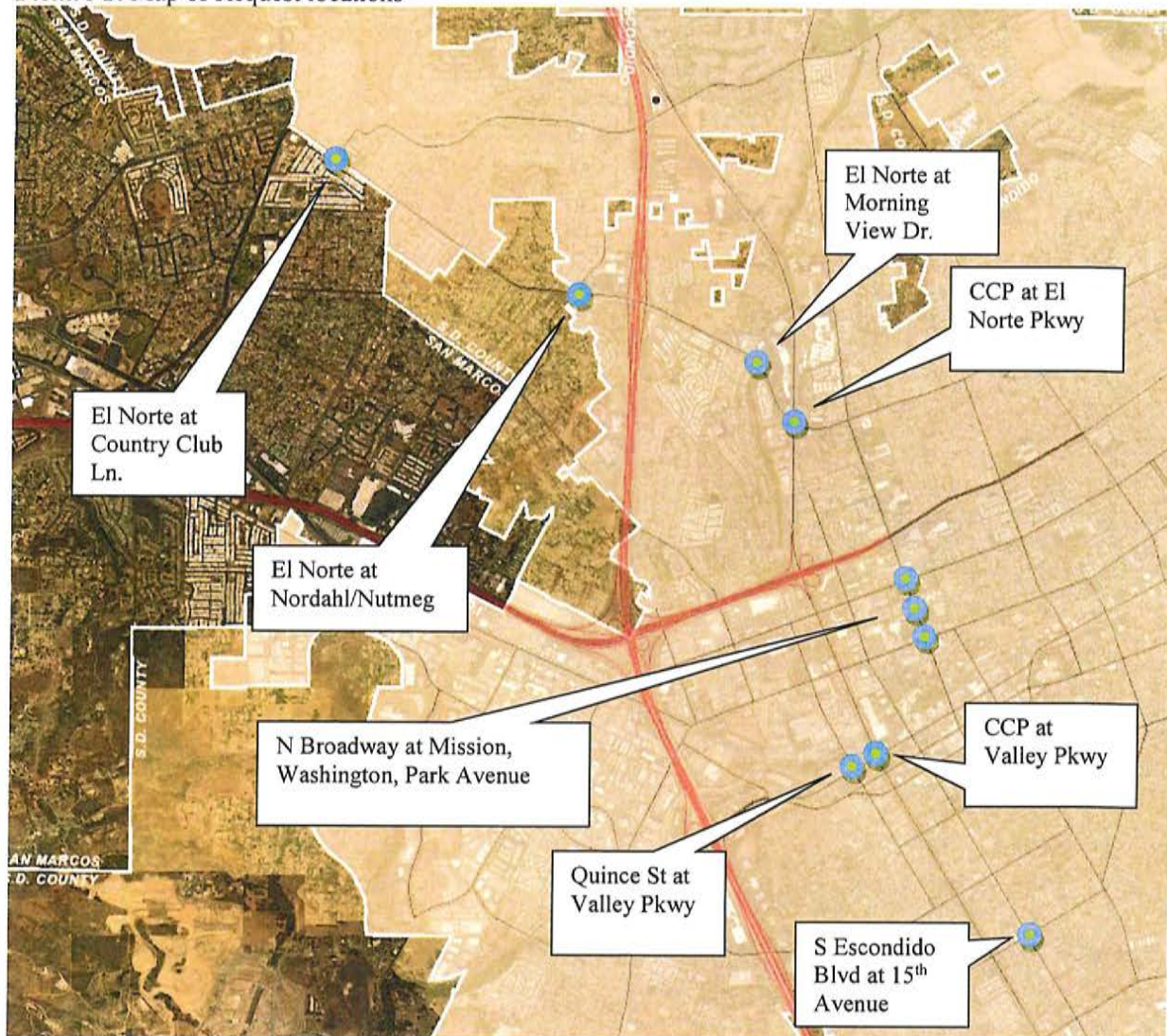
**Request 1** from Park Avenue Community Center (PACC) (210 Park Avenue) nominated three (3) locations for APS. Park Avenue Community Center hosts Legally Blind Social Club that provides services such as braille classes. Staff evaluated nominated intersections and it was determined that two of these are Caltrans signal locations (Broadway & Mission, Broadway & Washington) and APS has already been installed. One location didn't meet the basic criteria (N Broadway & Park Avenue) as it is not currently signalized.

**Requests 2 and 3** were received from area resident and an organization. Both ask for the installation of APS at South Escondido Blvd at 15th Avenue to provide increased access and enhanced safety. Access to Independence of San Diego is a non-profit organization that serves individuals with vision impairment as a primary disability. In addition, they serve many whose secondary disability affects their vision. Their North

County branch is located at 1440 S. Escondido Blvd. and FY 2017-2018 they served 194 individuals with disabilities at this location. Many of these individuals utilize the Breeze bus stop, located on the corner of S. Escondido Blvd. and 15th Avenue, to access the office. This location meets the basic criteria and was selected as a candidate.

**Request 4** comes from a resident residing along El Norte Parkway. This request nominates 2 locations for APS: El Norte Pkwy at Country Club Ln and El Norte Pkwy at Nordahl Rd/North Nutmeg St. **Request 5** from another area resident supports the nomination of El Norte Pkwy at Country Club Ln. Both of these locations meet the basic criteria and were selected as a candidate. **Requests 6 and 7** from area residents nominate El Norte Pkwy at Morning View Drive. **Request 7** nominates four additional locations: Centre City Parkway at El Norte Parkway, Quince Street at Valley Parkway, Centre City Parkway at Valley Parkway and North Broadway at Mission Avenue. New development is planned near Transit Center and APS will be installed at Quince Street and Valley Parkway as a part of signal modification project. This location does not need to be included on the priority list.

**Picture 1:** Map of Request locations



APS Prioritization Tool was used to evaluate and prioritize the following locations that passed the preliminary evaluation and met the basic criteria:

- South Escondido Blvd at 15th Avenue
- El Norte Parkway at Morning View Drive
- El Norte Parkway at North Nutmeg Street / Nordahl Road
- El Norte Parkway at Country Club Lane
- Centre City Parkway at El Norte Parkway
- Valley Parkway at Centre City Parkway

South Escondido Boulevard is a fully improved Collector Street with ADT of 12,500 vehicles per day. It consists of two lanes separated by a two-way left-turn lane and turn pockets at intersection. Posted speed limit at this location is 35 mph with occasional off-peak traffic on West 15<sup>th</sup> Avenue. Bus stop for Bus #350 is located at the intersection. Pedestrian need to cross is estimated as daily, frequent use. Distance to alternative APS crosswalk is more than ½ mile. City of Escondido has received 2 separate requests for accessible pedestrian signal for this location.

**Picture 2:** South Escondido Blvd at W 15<sup>th</sup> Avenue



El Norte Parkway between North Nutmeg Street/Nordahl Road and I-15 is a Major Road with a posted speed limit of 45 mph and an ADT of 31,287 vehicles per day. Fully improved with four lanes divided by a raised concrete median and right-turn lanes at the intersection. Moderate off-peak traffic was observed on N Nutmeg St/Nordahl. Bus stop for Busses #358 and #359 is located near intersection. Pedestrian need to cross is estimated as regular weekly use. Shopping Center is located at the North-East corner of the intersection. Distance to alternative APS crosswalk is more than ½ mile. City of Escondido has received 1 request for accessible pedestrian signal for this location.

**Picture 3:** El Norte Parkway at North Nutmeg St/Nordahl



El Norte Parkway at Country Club Lane is a fully improved Major Road with a posted speed limit of 45 mph and an ADT of 12,600 vehicles per day. This segment consists of four lanes divided by a raised concrete median and dedicated left and right-turn pockets/lanes at the intersection.

Light off-peak traffic on was observed on Country Club Lane. Bus stop for Busses #358 and #359 is located near intersection. Pedestrian need to cross is estimated as regular weekly use. Shopping Center is located at the North-East corner of the intersection. Distance to alternative APS crosswalk is more than ½ mile. City of Escondido has received 2 requests for accessible pedestrian signal for this location.

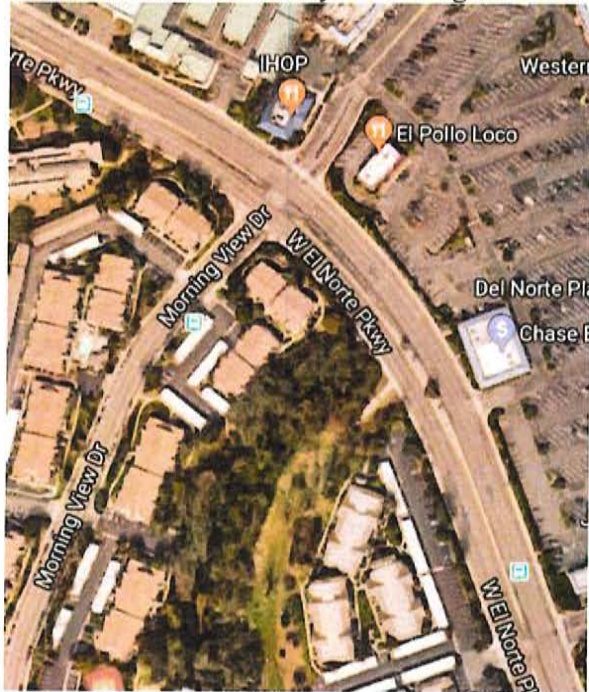
**Picture 4:** El Norte Parkway at Country Club Lane



El Norte Parkway at Morning View Drive is a fully improved Major Road with a posted speed limit of 45 mph and an ADT of 23,350 vehicles per day. This segment consists of six lanes divided by a raised concrete median and dedicated left and right-turn pockets/lanes at the intersection.

Light off-peak traffic was observed on Morning View Drive. Bus stops for Busses #358 and #359 are located near intersection. Daily pedestrian need to cross is estimated as several shops are located at the North-Side of the intersection. Intersection serves a high volume of senior citizens. Equipment assisting pedestrians is placed at the location providing assistance (by chirping sounds) but vibrotactile information is not provided (A vibrotactile pedestrian device communicates information about pedestrian timing through a vibrating surface by touch). Distance to alternative APS crosswalk is more than ½ mile. City of Escondido has received 1 request for vibrotactile pedestrian signal for this location.

**Picture 5:** El Norte Parkway at Morning View Drive and existing equipment.



Centre City Parkway at El Norte Parkway is a fully improved Major Road with a prima facie speed limit of 65 mph and ADT of 25,750 vehicles per day. This segment consists of six lanes divided by a raised concrete median and dedicated left and right-turn (2) lanes at the intersection. Pedestrian crossing is allowed on all legs of this wide and large intersection.

Constant/heavy off-peak traffic was observed on El Norte Pkwy. Several bus routes serve the area and the nearest bus-stops are located app. 300 feet from intersection. Daily, frequent pedestrian need to cross is estimated as several shops are located at the North-Side and East-side of the intersection. Intersection serves a high volume of senior citizens as senior residences and Salvation Army Escondido Corps are located on the south-side of the intersection. Salvation Army provides several services, such as Adult Day Care Programs and activities. Distance to alternative APS crosswalk is more than ½ mile. City of Escondido has received 1 request for vibrotactile pedestrian signal for this location.

**Picture 5:** El Norte Parkway at Centre City Parkway



Valley Parkway at Center City Parkway is a fully improved Collector Road with a speed limit of 35 mph and ADT of 19,000 vehicles per day. Valley Parkway is a one-way road allowing Westbound Traffic. Newly constructed Class IV two-way bikeway cycle track crosses the intersection. Pedestrian crossing is allowed on all legs of the intersection. Centre City Parkway is a fully improved Major Road with a prima facie speed limit of 65 mph.

Constant/heavy off-peak traffic was observed on Valley Pkwy. Several bus routes utilize the area as the transit station is nearby. The nearest bus-stop is located app. 500 feet from intersection. Daily, frequent pedestrian need to cross is estimated as several services, movie theater, Center of the Arts and City Hall are nearby. Distance to alternative APS crosswalk is more than ½ mile. City of Escondido has received 1 request for vibrotactile pedestrian signal for this location.

**Picture 6:** Valley Parkway at Centre City Parkway



### Summary of evaluations and ranking of requests

Prioritization tool gives scores for several factors for both the intersection and the crosswalk. These scores are shown in Tables 1-3.

**Table 1:** Intersection Score

| Intersection Score                   | 15 <sup>th</sup> Escondido & | El Norte & Morning View Dr. | El Norte & N Nutmeg St / Nordahl Rd. | El Norte & Country Club Ln | CCP & El Norte | Valley Pkwy at CCP |
|--------------------------------------|------------------------------|-----------------------------|--------------------------------------|----------------------------|----------------|--------------------|
| Configuration                        | 1                            | 1                           | 3 (4-leg skewed)                     | 1                          | 3              | 3                  |
| Safety 3 years                       | 0                            | 1                           | 0                                    | 0                          | 0              | 3                  |
| Transit facilities, number of routes | 1                            | 3                           | 3                                    | 3                          | 3              | 5                  |
| Facility for visually impaired       | 5                            | 2                           | 1                                    | 1                          | 4              | 0                  |
| Major pedestrian attraction          | 2                            | 5                           | 5                                    | 5                          | 4              | 3                  |
| <b>Total Intersection Score</b>      | <b>9</b>                     | <b>12</b>                   | <b>12</b>                            | <b>10</b>                  | <b>14</b>      | <b>14</b>          |

**Table 2:** Crosswalk Score

| Crosswalk Score                       | 15 <sup>th</sup> Escondido & | El Norte & Morning View Dr. | El Norte & N Nutmeg / Nordahl Rd. | El Norte & Country Club Ln | CCP & El Norte Pkwy | Valley Pkwy at CCP |
|---------------------------------------|------------------------------|-----------------------------|-----------------------------------|----------------------------|---------------------|--------------------|
| Crosswalk length                      | 2                            | 5                           | 5                                 | 4                          | 6                   | 5                  |
| Posted speed limit                    | 3                            | 5                           | 5                                 | 5                          | 5                   | 5                  |
| ADT                                   | 5                            | 5                           | 5                                 | 5                          | 5                   | 5                  |
| Need to cross                         | 10                           | 10                          | 4                                 | 4                          | 6                   | 10                 |
| Off-Peak Traffic Presence             | 4                            | 3                           | 2                                 | 3                          | 1                   | 1                  |
| Distance to Alternative APS crosswalk | 4                            | 4                           | 4                                 | 4                          | 4                   | 4                  |
| Number of Requests for APS (required) | 10                           | 5                           | 5                                 | 10                         | 5                   | 5                  |
| <b>Total Crosswalk Score</b>          | <b>38</b>                    | <b>37</b>                   | <b>30</b>                         | <b>35</b>                  | <b>32</b>           | <b>35</b>          |

**Table 3:** Total Score

| <b>Total Score</b> | <b>15<sup>th</sup> &amp; Escondido</b>                            | <b>El Norte &amp; Morning View Dr.</b>              | <b>El Norte &amp; Nutmeg / Nordahl Rd.</b> | <b>El Norte &amp; Country Club Ln</b> | <b>CCP &amp; El Norte</b> | <b>Valley Pkwy at CCP</b>                                                                                     |
|--------------------|-------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------|---------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------|
| Intersection Score | 9                                                                 | 12                                                  | 12                                         | 10                                    | 14                        | 14                                                                                                            |
| Crosswalk Score    | 38                                                                | 37                                                  | 30                                         | 35                                    | 32                        | 35                                                                                                            |
| <b>Total Score</b> | <b>47</b>                                                         | <b>49</b>                                           | <b>42</b>                                  | <b>45</b>                             | <b>46</b>                 | <b>49</b>                                                                                                     |
| Notes              | Access to Independence Lease-term 2012-2022 with intent to extend | Existing APS chirping sounds, added ped. green time | Future mitigation measure?                 | Future mitigation measure?            | 1x individual request     | Near Transit Center. A developer has been conditioned to make improvements which include the addition of APS. |

### **Prioritization and funding**

The cost of installing APS on all legs of the intersection is app. \$10,000 per intersection. These installations can be funded as part of a construction or maintenance project, with ADA Transition Plan Funding or with TCSC/TMPL Funding. In 2019, The City of Escondido's ADA Transition Funding allows adding APS at two (2) intersections. In the future, this funding is likely to continue and one location can be retrofitted annually.

In 2019, the highest total score of 49 points was calculated for the intersection of El Norte Parkway at Morning View Drive. This location has existing equipment (chirping sounds) but vibrotactile equipment was requested. Also, 49 points were assigned to the intersection of Valley Parkway at Centre City Parkway, near the Transit Center. For this location, a developer has been conditioned to make improvements which include the addition of APS. The third highest scoring location with the score of 47 points is South Escondido Blvd at 15th Avenue. It's recommended that APS will be installed at these two locations with ADA Transition Funding.

The fourth on the priority list is the intersection of Centre City Parkway at El Norte Pkwy with total score of 46 points. This location will be included on the list of projects to be evaluated with the TMPL 2019. If project is not selected, it will be placed on the APS Priority List for future funding.

In the future, the request list will be updated Quarterly. All new APS requests will be scored using the Prioritization Tool and the relative priority of the requested intersection as compared to previously requested intersections is determined. This updated Priority List will be used to request funding for design and construction of APS.

**Necessary Council Action:**

None.

**Respectfully submitted,**

*Prepared by:*



Ali M. Shahzad, PE (Traffic)/ Virpi Kuukka-Ruotsalainen  
Associate Engineer/Traffic Division



*Reviewed by:*



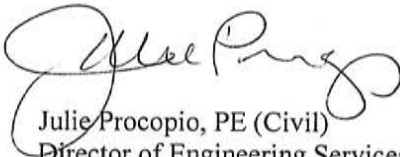
Owen Tunnell, PE (Civil)  
Assistant City Engineer

*Reviewed by*



Jodi Vinson  
Risk & Safety Manager, Risk Management

*Approved by:*



Julie Procopio, PE (Civil)  
Director of Engineering Services/City Engineer



**CITY OF ESCONDIDO**  
**TRANSPORTATION and**  
**COMMUNITY SAFETY COMMISSION**

**Commission Report of: April 11<sup>th</sup>, 2019**

**Item No.: F2**

**Location: Citywide**

**Initiated By: Staff**

**Request: Review and approve City of Escondido 2019/20 Traffic Management Project List (TMPL) Preliminary Prioritization**

**Background:**

Transportation and Community Safety Commission (TCSC) approved a policy to evaluate and prioritize proposed projects using a Traffic Management Project List (TMPL) on January 9, 2014. As stated in the policy, a list of projects needs to be evaluated by staff and presented to TCSC for consideration each year. The TCSC will provide direction to staff as to which projects should be selected for further evaluation and design. Staff will then report back in July with detailed design and cost information for TCSC consideration.

