



**CITY OF NORCO  
CITY COUNCIL  
SPECIAL MEETING AGENDA**

**Wednesday, March 23, 2016  
Council Chambers, 2820 Clark Avenue, Norco, CA 92860**

**Kevin Bash, Mayor  
Greg Newton, Mayor Pro Tem  
Robin Grundmeyer, Council Member  
Berwin Hanna, Council Member  
Ted Hoffman, Council Member**

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**CALL TO ORDER:** 4:00 p.m.

**ROLL CALL**

**PLEDGE OF ALLEGIANCE:** Council Member Robin Grundmeyer

**DISCUSSION ITEMS:**

1. Traffic Study Review and Discussion. **Recommended Action: Receive and file.** (Director of Public Works)
2. New Bluff Reservoir Project Review and Discussion. **Recommended Action: Receive and File.** (Director of Public Works)

**ADJOURNMENT**

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*In compliance with the Americans with Disabilities Act, any person with a disability who requires a modification or accommodation in order to participate in this meeting, please contact the City Clerk's office, (951) 270-5623, at least 48 hours prior to the meeting to make reasonable arrangements to ensure accessibility. Staff reports are on file in the City Clerk's Office. Any writings or documents provided to a majority of the City Council regarding any item on this agenda will be available for public inspection at the City Clerk's Counter in City Hall located at 2870 Clark Avenue during normal business hours.*

# NEIGHBORHOOD TRAFFIC CALMING STUDY FOR NORTH DRIVE, CALIFORNIA AVENUE, AND CRESTVIEW DRIVE

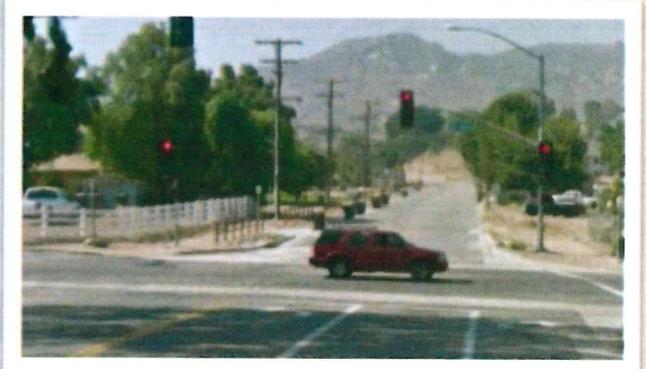
Prepared for



**PUBLIC WORKS DEPARTMENT**

January 2016

Submitted By





# TABLE OF CONTENTS

	<b>PAGE</b>
Introduction.....	1
Existing Conditions .....	4
Data Analysis.....	8
Conclusions and Recommendations .....	17

## LIST OF FIGURES

### FIGURE

1	North Drive Vicinity Map.....	2
2	North Drive, California Avenue, and Crestview Vicinity Map .....	3
3	North Drive Traffic Control Devices .....	6
4	California Avenue and Crestview Drive Traffic Control Devices .....	7
5	North Drive Peak Hour Traffic Flow .....	11
6	California Avenue and Crestview Drive Traffic Flow.....	12

## APPENDICES

### APPENDIX

A	Traffic Volume and Intersection Turning Movements
B	Statewide Integrated Traffic Records System
C	Regulations Governing Speed Limits
D	Speed Survey Data Sheets



## INTRODUCTION

Based on reports of excessive neighborhood cut-through commute traffic and traffic safety concerns expressed by residents, the City of Norco retained Albert Grover & Associates (AGA) to perform a comprehensive traffic calming and traffic safety study for North Drive between California Avenue and the City limit east of Crestview Drive and for Crestview Drive between North Drive and Sixth Street. The purpose of this report is to document the findings of the traffic engineering assessments conducted in response to the reported concerns and to provide recommendations to calm traffic speeds and improve traffic safety on both roadways.

Based on input received from the City of Norco, it was determined that documenting the existing traffic conditions on not only North Drive and Crestview Drive but along California Avenue as well would provide a more complete picture of the traffic characteristics of this northeastern Norco neighborhood. It was also determined that it would be important to investigate the reported resident concerns of excessive commute traffic, high travel speeds, and accidents along both North Drive and Crestview Drive. Based on the traffic data collected and the engineering review conducted, a series of recommendations were developed to calm traffic and improve safety for both North Drive and Crestview Drive.

The North Drive study area is depicted in Figure 1 while the extended Crestview study area, including California Avenue, is depicted in Figure 2. The predominate traffic pattern through the neighborhood is along California Avenue and North Drive connecting the City of Norco to the City of Riverside around the La Sierra Hills. To fully investigate motorist behavior and determine appropriate mitigations and recommendations, traffic engineers observed commuter behavior traversing the neighborhood during various times of the day in an attempt to validate residents' concerns and to determine why motorists, and specifically commuters, chose the routes they take and to drive the way they drive.

AGA met with City staff on three occasions during the study effort to ensure that the study objectives, methodologies, deliverables, and recommendations were appropriate. Thorough field review of traffic conditions and operations in the study area during both peak and off-peak traffic times, including evaluation of all pavement markings and street signs, was performed. A review of individual traffic collision reports during the last five years was also conducted. Based on the data gathered, field reviews, and analysis, the AGA engineering team has developed comprehensive traffic calming recommendations for the City of Norco.



Figure 1: North Drive Vicinity Map





Figure 2: North Drive, California Avenue, and Crestview Drive Vicinity Map



## EXISTING CONDITIONS

In order to comprehensively understand the traffic and roadway characteristics of the area, it was important to gather information on and document the existing traffic controls, street geometrics, traffic volumes, traffic speeds, traffic collision history, and adjacent land use. The following is a summary describing the existing street characteristics and setting along with observations noted by the investigating traffic engineers from their research and field observations.

### NORTH DRIVE

The City of Norco General Plan designates North Drive as a two lane major arterial residential street approximately a quarter mile in length, between California Avenue and the east-city limits just east of Crestview Drive. North Drive provides a key arterial connection between the City of Norco and the City of Riverside around the La Sierra Hills. North Drive is posted with a 40 miles per hour speed limit and it changes its name to Arlington Avenue as it enters the City of Riverside. The North Drive and Arlington Avenue corridor is well traveled by residents of both cities and commuters alike. The overall roadway (curb-to-curb) width of North Drive at California Avenue is 64 feet that narrows to 42 feet as it approaches Crestview Drive. Unpaved walking paths run along both the north and south sides of North Drive. A wooden fence protecting a dirt equestrian trail is in place throughout the north side of the roadway and throughout half of the south side of the segment. With the exception of stop bars and legends, the majority of striping consists of left turn pockets that provide access to Wyatt Circle and Viceroy Avenue. Channelization in the eastbound direction exists to reduce the roadway width and guide motorist to the left to avoid an abrupt narrowing of the roadway on the approach to Viceroy Avenue. North Drive has a rather wide raised median that ranges from 20 feet in width to 40 feet in width. The median was installed a few years ago as a traffic calming measure. North Drive also has a slight downgrade to the west which may also influence motorist speeds.

The intersection of North Drive and California Avenue is controlled by all-way stop controls while the intersection of North Drive and Crestview Drive is controlled by a traffic signal. The traffic signal at North Drive and Crestview Drive is provided with a protected left-turn arrow for westbound traffic heading south onto Crestview Drive. There are two intervening "T-intersections" along North Drive at Wyatt Circle and at Viceroy Avenue both of which are stop controlled for traffic entering on to North Drive. North Drive is posted with parking prohibitions along its entire length both along the north and south curbs. The existing traffic and parking controls on North Drive are illustrated in Figure 3, North Drive, *Traffic Control Devices*.

### CALIFORNIA AVENUE

California Avenue, between North Drive and 6<sup>th</sup> Street, is a two-lane two-way north/south roadway of approximately a mile in length connecting North Drive to 6<sup>th</sup> Street. 6<sup>th</sup> Street is the first major east/west roadway south of the Santa Ana River that is provided with a bridge over the I-15 and freeway on and off ramps. As such California Avenue plays an important traffic circulation role in the northeastern part of the City connecting the City of Riverside to the I-15 freeway via North Drive and 6<sup>th</sup> Street. California Avenue is designated as a minor arterial; however, it is a residential street with many homes facing the street and wide residential access points more so than formally constructed driveways. Unpaved walking paths are provided along both sides of California Avenue and a wooden fence delineates a dirt equestrian trail on the west side of the street. The roadway is striped with a double yellow centerline stripe providing one eleven foot wide travel lane in each direction. Solid white right



edge lines delineating the edge of the traveled way for motorists are in place for both directions of travel. 6<sup>th</sup> Street widens on the approach with North Drive providing two northbound lanes, at 7<sup>th</sup> Street providing for a southbound right-turn pocket, and at 6<sup>th</sup> Street providing for both a southbound right-turn and a southbound left-turn pocket. California Avenue is a relatively flat and straight roadway that is posted with a 35 miles per hour speed limit in a number of locations along its length.