The following scoring criteria has been approved by TCSC to be used to evaluate and prioritize projects on the TMPL:

- Road Condition (max. 6 points)
  - Geometric Design (max. 3 points)  
Not Standard= 3, Substandard= 2, Partially Substandard= 1
  - Roadside Improvement (max. 3 points)  
Unimproved= 3, Partially Unimproved= 2, Mostly Improved with Gaps in Improvement= 1
- Road Usage (max. 6 points)
  - Bike and Pedestrian Volume (max. 3 points)  
High= 3, Medium= 2, Low= 1
  - Average Daily Traffic (ADT) (max. 3 points)  
ADT>7400veh/day= 3, 7400≥ADT>5400veh/day= 2, 5400≥ADT>3400veh/day= 1
- Anticipated Effectiveness (max. 6 points)
  - Feasibility of the Solution (max. 3 points)  
High=3, Medium=2, Low=1
  - Effectiveness of the Solution (max. 3 points)  
High=3, Medium=2, Low=1

- Problem Severity×2 (max. 12 points)
  - Frequency of Accidents (max. 6 points)  
Accident Rate $\geq$ 1.5= 6, 1.5>Accident Rate $\geq$ 0.5= 4, 0.5>Accident Rate= 2
  - Speeding Problem (max. 6 points)  
(85% - Design Speed) $\geq$ 10mph= 6, 10mph>(85% - Design Speed) $\geq$ 5mph=4, (85% - Design Speed)< 5mph= 2

Projects could receive a maximum of 30 points based on their different characteristics, projects nature and location. The projects with the higher total accumulated points have a higher priority on TMPL.

### **Discussion & Purpose:**

2019/20 Traffic Management Project List (TMPL) includes five different projects citywide. The list of projects with a brief description of the traffic concerns together with the potential solution are provided in this report. Project selected by TCSC will be further evaluated and engineering design will be provided for TCSC review and approval at the July meeting.

### 2019 TMPL

#### **1. Crosswalk Improvements at Citrus Avenue and Oak Hill Drive (estimated cost: \$30,000)**

City staff coordinated with the Escondido Union School District (EUSD) to prioritize the existing uncontrolled mid-block crosswalks in school zones. The crosswalk at the intersection of Citrus Avenue and Oak Hill Drive near Hidden Valley Middle School has been recommended to be included on this year's TMPL due to the high volume of students utilizing this crosswalk and the amount of traffic on Citrus Avenue. The intersection of Citrus Avenue and Oak Hill Drive is side-street-stop-controlled on Oak Hill Drive with no marked crosswalk on Oak Hill Drive and a marked mid-block crosswalk on Citrus Avenue. Figure 1 depicts the location of the existing mid-block crosswalk on Citrus Avenue at Oak Hill Drive.

Hidden Valley Middle School, with student population of approximately 1,022, is located at 2700 Reed Road. According to COMPACT, who provides crossing guard services to the District, a large number of students utilize the existing crosswalks at Citrus Avenue and Oak Hill Drive. Pedestrian counts provided by COMPACT reflect that 75 and 110 students crossed Citrus Avenue, and 23 and 78 students crossed Oak Hill Drive in the AM and PM school peaks, respectively.

Citrus Avenue between Bear Valley Parkway and Glenridge Road is classified as a two-lane Local Collector Road per City's Circulation Element. Under existing conditions, Citrus Avenue is a two-lane roadway with no center two-way-left-turn lane. On-street parking is prohibited. The roadway is partially improved to Local Collector Road standard. Concrete sidewalk is provided on the west side of the roadway between Patterson Road and Glenridge Road, and an asphalt pedestrian path is provided on the east side of the roadway between Patterson Road and Bear Valley Parkway. The average daily traffic on this segment of Citrus Avenue is 8,600 and the speed limit is 40 MPH. The 85<sup>th</sup> percentile speed on Citrus Avenue was measured to be 39 MPH.

High visibility crosswalk (ladder type) was installed at this location as part of the 2015 TMPL, prior to the City's Crosswalk Policy was established and approved by the TCSC in July 2017. Advanced school

crossing signage and pavement markings were installed on Citrus Avenue. No marked crosswalk or advanced school crossing signage is provided at the stop-controlled Oak Hill Drive.



**Figure 1 – Existing Mid-block Crosswalk at Citrus Avenue and Oak Hill Drive**

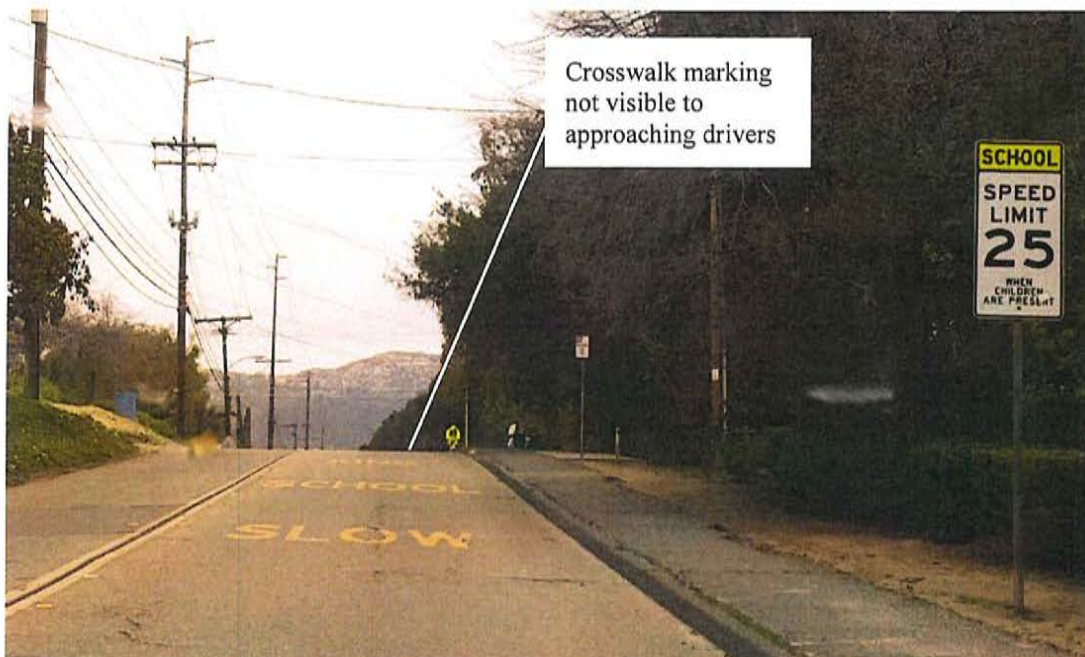
City staff conducted a field visit during the school pick-up time. One crossing guard was on site to assist students crossing Citrus Avenue. It was observed that vehicles were stopping in close proximity to the crosswalk while students were crossing and there were conflicts between vehicles making left-turn onto Oak Hill Drive and the students crossing Oak Hill Drive at the intersection. The mid-block crosswalk on Citrus Avenue is situated at the crown of a vertical curve of the roadway, therefore the crosswalk marking is not apparent to the approaching vehicles except the school crossing signage at the crosswalk. Figures 2 to 4 show the existing crosswalk and its field conditions.

#### Improvements

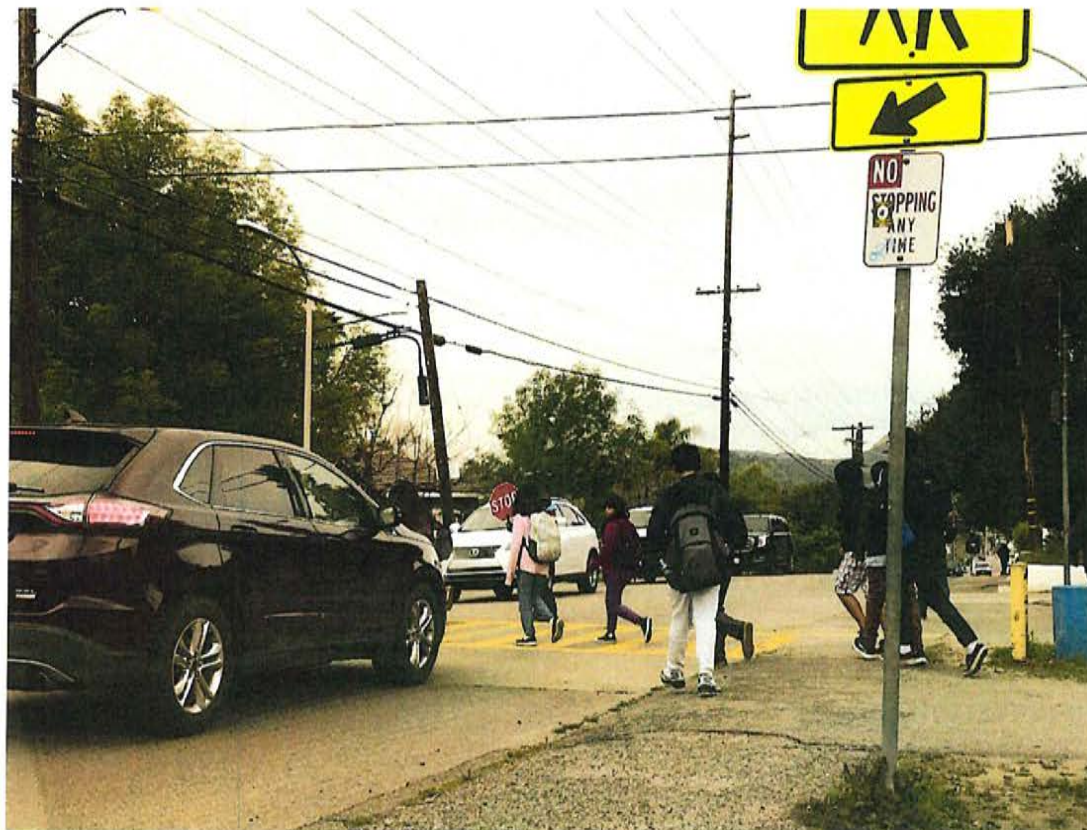
Per City's Crosswalk Policy, the crosswalk treatments would be **Std. + Rectangular Rapid-Flashing Beacons (RRFB) + one treatment from "A"** based on the existing traffic data and roadway classification, see Attachment 1. Improvements would include new yield lines, double-sided crossing signage, crosswalk marking and signage on Oak Hill Drive, RRFB on Citrus Avenue, and a traffic calming measure from City's Traffic Management Toolbox. RRFB and additional signage would enhance drivers' awareness of the crosswalk.



**Figure 2 – Existing Mid-block Crosswalk on Citrus Avenue**



**Figure 3 – Heading North on Citrus Avenue Approaching the Existing Crosswalk**



**Figure 4 – Student Crossing Mid-block Crosswalk on Citrus Avenue**

## 2. Pioneer Elementary School Crosswalk Improvements (estimated cost: \$6,000)

The uncontrolled crosswalk at the eastbound channelized right-turn lane of the signalized intersection of Lincoln Avenue and Ash Street has been recommended by EUSD and COMPACT to be included on this year's TMPL. The intersection is adjacent to the Pioneer Elementary School with student population of approximately 740.

The location of the uncontrolled crosswalk is shown on Figure 5. Improvements to this crosswalk have been implemented as part of the 2015 TMPL, which included high visibility crosswalk, yield line, striping improvements, and advanced crosswalk signage on eastbound Lincoln Avenue. According to the School District and COMPACT, concerns that right-turning vehicles not yielding to pedestrians at the crosswalk and vehicles making lane change close to the crosswalk still persist after the previous crosswalk improvements were completed.

Lincoln Avenue between Fig Street and Ash Street is classified as a Prime Arterial according to City's Circulation Elementary. The existing roadway is a four-lane roadway with no center turn lane. On-street parking is prohibited. The average daily traffic on this segment of Lincoln Avenue is 24,699 and the speed limit is 40 MPH.



**Figure 5 - Uncontrolled Crosswalk at Lincoln Avenue and Ash Street**

Police Department and City staff had site visits to observe traffic conditions during school pick-up time. Based on the field observation and input from the crossing guard, a few concerns were identified at the uncontrolled crosswalk: 1) Some of the signs are old and not CA MUTCD compliant; 2) the crosswalk is in the shadow of a big wild palm tree during the afternoon school peak time, which potentially reduces driver's visibility of crosswalk as well as pedestrians crossing; 3) vehicles making illegal lane change in front of the channelizing island and the crosswalk; 4) existing flashing warning light and school

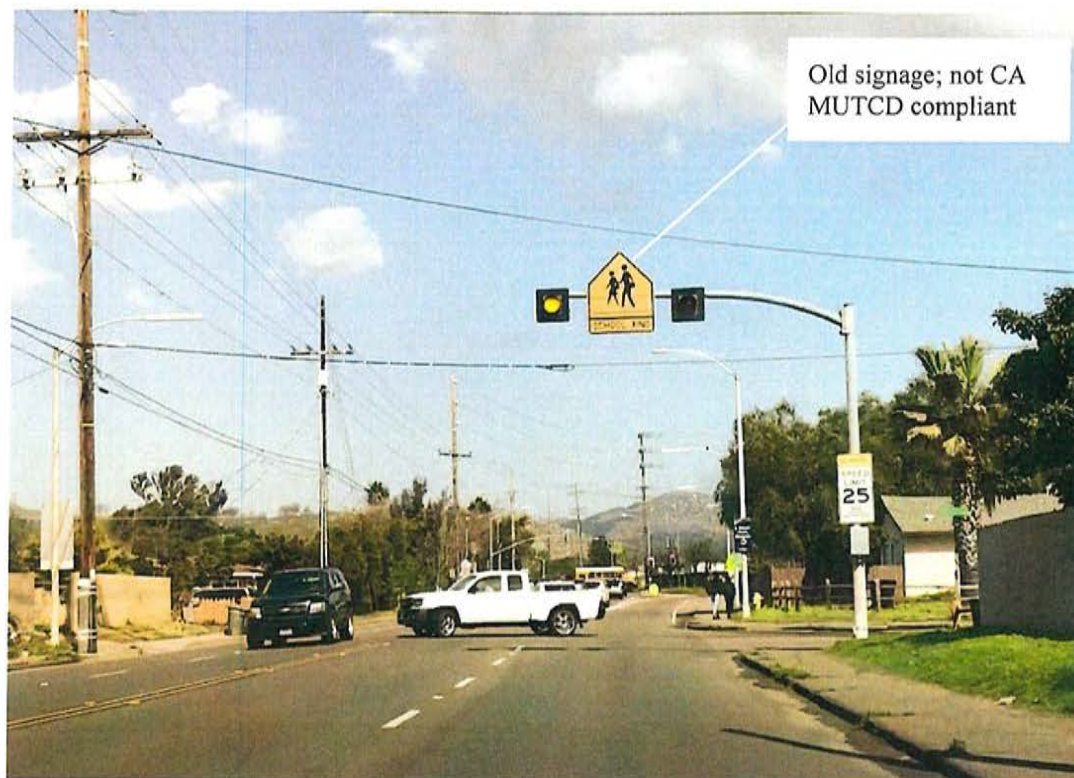
crossing sign at the crosswalk was damaged by an accident but will be replaced by City's Public Works. Figures 6 to 8 show pictures of the field conditions.

Improvements:

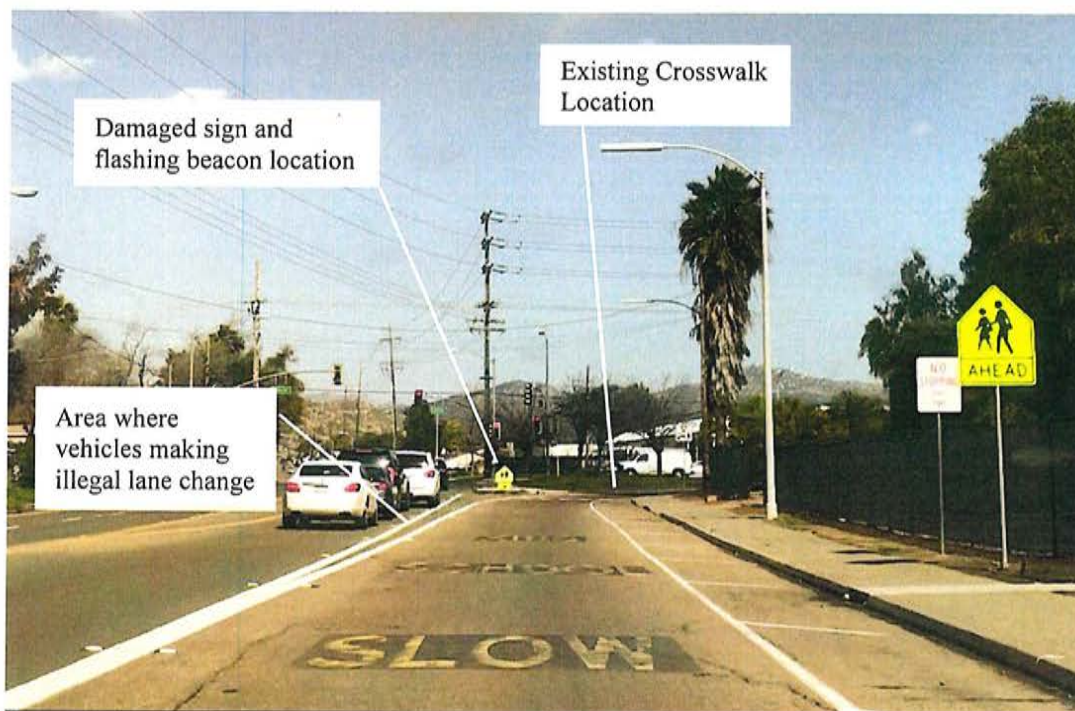
Considered the aforementioned concerns, staff recommends replacing old signs to be compliant with CA MUTCD, upsizing some existing warning signage approaching the crosswalk, adding YIELD pavement legend upstream of the existing yield line, removing the wild palm tree on the side of the road, adding new striping to deter drivers from making lane change in striped island area.