The intersection of California Avenue and 6<sup>th</sup> Street is controlled by a traffic signal that provides a protect left-turn arrows for both eastbound and westbound traffic on 6<sup>th</sup> Street. The traffic signal also splits the operation of the northbound and southbound directions so that traffic in the two directions move independently so that left-turn arrows can be provided in both directions and a southbound right-turn arrow can be provided. In addition, all-way stop controls are in place at the intersections of California Avenue and 7<sup>th</sup> Street, 8<sup>th</sup> Street, and North Drive. Other intervening minor streets are stop controlled at California Avenue. On street parking is prohibited on both the east and west curbs along the entire stretch of California Avenue from 6<sup>th</sup> Street to North Drive. The existing traffic and parking controls on California Avenue are illustrated in Figure 4, California Avenue and Crestview Drive, *Traffic Control Devices*.

### **CRESTVIEW DRIVE**

Crestview Drive, between North Drive and 6<sup>th</sup> Street, is a narrow two-way local residential street that stretches for a little more than a mile alongside the La Sierra Hills. The roadway has a number of horizontal and vertical curves and continuous sidewalks or clearly delineated walking paths are not provided along the entire stretch. At spots the pavement is in poor condition and there is evidence that some of the adjacent slopes may not be stable in poor weather leading to dirt and mud flowing onto the roadway. Curb and gutter is in place for a short distance between 6<sup>th</sup> street and 7<sup>th</sup> street. Roadway striping consists of a double yellow centerline separating northbound and southbound traffic and solid white right edge lines in each direction denoting the edge of the traveled roadway. Crestview is also marked with “sharrows”, or bicycle sharing lane markings in each direction of travel between 8<sup>th</sup> street and North Drive. The “sharrows” are supplemented with share the road and bike route signs. Crestview Drive is posted with a 25 miles per hour speed limit in a number of locations along its length. There are also a number of curve warning signs posted along the street on approach or at curves.

The intersection of Crestview Drive and 6<sup>th</sup> Street is controlled by a traffic signal that provides permissive left-turns (no arrows), meaning that vehicles are free to make left-turns on green as long as they yield to opposing through traffic. All-way stop controls are in place on Crestview Drive at 8<sup>th</sup> Street (3-way stop), 7<sup>th</sup> Street (3-way stop), and Mount Rushmore Drive (3-way stop). The existing traffic and parking controls on Crestview Drive are illustrated in Figure 4, California Avenue and Crestview Drive, *Traffic Control Devices*.



Figure 3: North Drive Traffic Control Devices

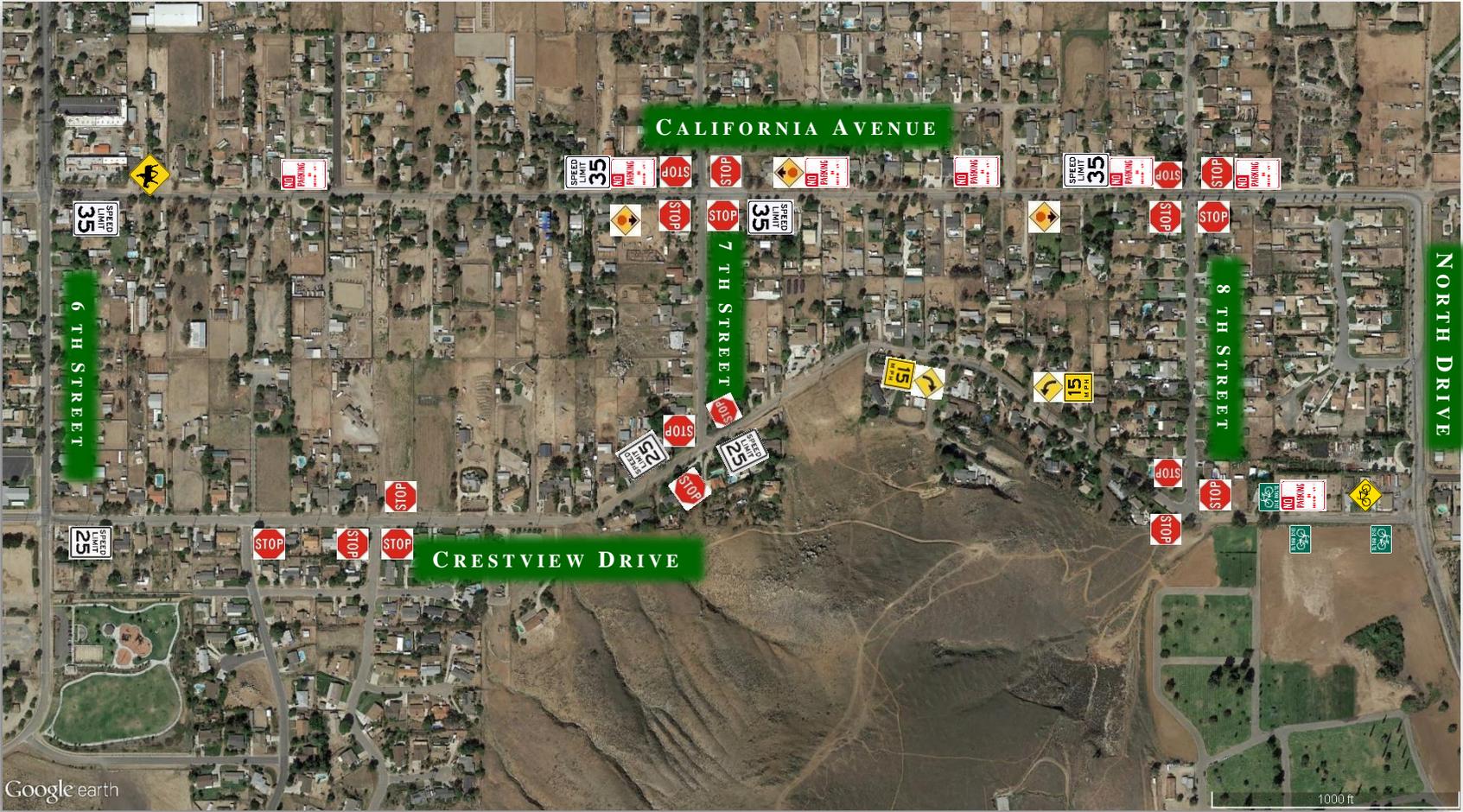


Figure 4: California Avenue and Crestview Drive  
Traffic Control Devices



## DATA ANALYSIS

In addition, to observing traffic patterns and flows in person, traffic engineers routinely collect information on traffic movements, traffic flow, traffic speed, and collisions to determine how roadways are functioning in relation to expected criteria or “rules of thumb” for similar type of roadways. Traffic data values can vary from day-to-day, week-to-week, and month-to-month; therefore, traffic engineers try to select days and times that are generally reflective of a typical day to gather data. In the end the specifics of the data is less important than its comparative difference to other similar roadways. Traffic engineers use these data comparisons to spot trends or patterns of driver behavior that may need further review and investigation. Ultimately, it is the data that is gathered that leads the engineer to recommendations to most appropriately address documented traffic flow and safety concerns. The following sections highlight traffic and collision data that was gathered on North Drive, California Avenue, and Crestview Drive and the traffic engineer’s interpretation of that data in relation to what is considered regular or normal and what could be considered remarkable or abnormal.

### 3.1 Traffic Data

Twenty-four hour traffic volume counts and peak-period turning movement counts were gathered at key locations along North Drive, California Avenue and Crestview Drive. Twenty-four hour traffic volume counts are recorded by automated traffic counting machines placed on the side of the roadway and provide a traffic flow profile in fifteen minute increments over the course of an entire day. The data from the automated counting machines are used to determine peak periods of traffic flow and to provide an estimate of the average traffic that typically travels the roadway in a day. Peak period-turning movement counts are gathered manually by traffic counting crews of people that observe traffic movements at an intersection and record how many vehicles make left-turns, right-turns, or go straight on each approach. In addition to information on vehicle movements, the counting crews can also record pedestrian crossings, bicycle traffic, and other traffic characteristics. Typically peak-period turning movement counts are conducted during the busiest three hours in the morning and busiest three hours in the afternoon to evening. The detailed traffic volume and turning movement data sheets are provided in Appendix A; however, a summary of the data gathered and an engineering interpretation of that data is provided below.