**Figure 6 – Pedestrians Crossing in the Shadow of a Wild Palm**



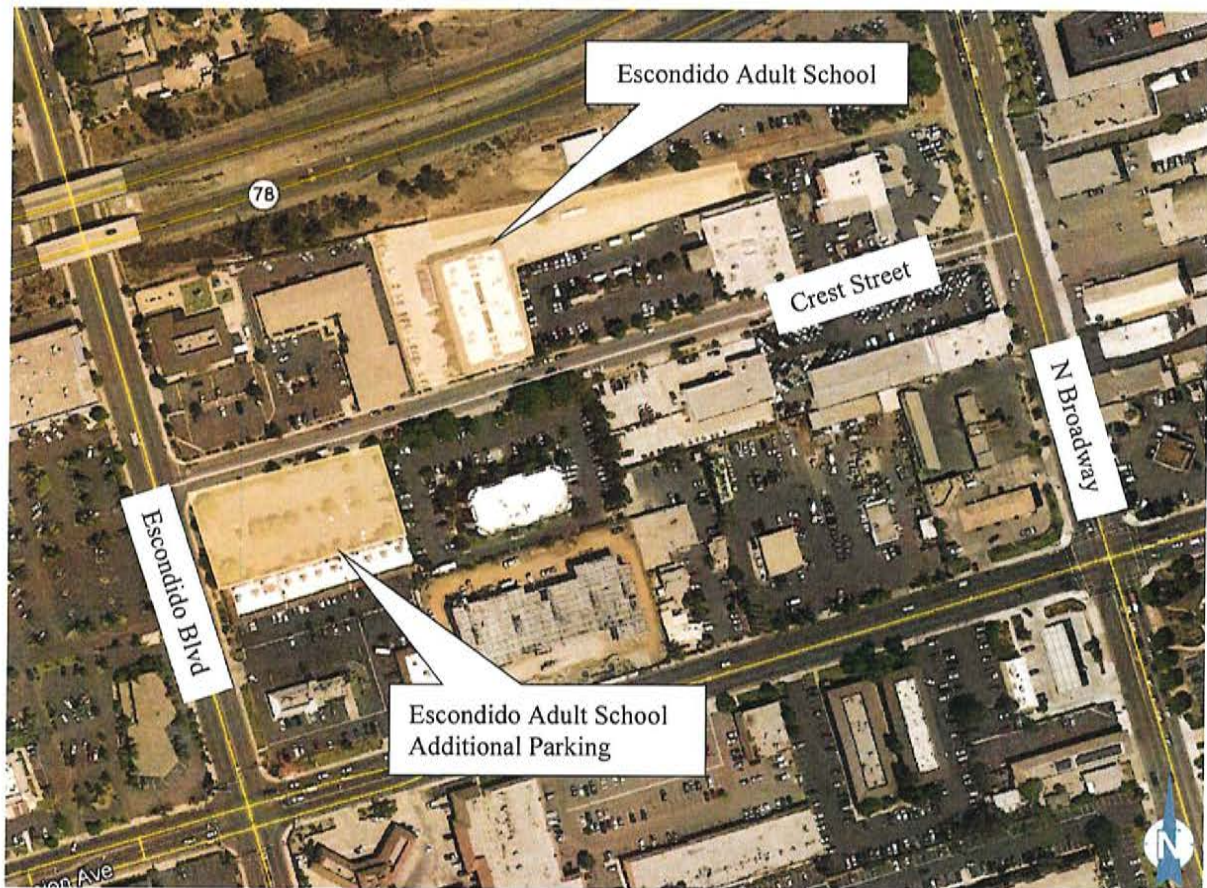
**Figure 7 – Advanced Flashing Beacons with Old Signage**



**Figure 8 – EB Lincoln Ave Approaching the Crosswalk**

**3. Escondido Adult School New Crosswalk on W. Crest Street (estimated cost: \$30,000)**

The City has received requests from the Escondido Adult School as well as Escondido Union High School District for a mid-block crosswalk on W. Crest Street near the school. Escondido Adult School, located 220 W. Crest Street, offers classes from 8:30am to 8:30pm Monday to Thursday, and from 8:00am to 2:30pm on Friday. The main school building, with approximately 85 parking spaces, is located on the north side of W. Crest Street. There is an additional parking lot located on the south side of the street provided by the school. Figure 9 depicts the location of the school and the additional parking on W. Crest Street.

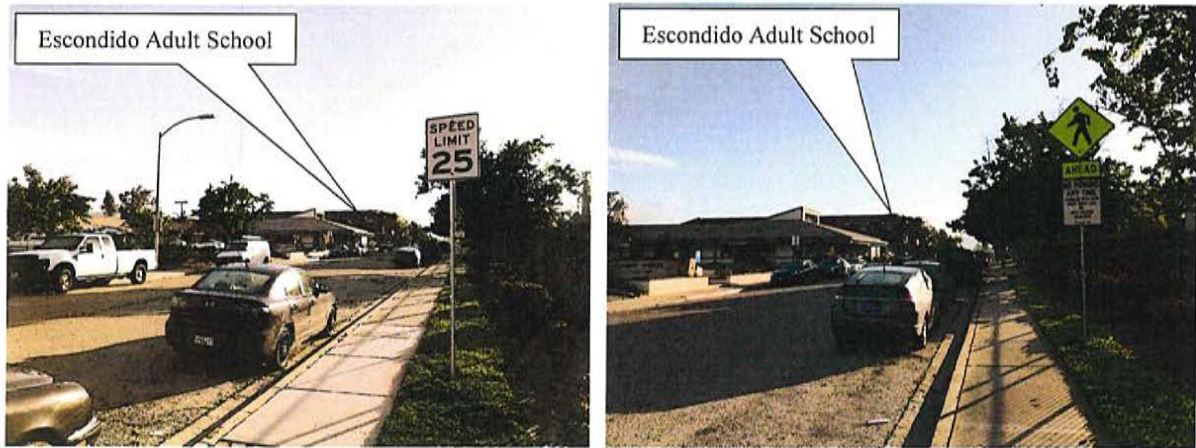


**Figure 9 – Escondido Adult School and Additional School Parking Lot on W. Crest Street**

W. Crest Street between N Broadway and Escondido Boulevard is a two-lane local street with a prima facie speed of 25 MPH being in a business zone. Parking is allowed on both sides of the street. An average daily traffic is estimated to be 4,900. The pedestrian count provided by the school indicated 102 pedestrians cross the street between the school building and the parking lot across the street in the morning peak hour.

The adult school has expressed concerns about drivers speeding on W. Crest Street and requested a marked uncontrolled crosswalk in May 2018. The city has evaluated and determined that the location would not meet the city's basis crosswalk warrant, see Attachment 2. It was expressed to the Adult School then that in order to meet the basis crosswalk warrant, accessible pedestrian ramps would need to be constructed at the crosswalk location, and if the school is interested in funding this improvement, the city could assist by providing the design and other technical details needed. As a result, the city

installed 25 MPH speed limit signs on both ends of the street as well as pedestrian crossing ahead warning signs near the adult school where students would cross the street to address the concerns. Figure 10 shows the improvements implemented in 2018.



**Figure 10 –Speed Limit Signs and Pedestrian Crossing Ahead Signs Installed in 2018**

To follow up on this request, City staff has performed the crosswalk point warrant for this location. Gap time data and pedestrian counts were collected in the field during the morning peak in March 2019. The collected data shows that the average number of vehicle gap in 5-minute interval was over six and the number of pedestrians crossing during the same morning peak hour was approximately 65. Based on the existing conditions and the data collected, the number of points awarded to this location is 11 points, which is under the minimum of 16 points required to justify an uncontrolled crossing, see Attachment 3. If the number of pedestrians was assumed to be 102 based on the data provided by the school in 2018, the warrant would still not be met.

If a mid-block crosswalk is installed at this location, per City's crosswalk policy, the crosswalk treatment for this location would be **Std. + Rectangular Rapid Flashing Beacons (RRFB)**, see Attachment 1. In addition, two new accessible pedestrian ramps would also be needed at the crosswalk location. However, because the crosswalk point warrant would not be met at this location, a mid-block uncontrolled crosswalk is not recommended.

**4. Countdown Pedestrian Indications in School Zones (estimated cost: \$1,500 per location)**

The City has a list of signalized intersections within school zones that have not been upgraded with countdown pedestrian indications. It is recommended that the top five locations be included in this year's TMPL.

Due to the large number of pedestrians crossing during the peak school traffic hours, some pedestrians/students cross the street late in the pedestrian crossing period and end up not able to finish crossing the street within the allocated pedestrian crossing time. By providing countdown indications of the remaining crossing time to the pedestrians, the amount of pedestrians not completing their crossing by the end of the pedestrian clearance time could be reduced and therefore reducing the amount of vehicle and pedestrian conflicts at the intersections.



**Figure 11 – Countdown Pedestrian Indications**

COMPACT has provided the recommendation on the top five signalized intersections for upgrades based on the amount of students crossing at the location and its proximity to existing schools. The following intersections are recommended for this year's TMPL.

- 1) Mission Avenue and Ash Street (Mission Middle School)
- 2) Bear Valley Parkway and Citrus Avenue (Orange Glen High School School)
- 3) Bear Valley Parkway and East Valley Parkway (Orange Glen Elementary School)
- 4) Midway Drive and Oak Hill Road (Oak Hill Elementary School)
- 5) Midway Drive and Grand Avenue (Oak Hill Elementary School)

**5. Accessible Pedestrian Signals at Centre City Parkway and El Norte Parkway (estimated cost: \$10,000)**

The City has received requests for Accessible Pedestrian Signals (APS), name used in MUTCD, at six signalized intersections within the City. These requests were made by residents who are visually-impaired, a senior center, and an organization who serves those with vision impairment. APS are devices integrated with pedestrian push button that communicate information about pedestrian timing in nonvisual format such as audible tones, verbal messages, and/or vibrating surfaces.

TCSC at its January 2019 meeting approved the ranking analysis criteria for the adopted City APS Policy. This ranking criteria was used to prioritize the signalized intersections where APS requests have been received by the City. City's ADA Committee has an annual ADA Budget that could fund APS installation at one or more of these intersection(s). For FY 2019/20, ADA Budget would be able to fund two locations on the APS ranking.

Request for APS at the intersection of Centre City Parkway and El Norte Parkway was made by a resident who is deaf-blind. This resident has also requested APS at other intersections on the list. The intersection of Centre City Parkway and El Norte Parkway ranked fourth out of the six locations with a total score of 46 points based on the approved ranking criteria, see Table 1.

| Ranking | Intersection                        | Total Score | Funding                                     |
|---------|-------------------------------------|-------------|---------------------------------------------|
| 1       | El Norte Pkwy/Morning View Dr       | 49          | ADA Budget                                  |
| 2       | Centre City Pkwy/Valley Pkwy        | 49          | Improvements to be completed by a developer |
| 3       | Escondido Blvd/15 <sup>th</sup> Ave | 47          | ADA Budget                                  |
| 4       | Centre City Pkwy/El Norte Pkwy      | 46          | 2019/20 TMPL Consideration                  |
| 5       | El Norte Pkwy/Country Club Ln       | 45          | None Recommended at this time               |
| 6       | El Norte Pkwy/Nutmeg/Nordahl Rd     | 42          | None Recommended a this time                |

Source: TCSC Staff Report, Ranking Analysis for APS Citywide, 4-11-19

**Table 1 – APS Ranking**

**TMPL Prioritization:**

Using the point-based scoring criteria in this report, all five projects were evaluated and scored. Traffic Management Project List (TMPL) prioritization table, Table 2, shows the scores of each of the five projects. Top priority projects are recommended to be selected for further assessment and detailed design considering an estimated \$50,000 Transportation and Community Safety budget. City staff will present the final design of the selected projects at the next TCSC meeting to receive final comments and approval prior to implementation.

| Project Name                                                                       | Measures of Prioritization |                         |                                  |                                      |                                       |                                     |                                   |                     | Score<br>(max. 30) | Estimated<br>Cost |
|------------------------------------------------------------------------------------|----------------------------|-------------------------|----------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|-----------------------------------|---------------------|--------------------|-------------------|
|                                                                                    | Road Condition<br>(max. 6) |                         | Road Usage<br>(max. 6)           |                                      | Anticipated Effectiveness<br>(max. 6) |                                     | Problem Severity x 2<br>(max. 12) |                     |                    |                   |
|                                                                                    | Geometric<br>Design        | Roadside<br>Improvement | Bike and<br>Pedestrian<br>Volume | Average<br>Daily<br>Traffic<br>(ADT) | Feasibility<br>of the<br>Solution     | Effectiveness<br>of the<br>Solution | Frequency<br>of Accidents         | Speeding<br>Problem |                    |                   |
| Crosswalk Improvements at Citrus Ave and Oak Hill Dr (Hidden Valley Middle School) | 2                          | 2                       | 3                                | 3                                    | 3                                     | 2                                   | 2                                 | 2                   | 19                 | \$30,000          |
| Crosswalk Improvements at Lincoln Ave and Ash St (Pioneer Elementary School)       | 1                          | 2                       | 3                                | 3                                    | 3                                     | 1                                   | 2                                 | 4                   | 19                 | \$6,000           |
| Countdown Pedestrian Indications at Five Locations in School Zones                 | 1                          | 2                       | 3                                | 3                                    | 3                                     | 2                                   | 2                                 | 2                   | 18                 | \$7,500           |
| Accessible Pedestrian Signals at El Norte/Centre City Parkway                      | 1                          | 1                       | 2                                | 3                                    | 3                                     | 2                                   | 2                                 | 2                   | 16                 | \$10,000          |
| New Crosswalk on W. Crest St (Escondido Adult School)                              | 1                          | 1                       | 3                                | 1                                    | 1                                     | 1                                   | 2                                 | 2                   | 12                 | \$30,000          |

**Points Details:**

**Road Condition:**

Geometric Design of Road: Not Standard = 3, Substandard = 2, Partially Substandard = 1

Roadside Improvement: Unimproved = 3, Partially Unimproved = 2, Mostly Improved with Gaps in Improvement = 1

**Road Usage:**

Bike and Pedestrian Volume: High = 3, Medium = 2, Low = 1

ADT: >7400veh/day = 3, >5400veh/day and <=7400 veh/day = 2, >3400veh/day and <=5400veh/day = 1

**Anticipated Effectiveness:**

Feasibility of the Solution: High=3, Medium=2, Low=1

Effectiveness of the Solution: High=3, Medium=2, Low=1

**Problem Severity:**

Frequency of Accidents: Accident Rate >= 1.5 = 6, 1.5 > Accident Rate >= 0.5 = 4, 0.5 > Accident Rate = 2

Speeding Problem: (85% - Design Speed) >= 10mph = 6, 5mph <= (85% - Design Speed) < 10mph=4, (85% - Design Speed) < 5mph=2

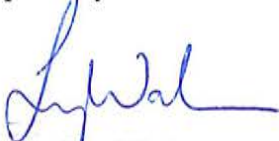
**Table 2 – 2019/20 TMPL Prioritization Table**

**Recommendation:** Staff recommends that the top four ranked project(s) be selected for further design and evaluation.

**Necessary Council Action:** None.

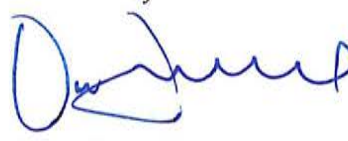
**Respectfully submitted,**

*Prepared by:*



Miriam Jim, PE, TE  
 Associate Engineer

*Reviewed by:*



Owen Tunnell, PE  
 Assistant City Engineer

*Approved by:*



Julie Procopio, PE  
 Director of Engineering Services/City Engineer

## Attachment 1: City's Crosswalk Policy – Treatments (1 of 2)

### 3. Treatments

If a proposed crossing location meets the criteria set by both the Basic and Point warrants, the next step is to evaluate the most appropriate crossing treatment(s) to be installed with the marked crosswalk.

Using paragraphs 09 and 09a of section 3B.18 of the new 2014 CA-MUTCD as a guideline, and also considering City of San Diego proposed treatments for different cross sections, ADTs and speed limits, the following treatment thresholds are proposed to be added to the new City of Escondido Crosswalk Policy.

| ADT<br>Cross Section              | <1500                        | 1500 - 5000                                                                            | 5000-12000                                                                         | > 12000           |
|-----------------------------------|------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------|
| Two-lane roads<br>(without TWLTL) | Std.                         | Std. + RRFB**                                                                          | Std. + RRFB** + one<br>from (A)                                                    | D                 |
| Two-lane roads<br>(with TWLTL)    | Std.<br>one measure from (B) | For SL < 35<br>Std. + RRFB**<br>For SL ≥ 35<br>Std. + RRFB** + one<br>measure from (B) | Std. + RRFB** + one<br>measure from (B)                                            | D                 |
| Four Lanes or more                | N/A                          | Std. + RRFB** + one<br>measure from (C)                                                | For SL < 35<br>Std. + RRFB** + one<br>measure from (C)<br>For SL ≥ 35<br>Measure D | Signal or<br>HAWK |

\* SL: Speed Limit of the roadway

\*\* RRFB (Rectangular Rapid Flashing Beacons), or other approved flashing beacon.

Std.: Advanced yield lines with associated Yield Here to Pedestrians (R1-5, R1-5a) signs should be placed 20 to 50 feet in advance of the crosswalk, adequate visibility should be provided by parking prohibitions, pedestrian crossing (W11-2) warning signs with diagonal downward pointing arrow (W16-7p) plaques should be installed at the crosswalk, and a high-visibility crosswalk marking pattern should be used. All Signing and Striping shall comply with CA-MUTCD standards.

#### MEASURES:

##### (A)

1. Raised Crosswalk or other traffic calming treatment in accordance with C.O.E. TMPL Guidelines
2. Speed Radar Feedback Signs for both approaches

##### (B)

1. Raised Crosswalk
2. Speed Radar Feedback Signs for both approaches
3. Pedestrian refuge islands

##### (C)

1. Road Diet
2. Raised Crosswalk
3. Speed Radar Feedback Signs for both approaches
4. Pedestrian refuge islands
5. Road Diet

**Attachment 1: City's Crosswalk Policy – Treatments (2 of 2)**

- (D) 1. A Traffic Signal is required if the CA MUTCD warrants are met and it is recommended by a traffic engineering study. Otherwise at least one of the following is required.  
2. HAWK Hybrid Beacon if the CA MUTCD warrants are met.  
3. Horizontal deflection traffic Calming treatment (\*\*) with RRFBs if the City of Escondido's Traffic Calming Guidelines are met to include:

- a. Pedestrian refuge islands & Bulbouts
- b. Road Diet
- c. Roundabouts

(\*\*) Horizontal deflection treatments include, but are not limited to: roundabouts, pedestrian refuge islands, and pedestrian bulb-outs.

Attachment 2: 2018 Crosswalk Basic Warrant Analysis – W. Crest Street

Revised City of Escondido Crosswalk Policy  
July 13, 2017  
Page 2 of 6

x-walk warrant analysis  
for Crest St. (Adult School).

1. Basic Warrants

All of the Basic Warrants must be met in order for an uncontrolled location to be considered for marked crosswalk.

✓ 1.1. Pedestrian Volume Warrant

Pedestrian Crossing Volume should be 10 pedestrian per hour or more during the peak pedestrian hour. AM Peak 102.

✗ 1.2. Approach Speed Warrant

The 85th percentile approach speed must be equal to or lower than 40 MPH, unless a HAWK or a pedestrian signal will be installed. 25 MPH < 40 MPH.

✓ 1.3. Nearest Controlled Crossing

The proposed location must be farther than 250 feet from the nearest controlled pedestrian crossing in City of Escondido downtown area and farther than 400 feet from the nearest controlled pedestrian crossing in other areas. none 250' ~ 400'

✓ 1.4. Visibility Warrant

The motorist must have an unrestricted view of all pedestrians equal or greater than the "Stopping Sight Distance" needed for the 85th percentile speed. Any other sight restrictive features will require special attention. YES

✓ 1.5. Illumination Warrant

The proposed location must have adequate existing lighting or adequate lighting shall be provided prior to the installation of the crosswalk. - light on 1 side of street

✗ 1.6. Accessibility Warrant

The proposed location must have existing accessibility to disabled pedestrians or accessibility improvements shall be included as part of the project.

need 2 ramps (one on either side of x-walk).

*[Signature]*  
5.11.18.

### Attachment 3: Crosswalk Point Warrant Analysis – W. Crest Street

Revised City of Escondido Crosswalk Policy  
 July 13, 2017  
 Page 3 of 6

Date: 3/26/19.

## 2. Points Warrants

Point warrants are the number of points a location gets along with the Basic Warrants to qualify for a marked crosswalk. A proposed location that meets all the Basic Warrants requires a minimum of 16 points on the Points Warrants to justify an uncontrolled crossing.

### 2.1. Pedestrian Volume Warrant

| No. of Pedestrians (Peak Hour) | Points | Total Available Points |
|--------------------------------|--------|------------------------|
| 11-30                          | 2      | 10                     |
| 31-60                          | 4      |                        |
| 61-90                          | 6      |                        |
| 91-100                         | 8      |                        |
| Over 100                       | 10     |                        |

All effort will be made to count the actual latent demand. However, when not possible to observe and count the latent crossing demand, the counted number of pedestrians will be increased by 30% in the following locations.

- Areas such as commercial areas and high density residential areas
- Where a pedestrian traffic generator exists within 600 feet of the proposed crosswalk
- Other locations with potential latent demand based on engineering judgement

### 2.2. General Condition Warrant

| Condition                                                                                                                                         | Points | Total Available Points |
|---------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------|
| The nearest controlled pedestrian/bicycle crossing is greater than 600 feet from the proposed crosswalk                                           | 3      | 12                     |
| The proposed crosswalk will position pedestrians to be seen better by motorists (applicable to uncontrolled intersections only)                   | 2      |                        |
| An existing bus-stop is located within 100 feet of the proposed crosswalk                                                                         | 2      |                        |
| The proposed crosswalk will establish a midblock crossing and channelize the flow where pedestrian crossing is spread over a long stretch of road | 2      |                        |
| Other safety related factors                                                                                                                      | 3      |                        |

### 2.3. Gap Time Warrant

| Average Number of Vehicular Gaps per Five-Minute Period | Points | Total Available Points |
|---------------------------------------------------------|--------|------------------------|
| 0-0.99                                                  | 0      | 8                      |
| 1-1.99                                                  | 2      |                        |
| 2-2.99                                                  | 4      |                        |
| 3-3.99                                                  | 8      |                        |
| 4-4.99                                                  | 4      |                        |
| 5-5.99                                                  | 2      |                        |
| 6 or over                                               | 0      |                        |

Total = 11 points.



**CITY OF ESCONDIDO**  
**TRANSPORTATION and**  
**COMMUNITY SAFETY COMMISSION**

**Commission Report of: April 11<sup>th</sup>, 2019**

**Item No.: F3**

**Location: N. Broadway – Escondido High School**

**Initiated By: City Staff**

**Request: Escondido High School Traffic Safety and Signal Warrant Report & Accident Data**

**Background & Discussion:**

City Staff received requests from citizens, to review traffic safety at Escondido High School, to evaluate traffic calming, accident history, and conduct a warrant analysis for a traffic signal at the high school driveway after a recent collision. At the January 10<sup>th</sup>, 2019 commission meeting the Transportation Commissioners requested that staff study the area and bring back a report.

The City of Escondido recently repaved N. Broadway all along the school frontage and narrowed down the lanes to slow traffic down and provided a two-way left turn lane (TWLTL) for vehicles to safely pull out of the through traffic lanes and be able to make lefts in/out of the multilane roadway. Bike lanes, and red curbing was added along the roadway.

After improvements were made, a Radar Speed Survey and Average Daily Traffic (ADT) volume machine counts were conducted. Speed Surveys are conducted whenever the road environment is changed to update the speed limits. As a result of the improvements the 85<sup>th</sup> percentile speed was reduced from 45 mph to 40 mph from Leslie to Rincon. The speed limit from El Norte to Leslie was set at 40 mph with sign postings of 25 MPH When Children Are Present (WCAP), supporting the posted limits.

City staff also provided a Traffic Management Plan to the School for pick up and drop off that was to be implemented in the summer of 2018, as they could no longer pull up curb side for drop off/pick up due to the addition of the bike lanes and narrowing lane to calm traffic. Additionally, a speed Radar Feedback sign was installed in a previous year to warn drivers to slow down in the southbound direction.

In response to the Transportation Commission's request, collision history and volume data was evaluated to determine if a signal was warranted at the Escondido High School driveway at N. Broadway. Staff had a data vendor conduct turning movement counts at the high school driveways.

## Collision History

North Broadway – Bahia Ln to Sheridan Avenue accidents per calendar year (12 months)

| Year                | 2013 | 2014 | 2015                                    | 2016                                             | 2017                                                         | 2018                          |
|---------------------|------|------|-----------------------------------------|--------------------------------------------------|--------------------------------------------------------------|-------------------------------|
| Number of accidents | 2    | 1    | 3                                       | 4                                                | 6                                                            | Crossroads shows no accidents |
| Cause               |      |      |                                         |                                                  |                                                              |                               |
|                     |      |      | Broadside:<br>Bike – wrong side of road | 1:<br>04/07/2016-<br>Pedestrian violation        | Bike – cause unknown, vehicle backed into biker              |                               |
|                     |      |      | Rear-End:<br>Unsafe speed               | Rear-End:<br>Unsafe speed                        | Head-On:<br>Sheridan signalized intersection – improper turn |                               |
|                     |      |      | Broadside:<br>Bike – wrong side of road | 2: Vehicle-pedestrian:<br>Other improper driving | Broadside:<br>Unsafe speed                                   |                               |
|                     |      |      |                                         | Rear-End:<br>Unsafe speed                        | Rear-End:<br>Unsafe speed                                    |                               |
|                     |      |      |                                         |                                                  | 3: Broadside:<br>Auto R/w<br>04/04/2017                      |                               |
|                     |      |      |                                         |                                                  | Read-End to parked vehicle: DUI                              |                               |

Any 12 month period with 5 or more accidents: 04/07/2016-04/04/2017 marked in red font correctible with a signal.

An accident study was conducted for traffic signal warrant analysis. Using Crossroads-Database, all reported, injury accidents were studied within a five (5) year time-period. In addition, the dates of the accidents were inspected to see if any 12 month period with more than 5 accidents could be noted that were correctable with a signal. A 12 month period was noted from 04/07/2016-04/07/2017 during which three accidents would have possibly been corrected with a signal. This does not meet the 5-accident warrant.

Approximate locations of these accident are shown on the map.

Accidents within the 12 month period of 04/07/2016-04/07/2017

**1:** 04/07/2016 at 07:36am. Vehicle-pedestrian accident caused by northbound driver changing lanes and colliding with pedestrian in violation 26' north from Trellis Lane. This PDO, non-injury accident happened near school's south driveway. **jaywalking- correctible with signal.**

**2:** 11/15/2016 at 4:59pm. Vehicle-pedestrian accident 10' north of Trellis Lane caused by pedestrian violation and improper driving near school's south driveway. Injury. **Possibly jaywalking- correctible with signal. Check report # 1613542**

**3:** 04/04/2017 at 03:05pm. Eastbound vehicle making a left turn collides with 2 other vehicles 10' south of La Lomita Dr (near School's northern driveway). Injury. **Correctible with signal.**

Four crashes were determined not to be correctable by a signal. Two crashes at another location and two were rear end accidents that are more likely with a signal.

**A:** 01/10/2017 at 05:45pm. Vehicle – bicycle accident, cause unknown 180' north of Leslie Lane (near school's athletic field entrance). Bicycle driving northbound. Accident happened before the bike lanes were installed. Injury. **Not correctible by a signal.**

**B:** 02/23/2017 at 09:16pm. Vehicle vs. motorcycle broadside accident caused by unsafe speed at Intersection of N Broadway at Leslie Lane. Fatal. (Driver was pulling out of Leslie Lane at a different location much north of the High School driveways)

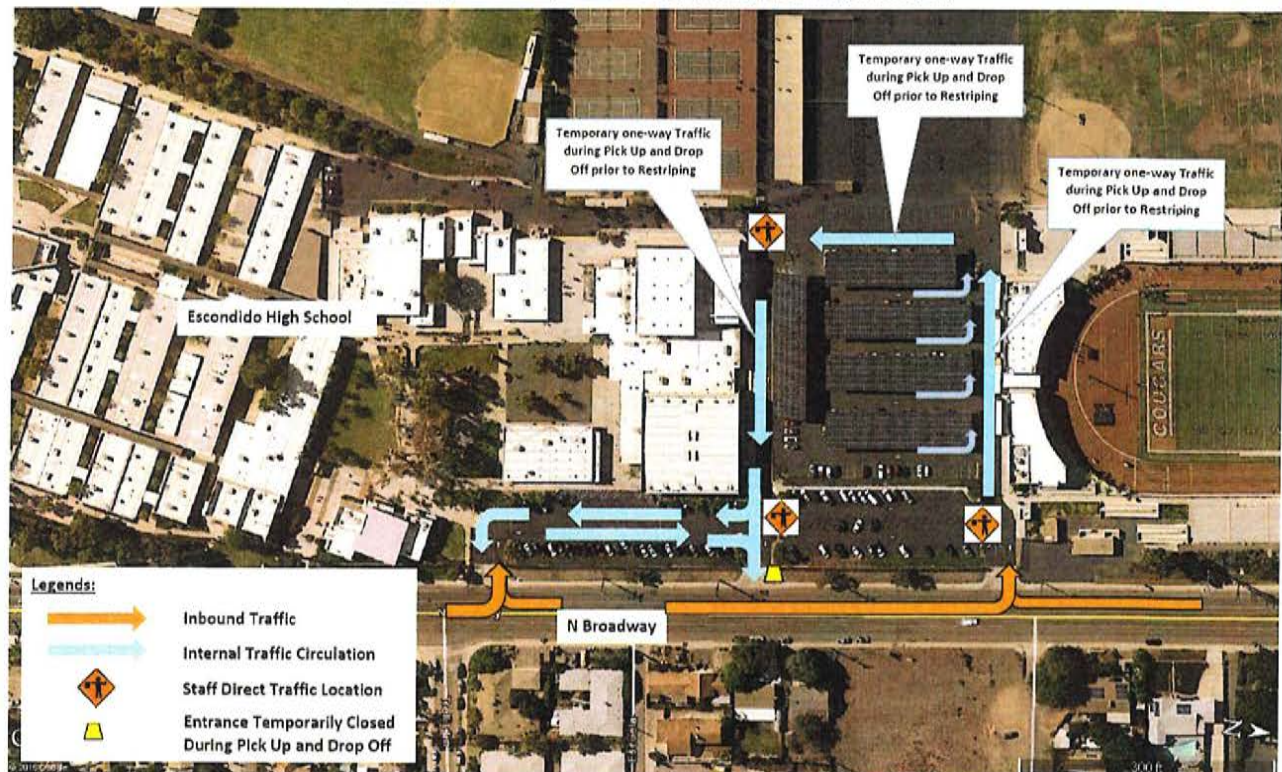
**C:** 07/22/2016 at 08:50am. Rear-End accident caused by unsafe speed, 92' north of Escuela Glen, near school's middle driveway. Injury. **Not correctible by a signal.**

**D:** 12/28/2016 at 06:25pm. Rear-End accident caused by unsafe speed 658' south from Leslie Ln (south from La Lomita Dr by school's north driveway). Injury. **Not correctible by a signal.**

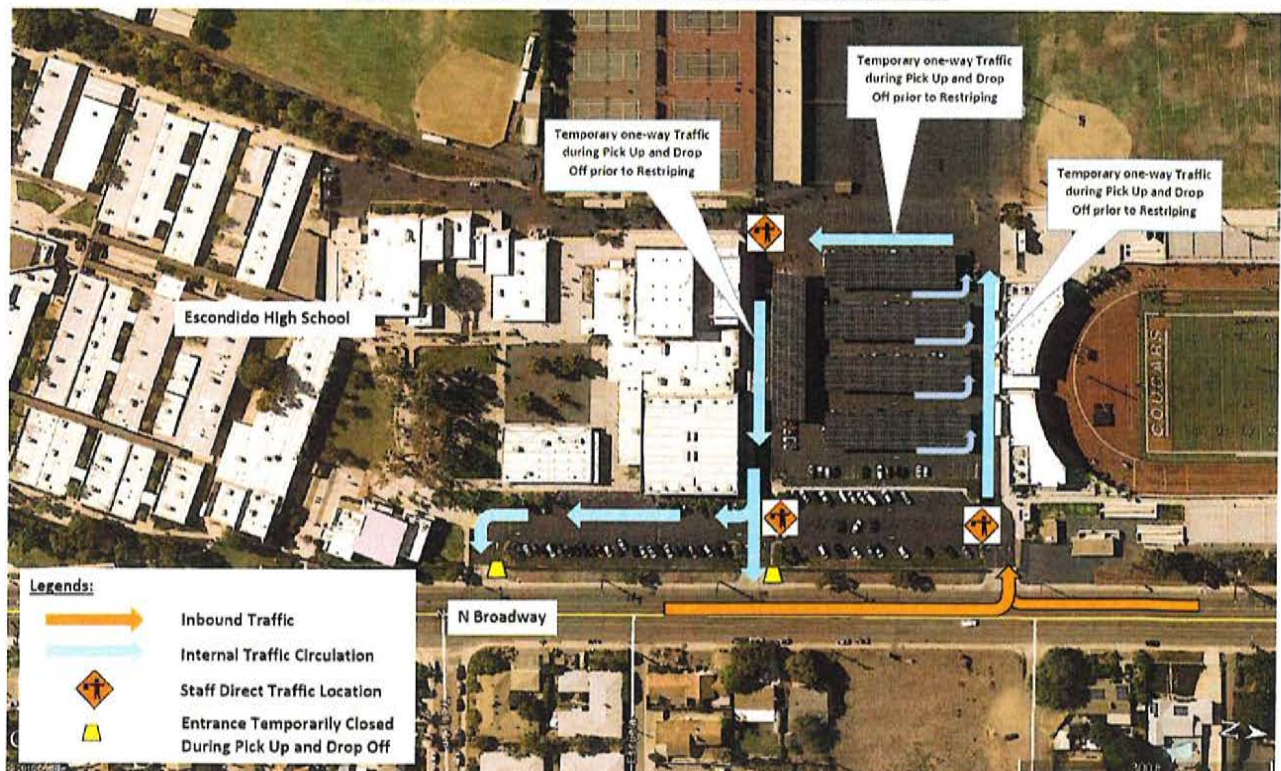


## Traffic Management Plan options provided to the High School – Option 1 & 2

Escondido High School – Proposed Traffic Circulation Plan for Pick Up and Drop Off



Escondido High School – Proposed Traffic Circulation Plan for Pick Up and Drop Off



The school was provided with 2 options of traffic management plans and the school choose option 2 with the north driveway being the main entrance. District elected to queue vehicles in the parking lot between the north and middle driveway queue in the TWLTL on N. Broadway.

### **Traffic Signal Warrant Analysis:**

The warrant analysis was done using the California Manual on Uniform Traffic Control Devices (CA-MUTCD 2014 Edition Revision 3) dated March 09, 2018 provides the methodology for conducting the warrant analysis. Section 4C.01 details the procedure for Traffic Control Signal Needs Studies.

As a result of the Traffic Signal Warrants for all the three (3) driveways, none of the signal warrants were met at any driveway.

|                                                      |           |
|------------------------------------------------------|-----------|
| <b>Warrant 1, Eight-Hour Vehicular Volume</b>        | <b>No</b> |
| <b>Warrant 2, Four-Hour Vehicular Volume</b>         | <b>No</b> |
| <b>Warrant 3, Peak Hour</b>                          | <b>No</b> |
| <b>Warrant 4, Pedestrian Volume</b>                  | <b>No</b> |
| <b>Warrant 5, School Crossing</b>                    | <b>No</b> |
| <b>Warrant 6, Coordinated Signal System</b>          | <b>No</b> |
| <b>Warrant 7, Crash Experience</b>                   | <b>No</b> |
| <b>Warrant 8, Roadway Network</b>                    | <b>No</b> |
| <b>Warrant 9, Intersection Near a Grade Crossing</b> | <b>No</b> |

03 The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

#### **A. Warrants 1-3: Volumes**

The turning volumes entering and leaving the three (3) driveways with the through volumes are not an even 50-50 distribution, there are substantially more through volumes.

A-South Driveway: 479    N. Broadway: 3,814 (for both AM & PM peak hour totals)  
B-Middle Driveway: 240    N. Broadway: 2,440 (for both AM & PM peak hour totals)  
C-North Driveway: 575    N. Broadway: 3,833 (for both AM & PM peak hour totals)

#### **B. Warrants 4 and 5: Pedestrian Volumes and School Crossing**

Not applicable. There is no existing crosswalk crossing N. Broadway at the three driveway locations.

#### **C. Warrant 7: Crash Experience**

The accidents for the Warrant 7 requirements of: 1 year of 5 or more correctable collisions that are susceptible to correction by a traffic signal are Not Met.

One (1) vehicle collision and two (2) jaywalking collisions are correctable from the 7 collisions (12-month period 04/07/2016-04/07/2017).

#### **D. Warrants 8 and 9: Roadway Network & Grade Crossing**

Not applicable.

## Conclusion

The Warrants for the counts taken at each driveway were conducted, and none of the warrants were met.

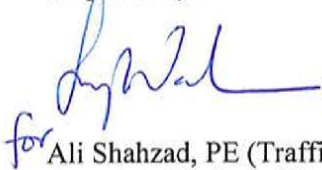
## Recommendation:

- ✓ Based on the data and analysis a traffic signal is not warranted at any driveway.
- ✓ Staff recommends that the school district implement the Traffic Management Plan provided to the High School precisely for getting the single file queue off the street and winding around to the back of the parking lot, and have flaggers to manage on-site traffic to the passenger drop off area, thus preventing the spill back into the TWLTL on N. Broadway. Alternatively, active management of the drop off zone could eliminate queuing onto N. Broadway.
- ✓ Traffic calming including narrowing travel lanes and adding a TWLTL and bike lanes, has been completed, along with the radar feedback sign on the southbound approach. The storage area for pedestrians has been increased with a wide pedestrian ramp area at the signalized intersection of N. Broadway and Bud Quade Way and Sheridan Avenue.

**Necessary Council Action:** None.

**Respectfully submitted,**

*Prepared by:*



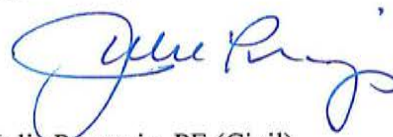
for Ali Shahzad, PE (Traffic)  
Associate Engineer/ Traffic

*Reviewed by:*



Owen Tunnell, PE (Civil)  
Assistant City Engineer

*Approved by:*



Julie Procopio, PE (Civil)  
City Engineer/Director of Engineering Services

## **ATTACHMENTS**

**WARRANT ANALYSIS WORK SHEETS (3 dwys.)  
&  
SPEED SURVEYS with ADT VOLUMES  
&  
STRIPING/SIGNING PLANS**

## **A-SOUTH DRIVEWAY**

## **B-MIDDLE DRIVEWAY**

## **C-NORTH DRIVEWAY**



**CITY OF ESCONDIDO**  
**TRANSPORTATION and**  
**COMMUNITY SAFETY COMMISSION**

**Commission Report of:** April 11<sup>th</sup>, 2019

**Item No.: F4**

**Location:** Various locations Citywide

**Initiated By:** City Staff

**Request:** Approval to evaluate recommended intersections for signal priority lists

**Background:**

City Staff often receive feedback from citizens, council members, and other departments concerning intersections that need a traffic signal or, where a signal already exists, a traffic signal modification. The number of warranted signals and signal modifications exceeds funding available. Therefore, an objective means of evaluating intersections for a signal or signal modification is desirable.

After evaluating requested traffic signals and modifications and, the crash history in the last 4 years, staff is recommending evaluation of the following two preliminary priority lists:

- Traffic Signal Priority List and
- Traffic Signal Modification for protected left turn phasing Priority List. (all-way and 2-Way)

Details on the lists and how staff compiled them are discussed in the following section.

The Commission is asked to review the priority lists and recommend the six (6) intersections from the signal priority list and fifteen (15) from the Left Turn Phasing list, for evaluation, including analyses and priority ranking.

**Discussion & Purpose:**

Using various forms of feedback and internal data, staff has compiled the two priority lists. Table 1 provides the Traffic Signal Priority List, which is comprised of 6 intersections. Table 2 provides the Traffic Signal Modification Priority List for Left Turn Phasing, which includes 15 intersections.

In addition to internal and external feedback, the lists were composed using available data, such as the number of crashes at that intersection and volume data for each intersection. This data is provided in the two tables. City Staff also used the most recent (2012) Traffic Signal Priority List (TSPL) as a starting point and reviewed past TSPL's to determine if additions were warranted.

**Table 1. Traffic Signal Modification Priority List**

|   | Intersection                           | Request from | ADT        | 2014 | 2015 | 2016 | 2017 | Total |
|---|----------------------------------------|--------------|------------|------|------|------|------|-------|
| 1 | * Rock Springs Rd. & Lincoln Ave.      | Citizen      | 14164/5115 | 2    | 0    | 1    | 4    | 7     |
| 2 | * Lincoln Ave. & Harding St.           |              | 15161/3320 | 2    | 0    | 2    | 1    | 5     |
| 3 | * Via Rancho Pkwy. & Lomas Serenas Dr. |              | 14917/2962 | 0    | 2    | 0    | 0    | 2     |
| 4 | S. Broadway & Fifth Ave.               |              | 4824/5460  | 0    | 0    | 0    | 0    | 0     |
| 5 | San Pasqual Rd & Sierra Linda          |              | 12600/926  | 0    | 0    | 0    | 0    | 0     |
| 6 | Oak Hill Dr. & Rose                    | Citizen      | 7783/7493  | 0    | 3    | 2    | 2    | 7     |

\*From previous Priority List

**Table 2. Traffic Signal Modification Left Turn Phasing Priority List****Signal Modification All-Way**

|   | Intersection                 | Request from           | ADT         | 2014 | 2015 | 2016 | 2017 | Total |
|---|------------------------------|------------------------|-------------|------|------|------|------|-------|
| 1 | Mission Ave. & Fig St.       |                        | 17400/6300  | 2    | 7    | 6    | 4    | 19    |
| 2 | Washington Ave.& Quince St.  |                        | 17179/5862  | 8    | 4    | 11   | 9    | 32    |
| 3 | Washington Ave. & Rose St.   | Citizen                | 11300/3800  | 5    | 6    | 3    | 9    | 23    |
| 4 | Mission Ave. & Metcalf St.   |                        | 13800/4200  | 2    | 4    | 1    | 4    | 11    |
| 5 | E. Valley Pkwy & Fig St.     |                        | 25000/4628  | 6    | 5    | 10   | 8    | 29    |
| 6 | Felicita Ave. & Juniper St.  |                        | 19400/12000 | 1    | 5    | 2    | 2    | 10    |
| 7 | *Escondido Blvd.& Fifth Ave. | Previous Priority List | 12500/7900  | 5    | 1    | 2    | 6    | 14    |

**Signal Modification 2-way lefts**

|    | Intersection                     | Direction     | Request from | ADT         | 2014 | 2015 | 2016 | 2017 | Total |
|----|----------------------------------|---------------|--------------|-------------|------|------|------|------|-------|
| 8  | Centre City Pkwy & 5th Avenue    | East-West     |              | 18900/4500  | 1    | 5    | 1    | 3    | 10    |
| 9  | Centre City Pkwy & 9th Avenue    | East-West     |              | 30600/11610 | 2    | 2    | 4    | 3    | 11    |
| 10 | Centre City Pkwy & 13th Avenue   | East-West     |              | 30600/5639  | 2    | 2    | 4    | 2    | 10    |
| 11 | Lincoln Ave. & Ash St.           | East-West     |              | 24700/19800 | 7    | 6    | 4    | 7    | 24    |
| 12 | Escondido Blvd. & Grand Ave      | North - South |              | 10300/13300 | 5    | 3    | 4    | 6    | 18    |
| 13 | Rock Springs Rd. & Mission Ave   | North - South | Citizen      | 11500/22100 | 2    | 5    | 4    | 3    | 14    |
| 14 | *Escondido Blvd. & Ninth Ave     | East-West     |              | 11608/11610 | 3    | 1    | 1    | 1    | 6     |
| 15 | *Escondido Blvd. & Felicita Ave. | North - South |              | 11586/22686 | 6    | 4    | 6    | 5    | 21    |

\*From previous Priority List

### **New Traffic Signals**

The City of Escondido has a Traffic Signal ranking Policy #11 for prioritizing the signals. The need for traffic signals is determined through the analysis of accidents, operational analysis and warrants. The Priority Rating System, Section 3.0 of Policy #11 is attached for reference to this report.

This policy has worked well in ranking the priority for new signals over the past years. Staff recommends that the existing criteria be used to prioritize signals. The warrant analysis should comply with the latest adopted CA-MUTCD.

### **Signal Warrants**

The warrant analysis is done using the California Manual on Uniform Traffic Control Devices (CA-MUTCD 2014 Edition Revision 4) dated March 29, 2019 provides the methodology for conducting the warrant analysis. Section 4C.01 details the procedure for Traffic Control Signal Needs Studies:

#### **Section 4C.01 Studies and Factors for Justifying Traffic Control Signals**

##### **Standard:**

**01 An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.**

**01a On State highways, the engineering study shall include consideration of a roundabout (yield control). If a roundabout is determined to provide a viable and practical solution, it shall be studied in lieu of, or in addition to a traffic control signal.**

##### **Guidance:**

**01b On local streets and highways, the engineering study should include consideration of a roundabout (yield control). If a roundabout is determined to provide a viable and practical solution, it should be studied in lieu of, or in addition to a traffic control signal.**

##### **Support:**

**01c Refer to Caltrans' website (<http://www.dot.ca.gov/hq/traffops/liaisons/ice.html>) for more information on the Traffic Operations Policy Directive 13-02, Intersection Control Evaluation (ICE), and other resources for the evaluation of intersection traffic control strategies.**

**02 The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:**

**Warrant 1, Eight-Hour Vehicular Volume**

**Warrant 2, Four-Hour Vehicular Volume**

**Warrant 3, Peak Hour**

**Warrant 4, Pedestrian Volume**

**Warrant 5, School Crossing**

**Warrant 6, Coordinated Signal System**

**Warrant 7, Crash Experience**

**Warrant 8, Roadway Network**

**Warrant 9, Intersection Near a Grade Crossing**

<sup>03</sup> **The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.**

### **Signal Ranking**

Ranking is based upon 10 key criteria, each of which are assigned a point value ranging from 15 points to 6 points. Additional information on each criterion is provided on the following page:

- **Criteria 1: Total Vehicular Volume (0 to 15 points)** – considers total entering volume from the major street and the minor street for a four hour period (2:00 to 6:00 p.m.)
- **Criteria 2: Interruption of Continuous Traffic (0 to 10 points)** – considers total entering volume on the side street in a four hour period (2:00 to 6:00 p.m.)
- **Criteria 3: Pedestrian Volume (0 to 10 points)** – considers number of pedestrians crossing the major street in a four hour period (2:00 to 6:00 p.m.)
- **Criteria 4: School Area Traffic Signal (0 to 10 points)** – considers the number of school aged children crossing the major street relative to the volume on the major street
- **Criteria 5: Progressive Movement or Signal System (-5 to +5 points)** – considers whether the installation of a signal is critical relative to the overall signal system and progression on a coordinated system.
- **Criteria 6: Accident History (0-15 points)** – considers accidents correctable by a traffic signal over a 12 month period
- **Criteria 7: Four Hour Volumes (6 points)** – based on the MUTCD Warrant #2
- **Criteria 8: Peak Hour Delay (0 points)** - negative points can be assigned if a signal would result in a degradation in traffic operations
- **Criteria 9: Peak Hour Volumes (6 points)** - based on the MUTCD Warrant #3
- **Criteria 10: Special Conditions** – to be determined on a case by case basis. Accident analysis and ADA compliance were considered in this study.

### **Signal Modifications:**

#### **For Left Turn Warrants**

The Highway Capacity Manual (HCM) includes a methodology for conducting left turn signal warrants. The methodology is based on peak hour volumes, speeds and intersection geometry. The HCM methodology is used to determine if left turn phase is appropriate at an existing signalized intersection.

The San Diego Traffic Engineers Council (SANTEC) developed a methodology for calculating left turn warrants, which included an assessment for both protected phasing and protected/permissive phasing. The report prepared by SANTEC and the HCM methodology are provided in this report. Although the HCM methodology was used to assess the appropriateness of left turn phasing, the results will be cross checked against SANTEC Standards to determine if protected/permissive phasing is a viable option for each of the 15 intersections studied.

#### **Left Turn Phase Ranking**

**The policy that has been used to prioritize signal modifications is as follows:**

This policy has worked well in ranking and verifying left turn phasing signal mods over the past years.

**Criteria 1 (Need)** is determined based on whether warrants are met in both the a.m. and p.m. peak period and whether the warrants are met in both directions of travel (northbound and southbound or eastbound and westbound). One point is assigned for each period and for each direction for a maximum of eight (8) points per intersection for intersections with no existing left turn phasing and four (4) points per intersection with existing left turn phasing on at least one approach. To normalize the analysis between those with no existing left turn phasing and those with left turn phasing on at least one approach, a percent of warrants met is calculated and used as the first criteria for ranking the intersections.

**Criteria 2 (Volume)** is based on the sum of the peak hour volumes for each intersection. A.M. and p.m. peak hour volumes are summed for all approaches and then the two peak periods are added together for a total peak intersection volume.

Accident data is also reviewed for each intersection to ensure that intersections with left turn related accidents are not overlooked in this ranking analysis. Ranking may be adjusted based on high number or frequency of accidents.

**Recommendation:**

Based on the data provided by City Staff, it is recommended that the Commission approve six (6) intersections each from the Traffic Signal Priority List and fifteen (15) Traffic Signal Modification Priority for Left Turn Phasing List for City Staff to hire a consultant with a Request for Proposals solicitation/selection and conduct warrant analyses and ranking. Previously adopted criteria is recommended to be used to rank new signals and signals modifications as described in the staff report. Staff will complete the evaluation and bring the results to the October meeting of the Commission for review and approval.

**Necessary Council Action:** None.

**Respectfully submitted,**

*Prepared by:*



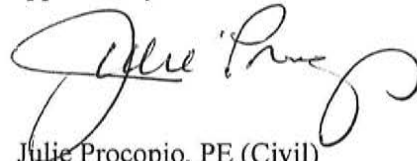
Ali Shahzad, PE (Traffic)  
Associate Engineer/ Traffic

*Reviewed by:*



Owen Tunnell, PE (Civil)  
Assistant City Engineer

*Approved by:*



Julie Procopio, PE (Civil)  
City Engineer/Director of Engineering Services

**Step 1: Determine Left-Turn Treatment**

The signal timing needs of permitted left-turn movements are not considered in synthesis of the traffic signal timing plan in the quick estimation method. Therefore, failure to assume protected left-turn phases for heavy left-turn flow rates will generally produce an overly optimistic assessment of the critical volume-to-capacity ratio and intersection operations.

Exhibit 31-38 describes a procedure for determining the left-turn treatment for each intersection approach. Treatment alternatives are specific to the left-turn phase sequence and include no left-turn phase (i.e., permitted only), left-turn phase (i.e., protected), and split phasing (i.e., not opposed). The left-turn treatment checks should not be used as the sole determinant of the need for a left-turn phase.

Even if the analyst already knows that the permitted left-turn mode will be implemented, this left-turn treatment check must still be used to verify that the left-turn treatment does not conflict with the assumptions on which this quick estimation method are based. The automobile methodology presented in Chapter 18, Signalized Intersections, should be used to analyze an intersection with permitted left-turn movements that fail the left-turn treatment checks in Exhibit 31-38.

The determination of the left-turn treatment is accomplished through four checks. Once it is determined that a left-turn phase is recommended for a given intersection approach, additional checks for that approach are unnecessary.

The first check recommends use of a left-turn phase if there is more than one left-turn lane on the approach.

The second check recommends use of a left-turn phase if the unadjusted left-turn volume exceeds 240 veh/h.

The third check recommends use of a left-turn phase if the cross-product of the unadjusted left-turn and opposing mainline volumes exceeds the minimum values shown in Exhibit 31-38. The opposing mainline volume used in this step is usually the summation of the opposing through and right-turning volumes. If the opposing approach geometry is such that the subject left-turning drivers can safely ignore the opposing right-turning vehicles, then the opposing right-turn volume can be excluded from the summation. Right-turn vehicles can sometimes be ignored when there is an exclusive right-turn lane on the opposing approach and the right-turning vehicles have their own lane to turn into on the cross street (i.e., there are two or more receiving lanes on the cross street).

The fourth check compares the left-turn volume with the "sneaker" capacity and the equivalence factor (computed in the next step). The sneaker capacity represents the average number of left-turning vehicles that can complete their turn after the green interval. This check recommends the use of a left-turn phase if either the unadjusted left-turn volume exceeds the sneaker capacity or the equivalence factor exceeds 3.5.

*Do not use the quick estimation method as the sole basis for determining the need for a left-turn phase.*

**Exhibit 31-38**  
Quick Estimation Left-Turn  
Treatment Worksheet

| QUICK ESTIMATION LEFT-TURN TREATMENT WORKSHEET                                                                                                                                                                                                                                                                                                                                    |                       |    |    |    |                         |                       |   |        |   |        |   |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----|----|----|-------------------------|-----------------------|---|--------|---|--------|---|---------|
| <b>General Information</b>                                                                                                                                                                                                                                                                                                                                                        |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Description _____                                                                                                                                                                                                                                                                                                                                                                 |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <b>Check # 1: Left-Turn Lane Check</b>                                                                                                                                                                                                                                                                                                                                            |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Approach                                                                                                                                                                                                                                                                                                                                                                          | EB                    | WB | NB | SB |                         |                       |   |        |   |        |   |         |
| Number of left-turn lanes                                                                                                                                                                                                                                                                                                                                                         |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Protect left turn (Y or N)?                                                                                                                                                                                                                                                                                                                                                       |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| If the number of left-turn lanes on any approach exceeds 1, then it is recommended that the left turns on that approach be protected. Those approaches with protected left turns need not be evaluated in subsequent checks.                                                                                                                                                      |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <b>Check # 2: Minimum Volume Check</b>                                                                                                                                                                                                                                                                                                                                            |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Approach                                                                                                                                                                                                                                                                                                                                                                          | EB                    | WB | NB | SB |                         |                       |   |        |   |        |   |         |
| Left-turn volume                                                                                                                                                                                                                                                                                                                                                                  |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Protect left turn (Y or N)?                                                                                                                                                                                                                                                                                                                                                       |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| If left-turn volume on any approach exceeds 240 veh/h, then it is recommended that the left turns on that approach be protected. Those approaches with protected left turns need not be evaluated in subsequent checks.                                                                                                                                                           |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <b>Check # 3: Minimum Cross-Product Check</b>                                                                                                                                                                                                                                                                                                                                     |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Approach                                                                                                                                                                                                                                                                                                                                                                          | EB                    | WB | NB | SB |                         |                       |   |        |   |        |   |         |
| Left-turn volume, $V_L$ (veh/h)                                                                                                                                                                                                                                                                                                                                                   |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Opposing mainline volume, $V_o$ (veh/h)                                                                                                                                                                                                                                                                                                                                           |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Cross-product ( $V_L * V_o$ )                                                                                                                                                                                                                                                                                                                                                     |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Opposing through lanes                                                                                                                                                                                                                                                                                                                                                            |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Protected left turn (Y or N)?                                                                                                                                                                                                                                                                                                                                                     |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <table border="1"> <thead> <tr> <th>Number of Through Lanes</th> <th>Minimum Cross-Product</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>50,000</td> </tr> <tr> <td>2</td> <td>90,000</td> </tr> <tr> <td>3</td> <td>110,000</td> </tr> </tbody> </table>                                                                                                                       |                       |    |    |    | Number of Through Lanes | Minimum Cross-Product | 1 | 50,000 | 2 | 90,000 | 3 | 110,000 |
| Number of Through Lanes                                                                                                                                                                                                                                                                                                                                                           | Minimum Cross-Product |    |    |    |                         |                       |   |        |   |        |   |         |
| 1                                                                                                                                                                                                                                                                                                                                                                                 | 50,000                |    |    |    |                         |                       |   |        |   |        |   |         |
| 2                                                                                                                                                                                                                                                                                                                                                                                 | 90,000                |    |    |    |                         |                       |   |        |   |        |   |         |
| 3                                                                                                                                                                                                                                                                                                                                                                                 | 110,000               |    |    |    |                         |                       |   |        |   |        |   |         |
| If the cross-product on any approach exceeds the above values, then it is recommended that the left turns on that approach be protected. Those approaches with protected left turns need not be evaluated in subsequent checks.                                                                                                                                                   |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <b>Check # 4: Sneaker Check</b>                                                                                                                                                                                                                                                                                                                                                   |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Approach                                                                                                                                                                                                                                                                                                                                                                          | EB                    | WB | NB | SB |                         |                       |   |        |   |        |   |         |
| Left-turn volume, $V_L$ (veh/h)                                                                                                                                                                                                                                                                                                                                                   |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Sneaker capacity, $C_s$ (veh/h) $C_s = 7200/C$                                                                                                                                                                                                                                                                                                                                    |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Equivalence factor, $E_{LT}$                                                                                                                                                                                                                                                                                                                                                      |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| Protected left turn (Y or N)?                                                                                                                                                                                                                                                                                                                                                     |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| If the equivalence factor is 3.5 or higher (computed in the Quick Estimation Lane Volume Worksheet) and the unadjusted left turn is greater than the sneaker capacity, then it is recommended that the left turns on that approach be protected.                                                                                                                                  |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <b>Notes</b>                                                                                                                                                                                                                                                                                                                                                                      |                       |    |    |    |                         |                       |   |        |   |        |   |         |
| <p>1. If any approach is recommended for left-turn protection but the analyst evaluates it as having permitted operation, then this quick estimation method may give overly optimistic results. The analyst should instead use the methodology described in Chapter 18, Signalized Intersections.</p> <p>2. All volumes used in this worksheet are unadjusted hourly volumes.</p> |                       |    |    |    |                         |                       |   |        |   |        |   |         |

## Step 2: Determine Lane Volume

The lane volume worksheet is shown in Exhibit 31-39. Its purpose is to establish the individual lane flow rate (in veh/h/ln) on each intersection approach. This information is then used in the control delay and level-of-service worksheet to synthesize the signal-timing plan. The directional designations (e.g., RT = right turn, LT = left turn) refer to the traffic movements as they approach the intersection.

MEMORANDUM

TO: SANTEC Members

FROM: Left Turn Phasing Committee

DATE: February 6, 1992

SUBJECT: Left Turn Phasing

---

The San Diego Regional Traffic Engineer Council (SANTEC) formed a committee to investigate the feasibility of Permitted/Protected Left Turn (PPLT) phasing and, if appropriate, to develop uniform guidelines and standards for San Diego County. Members of the committee conducted the following tasks:

1. Reviewed several reports from throughout the country, evaluating the effectiveness of Permitted/Protected Left Turn phasing.
2. Conducted field review of the intersection of Grand/Las Posas in San Marcos to observe the operation of the existing Permitted/Protected Left Turn phasing at the intersection.
3. Held several meetings and discussions between committee members to discuss the issues and to formulate uniform guidelines and standards for the County.

Following is a summary of the committee's findings and recommendations for the implementation of PPLT in San Diego County.

A. RESEARCH SUMMARY:

1. While PPLT phasing has been used successfully throughout the United States, only San Marcos (one signal), San Diego (two signals), and Chula Vista (two signals) have used this type of operation in San Diego County.
2. Most reports evaluating the effectiveness of left turn phasing indicate that significant vehicle delay savings can be realized with PPLT phasing compared to fully protected left turn phasing.
3. Left turn accident rates with PPLT phasing are comparable to those experienced under normal two-phase operation.

4. A driver education program as well as media exposure are needed in order to inform drivers of the operation of PPLT phasing prior to implementation in San Diego County.
5. Significant public acceptance and support was encountered when PPLT phasing was introduced in new areas.
6. Cluster signal heads on mast arms appear to be more advantageous than vertical heads.
7. Advisory signs appear unnecessary except in cases that show unusual motorist confusion or hazard.
8. The implementation of lead versus lag PPLT phasing should be reviewed on a case by case basis with consideration given to accidents, volumes, and progression. The provision of lag PPLT (permitted/protected) appears to be more advantageous.

**B. LEFT-TURN PHASE GUIDELINES:**

Since the use of separate phases for left turns will generally increase the overall delay at signalized intersections, the committee believes that it should only be used when alternate means cannot be utilized and when the conditions listed in this section exist. The committee also recommends that PPLT phasing should be used when left turn phasing is warranted and the protected-only left turn phase criteria (see Section C) is not satisfied. This approach is consistent with the current regional emphasis on improving air quality by reducing delay and increasing the efficiency of the traffic operation at signalized intersections.

With that in mind, prior to consideration of left-turn phasing, the following remedial actions or geometric changes should be investigated and implemented where practical:

1. Changes in pavement markings to improve visibility of approaching traffic from the left turn approach.
2. Adding a left-turn lane on the approach if none exists.
3. Restricting left turns from the approach if no left turn lane exists and alternate routes are available to the left turning vehicles.

For consideration of a left-turn phase on any one approach, two or more of the following six conditions (volume, right turns, U-turns, delay, accident, or speed) should be satisfied prior to the installation of a left-turn phase on said approach (each left turn movement at an intersection should be reviewed separately):

### *I — Volumes*

This left-turn phase condition is satisfied when the following criteria are met:

- a) left turning vehicles exceed 150 vehicles per hour on the approach for more than two hours of an average day;
- and b) the product of left turning vehicles per hour on the approach and conflicting through vehicles per hour on the opposite approach exceeds 125,000 on a six-lane roadway, 100,000 on a four-lane roadway, or 50,000 on a two-lane roadway for more than two hours of an average day;
- and c) the left turn volume on the approach exceeds two (2) vehicles per cycle still waiting at the end of the green phase during the peak hour.

### *II — Right-Turns*

This left-turn phase condition is satisfied when the following criteria are met:

- a) right-turn volume on the conflicting approach exceeds 350 vehicles per hour in the peak hour;
- and b) left-turn volume on the approach exceeds 150 vehicles per hour in the peak hour.

### *III — U-Turns*

This left-turn phase condition is satisfied when the following criteria are met:

- a) U-turn volume on the approach exceeds 50 vehicles per hour in the peak hour;
- and b) U-turn volume on the approach is greater than 30 percent of the traffic movement from that lane.

### *IV — Delay*

This left-turn phase condition is satisfied when the following criteria are met:

- a) left turn delay of 2.0 vehicle-hours or more occurs on the approach in a peak hour on a critical approach;
- and b) average left turning vehicle delay on the approach exceeds 35 seconds in the peak hour;
- and c) left turn volume on the approach exceeds two vehicles per cycle during the peak hour.

**V — Accidents**

This left-turn phase condition is satisfied when the following criteria are met:

- a) There were four or more left turn accidents involving left turning vehicles from the approach in a one-year period;
- and b) There were six or more left-turn accidents involving left turning vehicles from the approach in a two-year period.

**VI — Speed**

This left-turn phase condition is satisfied when the following criterion is met:

- a) The 85th percentile speed of opposing vehicles to the approach exceeds 45 mph on a four-lane roadway or 40 mph on a six-lane roadway.

**C. LEFT-TURN PHASE — PROTECTED-ONLY CRITERIA:**

If a left-turn phase is warranted, the following criteria should be considered to evaluate when a protected-only left-turn phase operation should be used:

- 1. The accident warrant was satisfied and the protected/permissive operation did not reduce accidents on the approach during the initial six months to 12 months of operation.
- 2. There were four or more accidents involving a left turning vehicle from the approach in a one-year period and the approach has a protected/permissive left-turn phase operation.
- 3. There are two or more left-turn lanes on the approach.
- 4. Inadequate sight distance caused by curvature in roadway or similar geometric restrictions.
- 5. A leading left-turn movement opposite a lagging left-turn phase operation.

**D. LEFT-TURN PHASE — PROTECTED/PERMISSIVE CRITERIA:**

When a left turn phase is warranted and the protected-only left-turn phase criteria is not satisfied, a Protected/Permissive Left Turn phase should be installed.

**E. REMOVAL OF LEFT TURN PHASE:**

When an existing left-turn phase does not satisfy two or more of the above left-turn phase warrants, it should be removed from operation.

When a protected-only left-turn phase is found to be unnecessary using the above protected-only criteria, it should be changed to a Protected/Permissive Left Turn operation.

**F. TRAFFIC OPERATION GUIDELINES:**

1. If the Protected/Permissive Left Turn phase volume is less than 50 vehicles per hour for any 12 hours of an average day, a time delay may be applied to the detection from the left-turn lane. The time delay should be equal to the longest cycle length used at the location of the left turn phase based upon a detection length of not less than 40 feet. When the detection length is less than 40 feet, no time delay should be applied to the detection.
2. Five-section cluster signal heads should be utilized on mast arms.
3. The location of the cluster head should be aligned with the 8" white line delineating the left turn pocket.

**G. IMPLEMENTATION PLAN:**

The committee recommends the following:

1. Adopt the left turn phasing guidelines listed previously for use in San Diego County.
2. Discuss with SANDAG the potential of including the provision of Protected/Permitted left turn phasing as a Transportation Control Measure (TCM).
3. Identify funding sources for implementation of Protected/Permitted Left Turn Phasing.
4. Initiate a demonstration project to include concurrent installation of Protected/Permitted Left Turn phasing in each city and the County.
5. In conjunction with item four above, conduct a public relation campaign to educate drivers on the PPLT operation.

6. Contact the Department of Motor Vehicles and request that training on the PPLT phasing operation be included in their manual.

GF:js

## PRIORITY RATING SYSTEM

### 3.0 Priority Evaluation System

The purpose of the priority evaluation system is to rank all locations that meet the minimal signal warrants. The importance of establishing a priority list is reflected in the fact that sufficient capital improvement funds are not available to install all needed signals.

The priority evaluation system is a method where an impartial evaluation of the traffic and pedestrian volumes, the accident history, and other roadway and traffic conditions can be made and these facts compared. The result is a priority list of all potential signal locations evaluated and ranked from greater to lesser needs.

The priority point system for evaluating signal locations is divided up in the following relative weight system:

| <u>Criteria</u> | <u>Description</u> | <u>Maximum<br/>Priority Points</u> | <u>Relative Weight</u> |
|-----------------|--------------------|------------------------------------|------------------------|
| 1               | Total Volume       | 15                                 | 16%                    |
| 2               | Interruption       | 10                                 | 11%                    |
| 3               | Pedestrian Volume  | 10                                 | 11%                    |
| 4               | School Area        | 10                                 | 11%                    |
| 5               | Signal Systems     | 5                                  | 5%                     |
| 6               | Accident History   | 15                                 | 16%                    |
| 7               | Four Hour Volumes  | 6                                  | 7%                     |
| 8               | Peak Hour Delay    | ---                                | ---                    |
| 9               | Peak Hour Volumes  | 6                                  | 7%                     |
| 10              | Special Conditions | 15                                 | 16%                    |
| TOTAL POSSIBLE  |                    | 92                                 | 100%                   |

TABLE 3-1

The priority point system is based on the warrants for traffic signals as shown in Table 2-1. Points are assigned for the applicable criteria, the points for the ten criteria are added, and the intersection arranged by descending number of points to form a priority list.

## TRAFFIC SIGNAL PRIORITY RATING SYSTEM

### Criterion 1 - Total Vehicular Volume

Points are assigned based upon Figure 3-1 which considers major and minor street volumes and capacity. The entering volumes are based upon four-hour counts (usually from 2 to 6 p.m. on a weekday). A maximum of 15 points may be assigned.

- NOTES
1. All volumes are for 4 hours (usually 2-6PM).
  2. Maximum points = 15.

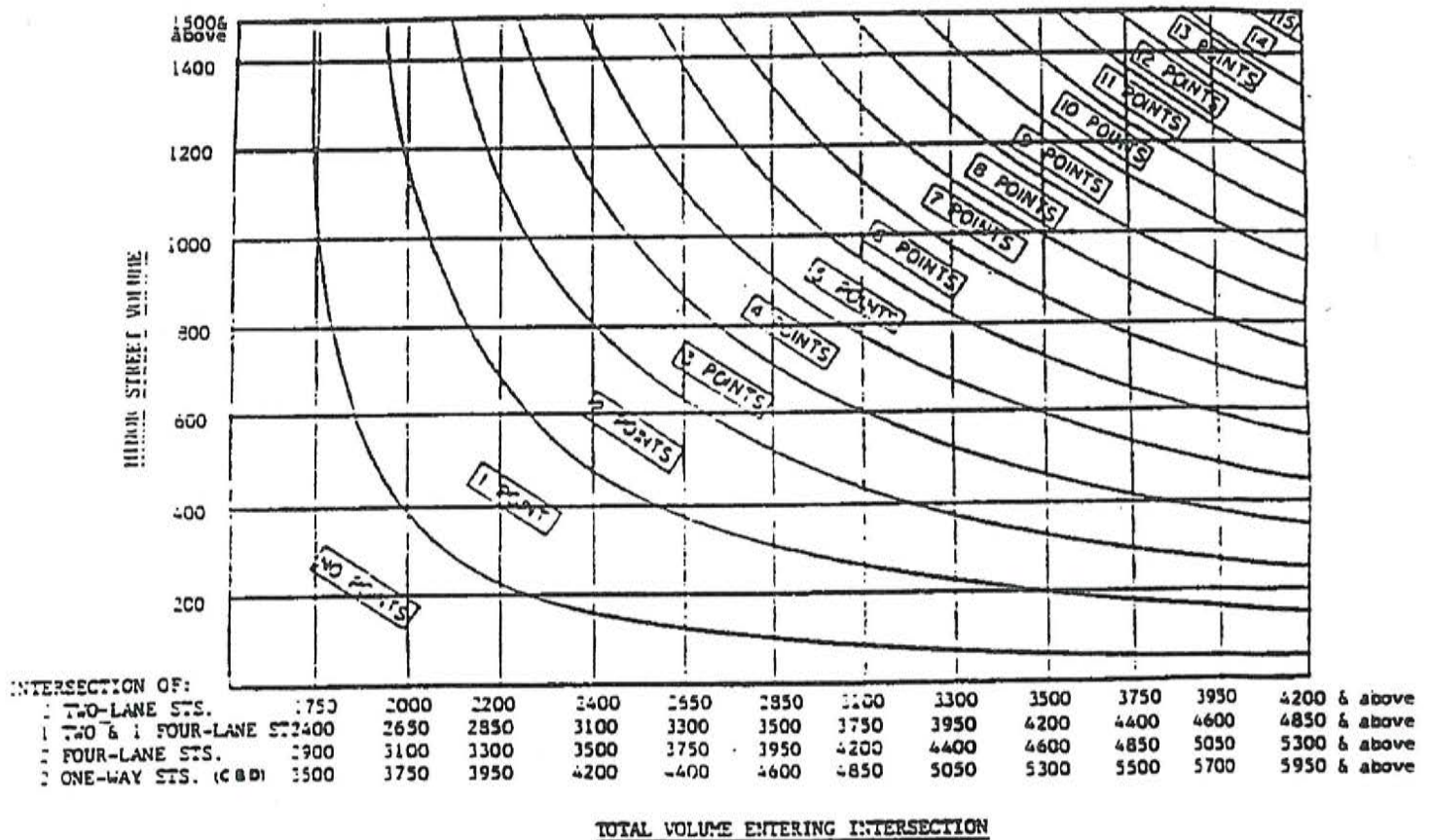


FIGURE 3-1

### Criterion 2 - Interruption of Continuous Traffic

Vehicles on through streets, if uncontrolled, tend to travel through minor street intersections at speeds that make it difficult and hazardous for vehicles and pedestrians from the side street to cross or enter the principal traffic stream. The total of the minor street vehicles plus pedestrians crossing or entering the major street must exceed 300 in four hours to receive any points. A maximum of ten points may be assigned using Figure 3.2.

| <u>Four-Hour Major Street Volumes</u> | <u>Points</u> |
|---------------------------------------|---------------|
| 0 - 2239                              | 0             |
| 2240 - 2879                           | 1             |
| 2880 - 3519                           | 2             |
| 3520 - 4159                           | 3             |
| 4160 - 4799                           | 4             |
| 4800 - 5439                           | 5             |
| 5440 - 6079                           | 6             |
| 6080 - 6719                           | 7             |
| 6720 - 7359                           | 8             |
| 7360 - 7999                           | 9             |
| 8000 & Over                           | 10            |

FIGURE 3-2

### Criterion 3 - Pedestrian Volume

A traffic signal may be needed where many pedestrians cross a major street. A maximum of ten points may be assigned using Figure 3-3.

#### NOTES

1. ALL VOLUMES ARE FOR 4 HOURS (USUALLY 2-6 P.M.)
2. MAXIMUM POINTS = 10
3. NO POINTS IF LESS THAN 100 PEDESTRIANS DURING THE 4 HOUR PERIOD
4. NO POINTS IF LESS THAN 1200 MAJOR STREET VEHICLES DURING THE 4 HOUR PERIOD.

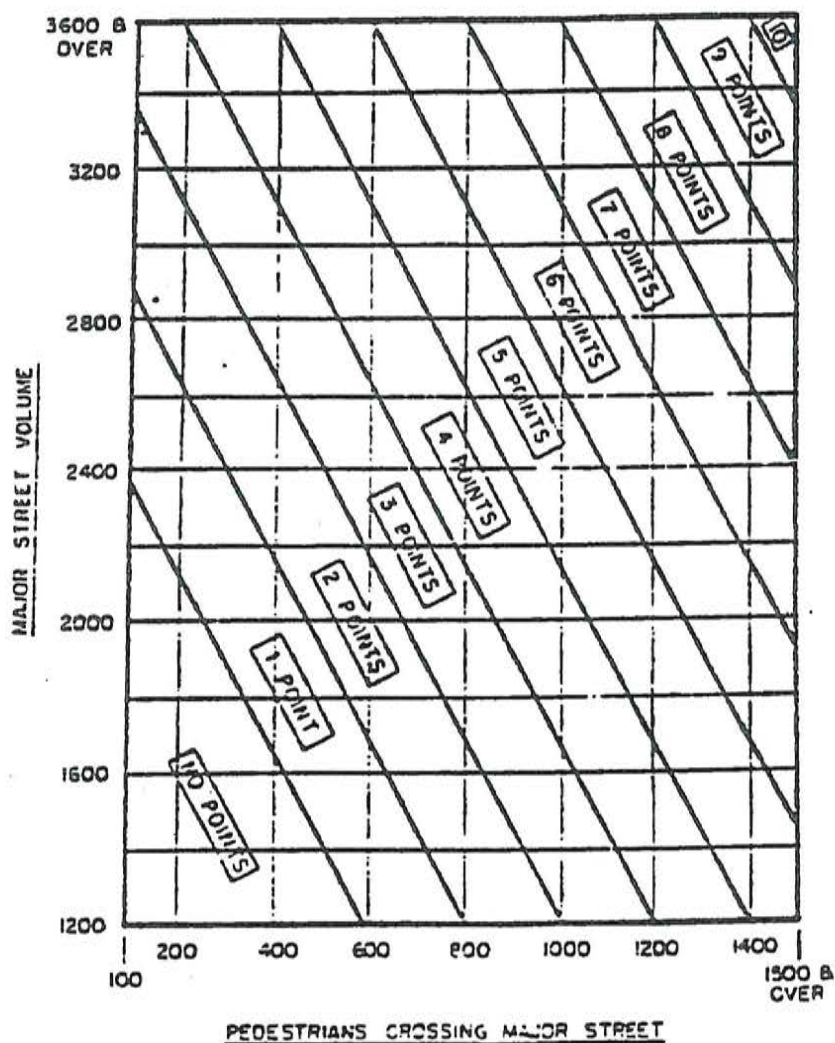
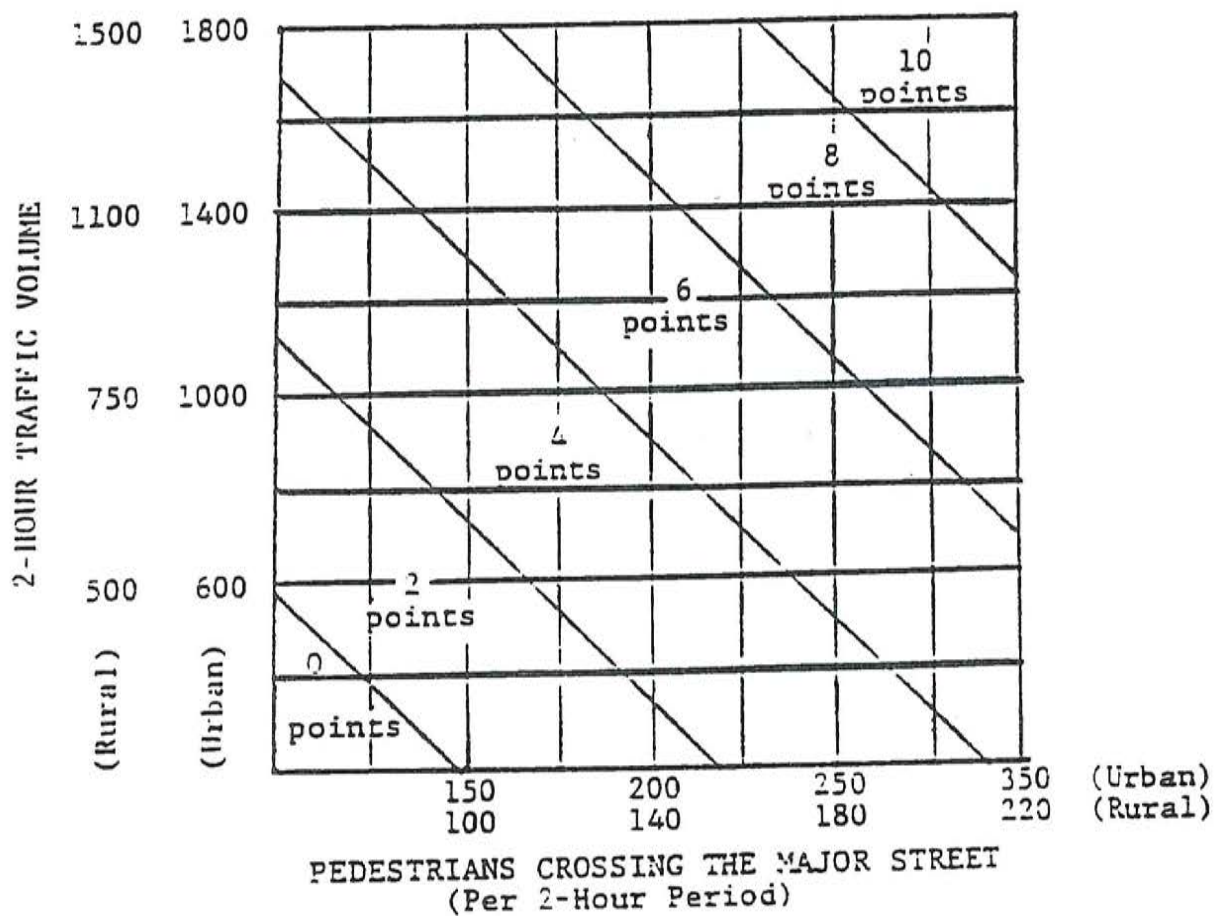


FIGURE 3-3

#### Criterion 4 - School Area Traffic Signals

Points are assigned based upon the number of school-age pedestrians crossing the major street as compared to the major street traffic. This criterion will apply only to locations within one mile of a school and where the nearest controlled intersection or potential crossing point is more than 600 feet away. Figure 3-4 can assign up to ten points for this analysis.



NOTE: No points will be assigned if nearest controlled crossing is less than 600 feet away or if the intersection being evaluated is an all-way stop.

FIGURE 3-4

### Criterion 5 - Progressive Movement or Signal Systems

This criterion depends upon engineering studies and must include the present and future traffic demands of the area. A signal may be justified when it forms a part of an interconnected or coordinated system. Closely spaced intersections can significantly delay traffic and require the use of non-actuated or non-optimum traffic signal timing. A maximum of five points may be assigned to this criterion or up to five points may be deducted for closely spaced intersections:

| <u>SPACING</u> | <u>POINTS</u> |
|----------------|---------------|
| < 400          | - 5           |
| 401-500        | - 4           |
| 501-600        | - 3           |
| 601-700        | - 2           |
| 701-800        | - 1           |
| > 800          | 0             |

FIGURE 3-5

### Criterion 6 - Accident History

Only those accidents susceptible to correction by traffic signals are considered and then only if less restrictive measures such as warning signs, proper lighting, painted markings, etc., have failed. A maximum of 15 points may be assigned to this warrant. Figure 3-6 assigns points to this warrant.

| <u>ACCIDENTS</u> | <u>POINTS</u> |
|------------------|---------------|
| 0-2              | 0             |
| 3                | 1             |
| 4                | 3             |
| 5                | 5             |
| 6                | 6             |
| 7                | 7             |
| 8                | 8             |
| 9                | 9             |
| 10               | 10            |
| 11               | 11            |
| 12               | 12            |
| 13               | 13            |
| 14               | 14            |
| 15-over          | 15            |

FIGURE 3-6

NOTE: Use the average of the last two years, provided the intersection has been in operation for two years.

#### Criterion 7 - Four Hour Volumes

The four hour volume warrant is satisfied when for each of any four hours of an average day the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher volume minor street approach (one direction only) all fall above the curve in Figure 3-7(a-c) for the existing combination of approach lanes.

#### Criterion 8 - Peak Hour Delay

The peak hour delay warrant is intended for application where traffic conditions are such that for one hour of the day, minor street traffic suffers undue delay in entering or crossing the major street. The peak hour delay warrant is satisfied when the conditions given below exist for one hour (any four consecutive 15-minute periods) of an average weekday.

The peak hour delay warrant is met when:

1. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes, and
2. The total entering volume serviced during the hours equals or exceeds 800 vph for intersections with four (or more) approaches or 650 vph for intersections with three approaches.

#### Criterion 9 - Peak Hour Volume

The peak hour volume warrant is also intended for application when traffic conditions are such that for one hour of the day, minor street traffic suffers undue traffic delay in entering or crossing the major street.

The peak hour volume warrant is satisfied when the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicle per hour of the higher volume minor street approach (one direction only) for one hour (any four consecutive 15-minute periods) of an average day falls above the curve in Figure 3-9(a-c) for the existing combination of approach lanes.

#### Criterion 10 - Special Conditions

This criterion considers extenuating circumstances that are not covered in the previous nine criterion. These may include the proximity of schools, churches, public buildings, and other traffic and pedestrian generators; an abrupt change from a rural to an urban area; the need for police control during portions of the day; a steep hill; a horizontal curve; or restricted sight distance. This criterion requires engineering judgment based on physical inspection of the site. A maximum of 15 points may be assigned.

#### 4.0 Traffic Signal Priority List

The Traffic Signal Priority List that is a result of the priority evaluation will be adopted by the Transportation Commission and submitted to the City Council for consideration and adoption.

Each priority list will be effective until an updated list is adopted.

ADOPTED BY:

Transportation Commission

City Council

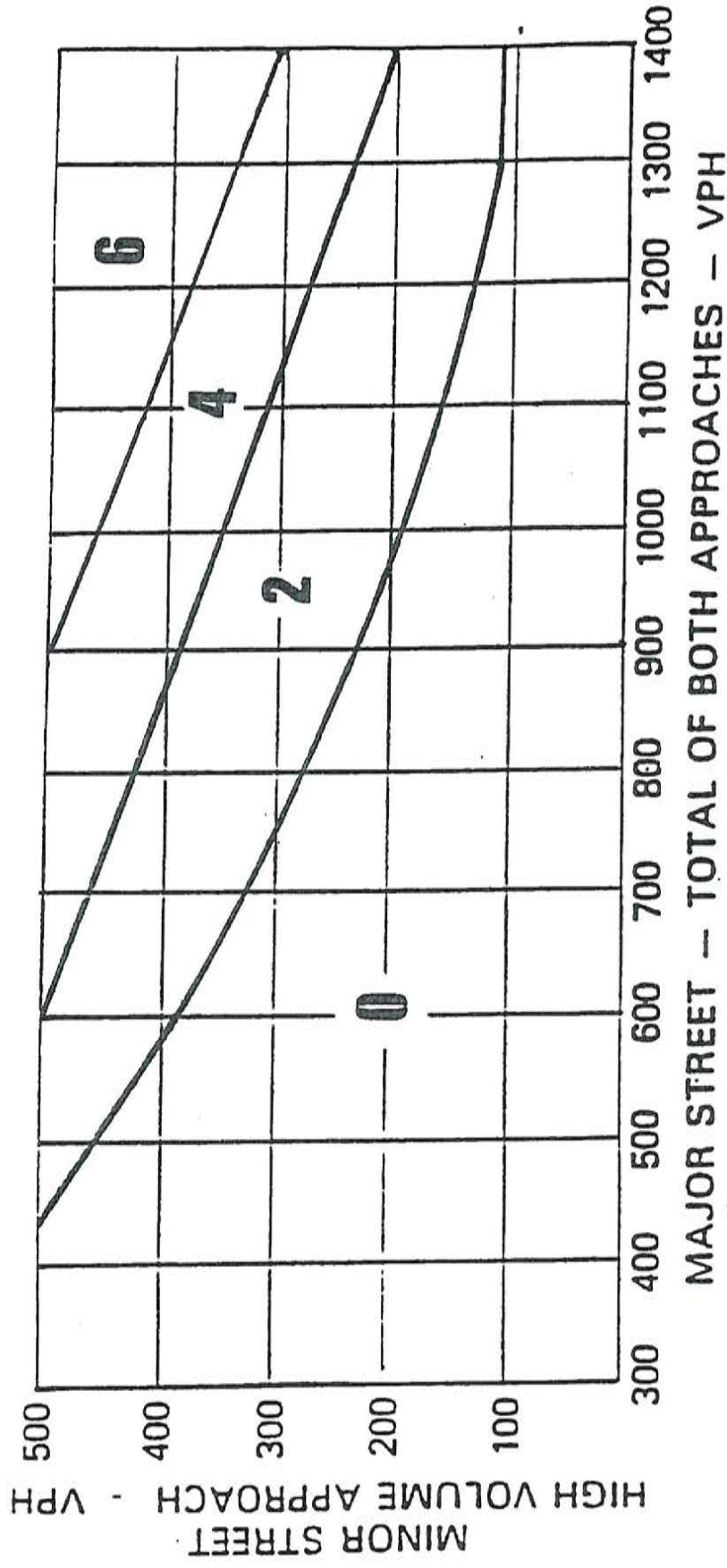
DATE:

Dec. 2, 1980

1981

Revised: April, 1991

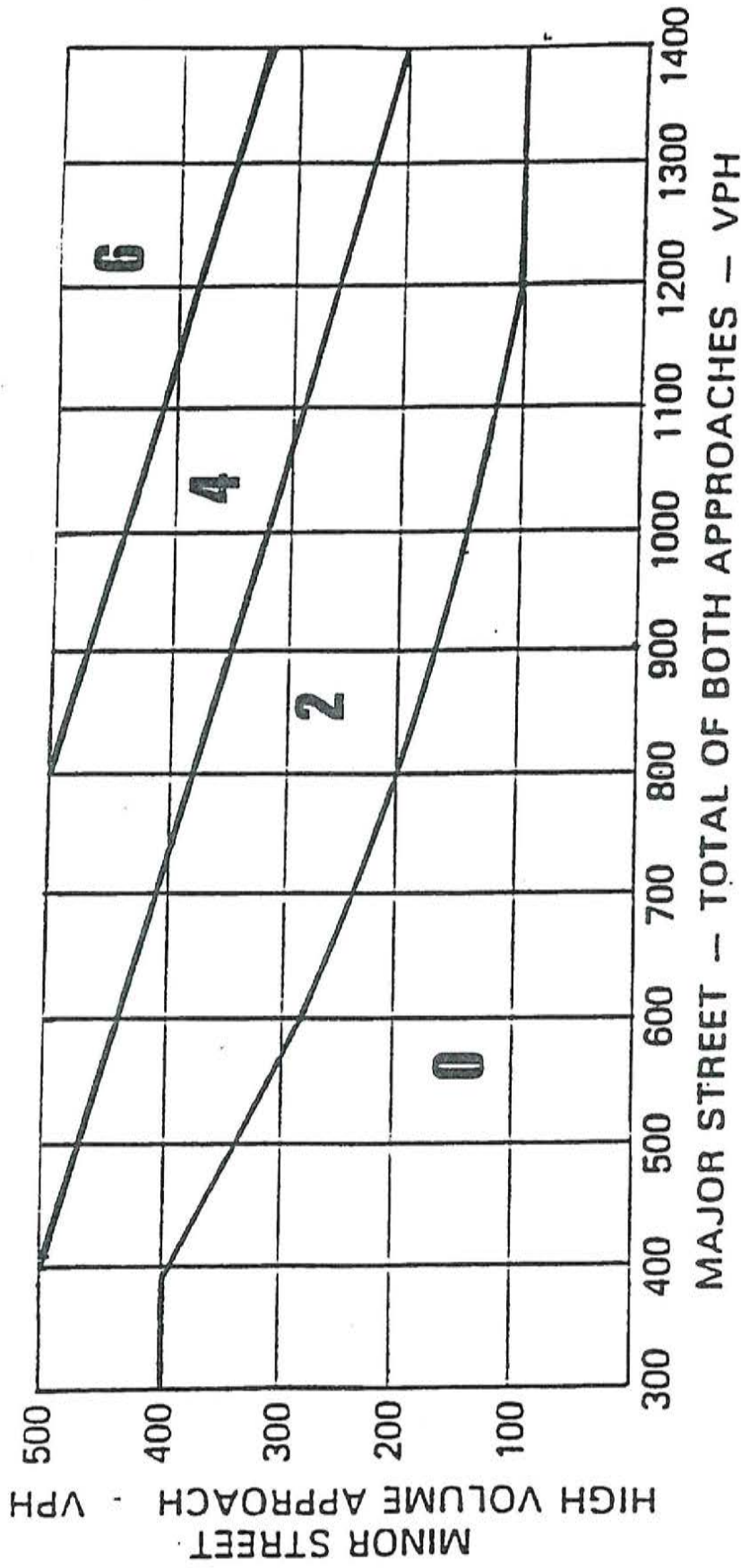
# FOUR HOUR VOLUME WARRANT



NOTE 115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE

(Fig. 3-7a)

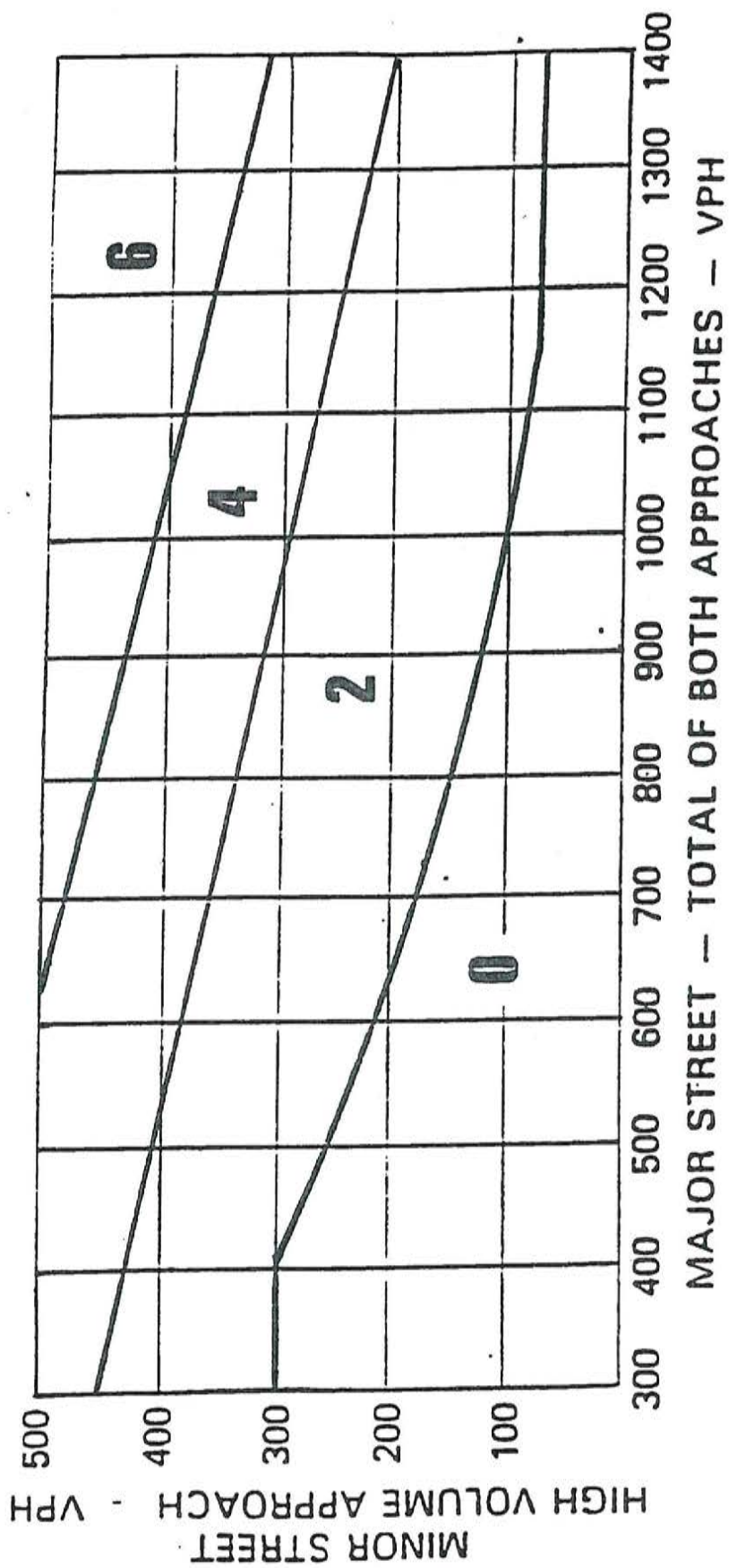
# FOUR HOUR VOLUME WARRANT



\*NOTE 115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE

(Fig. 3-7b)  
1 FOUR-LANED & 1 TWO-LANED STREET

# FOUR HOUR VOLUME WARRANT

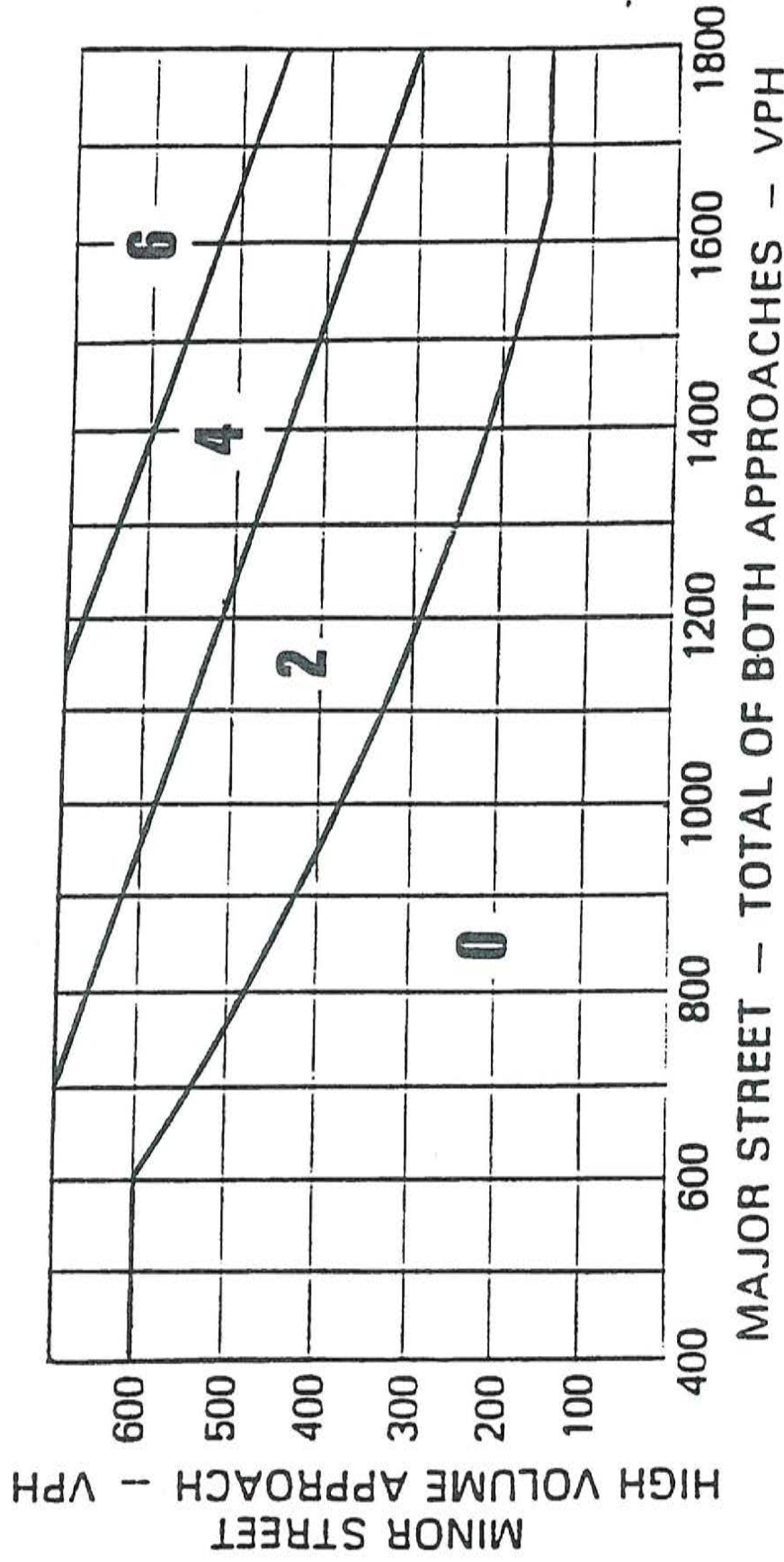


• NOTE 115 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 80 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE

(Fig. 3-7c)

2 TWO-LANED STREETS

# PEAK HOUR VOLUME WARRANT

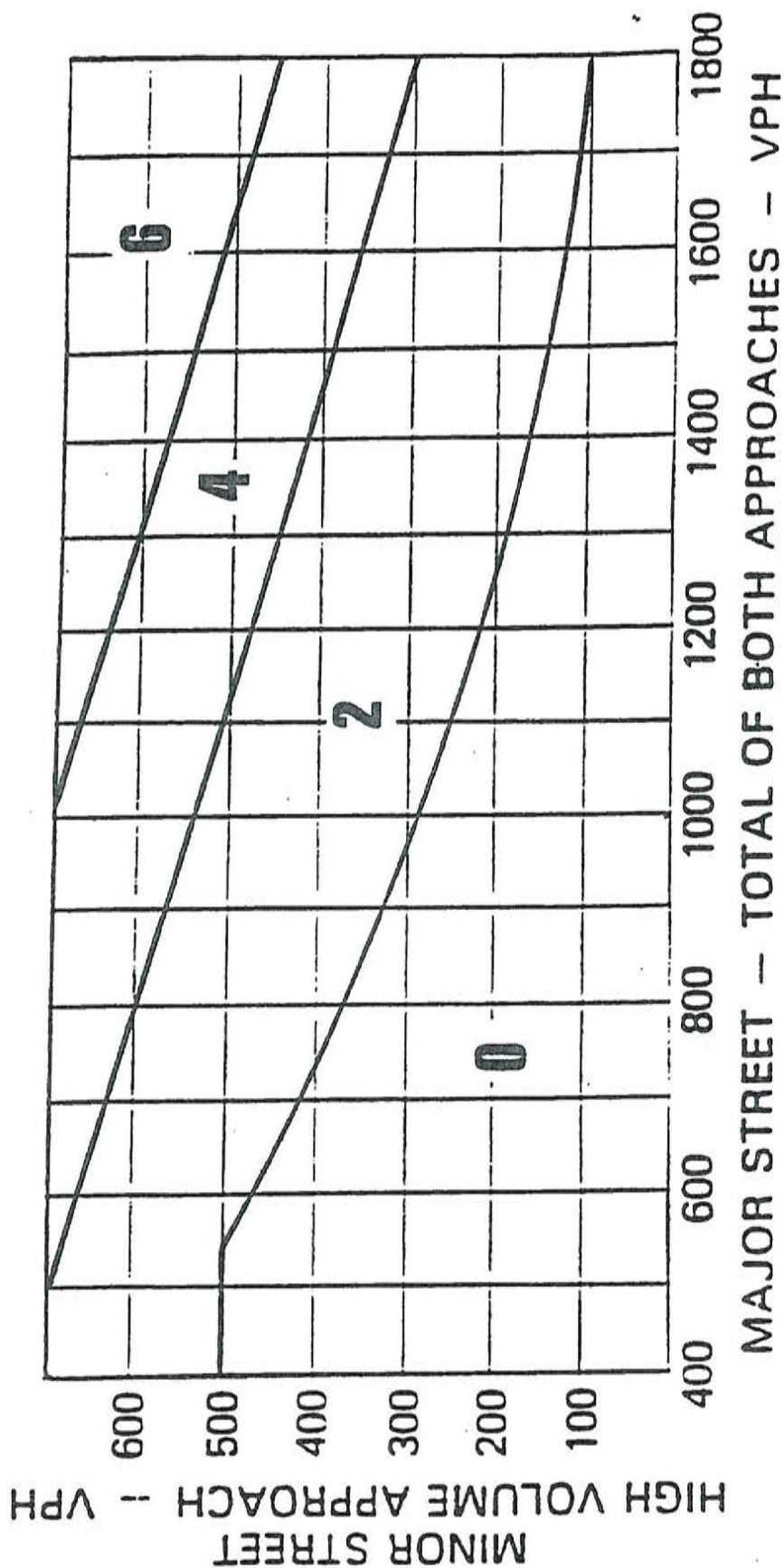


\*NOTE: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

(Fig. 3-9a)

2 FOUR-LANED STREETS

# PEAK HOUR VOLUME WARRANT



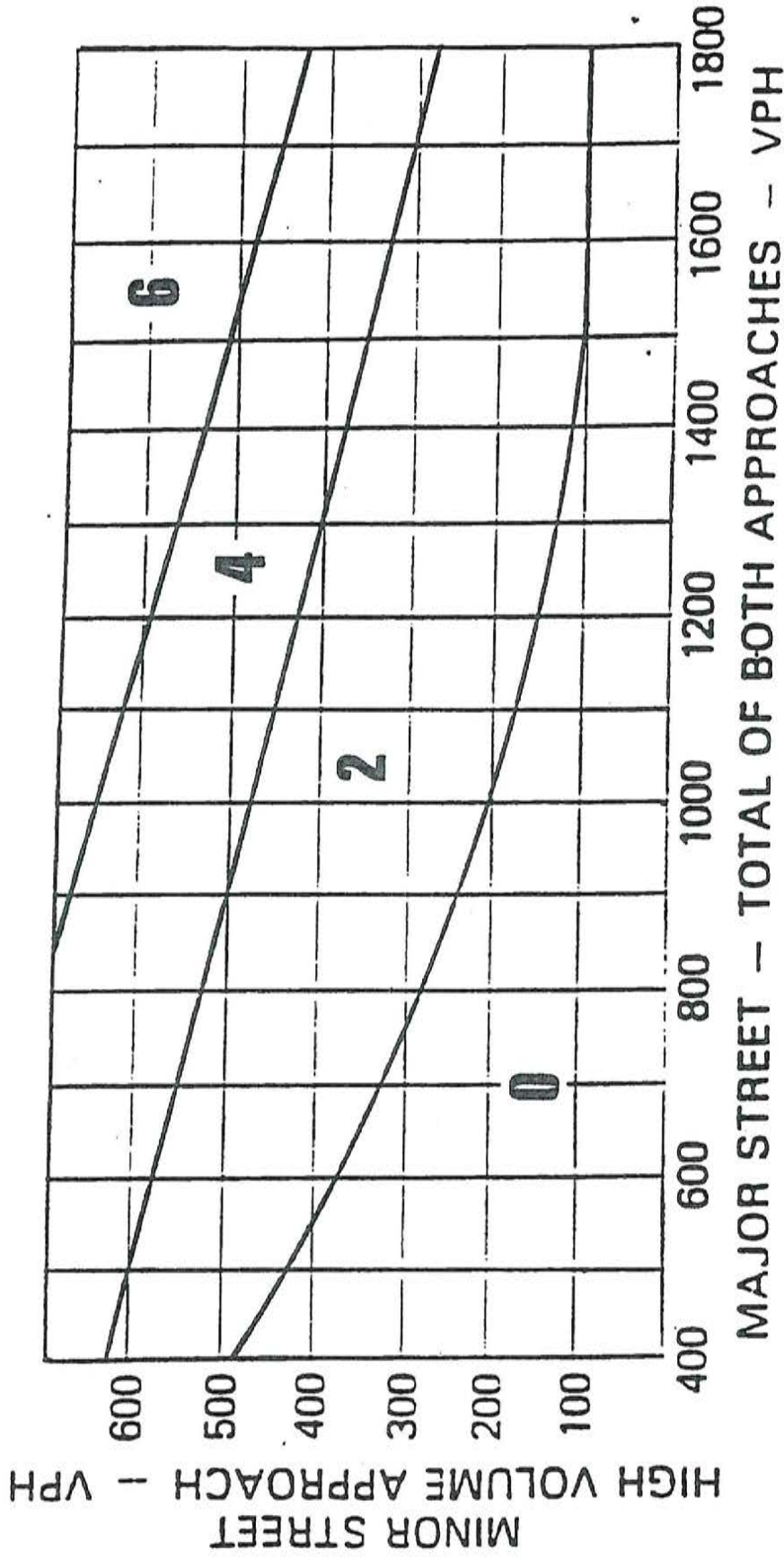
\*NOTE: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

(Fig. 3-9b)

1 FOUR-LANED & 1 TWO-LANED

STREET

# PEAK HOUR VOLUME WARRANT

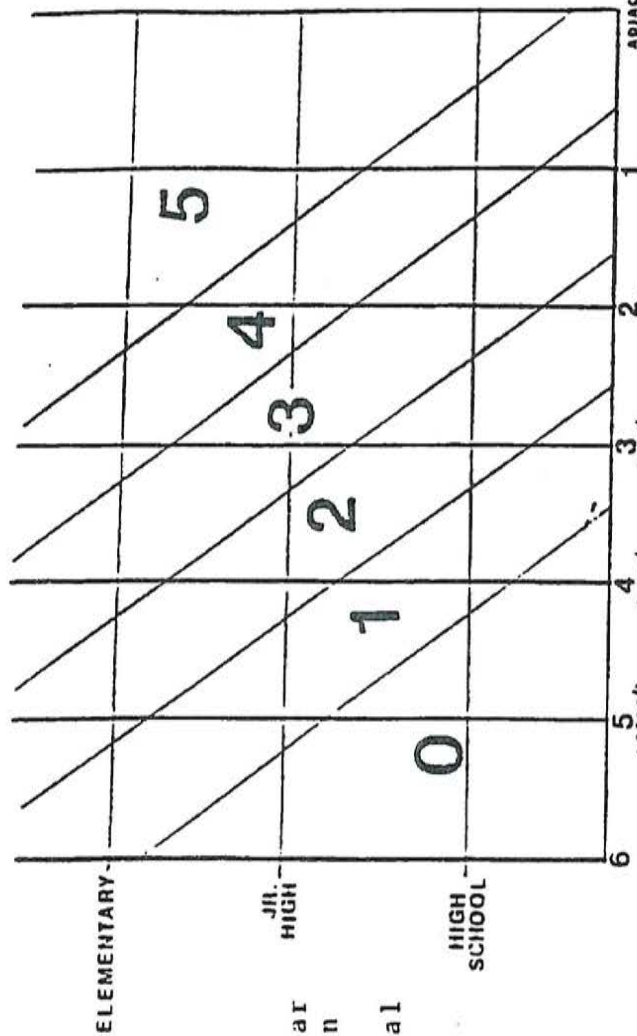


\*NOTE: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

(Fig. 3-9c)

2 TWO-LANED STREETS

# "SPECIAL CONDITION" POINT ASSESSMENT FOR SCHOOL AREA INTERSECTIONS



NOTE:  
This particular assessment is in addition to any other special conditions that may be present.

| PRIVATE SCHOOLS: |        |
|------------------|--------|
| Enrollment       | Points |
| Less than 50     | 0      |
| 50 - 150         | 2 max. |
| More than 150    | 3 max. |

NOTE:  
If the points earned from the chart are less than those allowed above, then only the chart-earned points are used

NUMBER OF BLOCKS THAT INTERSECTION IN QUESTION IS REMOVED FROM SCHOOL  
(If the distance between intersections is greater than 600 ft., use the distance in parenthesis or a combination thereof.)

FIGURE 3-10