#### Average Daily Traffic (ADT)

- **North Drive**

The following average traffic volume is based on traffic counts taken in July and August of 2015

- California Avenue to Crestview Drive ADT – **10,600 vehicles**

- **California Avenue**

The following traffic volumes are average values based on traffic counts taken in December of 2015 when traffic volumes are traditionally higher due to the holiday season.

- North Drive to 8<sup>th</sup> Street ADT – **11,800 vehicles**
- 8<sup>th</sup> Street to 7<sup>th</sup> Street ADT – **11,800 vehicles**
- 7<sup>th</sup> Street to 6<sup>th</sup> Street ADT – **10,000 vehicles**



- **Crestview Drive**

The following traffic volumes are average values based on traffic counts taken in December of 2015 when traffic volumes are traditionally higher due to the holiday season.

- North Drive to 8<sup>th</sup> Street ADT – **1,300 vehicles**
- 8<sup>th</sup> Street to 7<sup>th</sup> Street ADT – **1,300 vehicles**
- 7<sup>th</sup> Street to 6<sup>th</sup> Street ADT – **1,300 vehicles**

It was clear from the traffic flow observations that there is a significant travel pattern between the City of Norco, and possibly the I-15 freeway, and the City of Riverside using California Avenue and North Drive. Although more than ten thousand vehicles a day on a two-lane roadway is considered significant, in the case of North Drive and California Avenue it is not necessarily out of character considering the prominence of both roadways in the circulation pattern of this part of the City and the direct connection they provide around the La Sierra Hills and to the City of Riverside. However, what was rather surprising was the level of traffic that the automated traffic count machines recorded for Crestview Drive. Typically a local residential street on the “edge of town” would have light traffic in the range of 500 to 750 vehicles per day assuming that the street merely served to provide access to the adjacent residential homes. Based on the traffic counts, it is clear that Crestview Drive is carrying about double the level of traffic that traffic engineers would expect to find for a street of its type and location.

**Peak-Period Traffic Volumes**

Peak-period traffic volumes for North Drive are shown in Figure 5, North Drive, *Peak Hour Vehicle Traffic Flow*, and in Figure 6, California Avenue and Crestview Drive, *Peak Hour Traffic Flow*. The figures depict both the morning and afternoon peak hour traffic flows. It is important to note that the traffic volumes shown for Crestview Drive and California Avenue in Figure 6 are based on traffic counts performed in December of 2015 when traffic volumes are traditionally higher due to the holiday season. Traffic volumes shown for North Drive in that same graphic were performed in July and August of 2015 so the volumes are slightly lower and don’t “match up” exactly with those shown for California Avenue. The peak traffic flow hours are generally consistent for all three roadways with the morning peak hour being between 6:30am and 7:30am and the afternoon peak hour being between 4:30pm and 5:30pm.

The traffic volumes summarized in Figure 5 and Figure 6 definitely present a directional flow pattern with the highest traffic levels headed into the City of Norco and towards the I-15 along both North Drive and California Avenue in the morning and the opposite direction heading out of town and towards the City of Riverside in the afternoon and evening. Just how much of that traffic is City of Norco residents leaving the City in the morning for jobs elsewhere or City of Riverside residents destined to jobs in the City of Norco and surrounding employment areas is unclear. However, it is interesting to note that the morning peak traffic flow into town of about six to seven hundred vehicles in the peak-hour is consistent with a similar six to seven hundred vehicles heading out of town in the evening. Therefore, based on these consistent peak-hour traffic flow volumes traveling in opposite directions during the morning and evening peak-hour it can be assumed that some portion of that traffic along North Drive and California Avenue is regular every-day commuter traffic neither originating nor destined to the local area. Such commuters could be using North Drive and California Avenue as a regular short-cut to by-pass traffic congestion on the I-15 and/or CA-91 freeways. It is not practical to stop every motorist to inquire why they are using the two streets; however, based on the traffic volumes it is speculated that the non-local commuter traffic along both streets could be in the range of fifteen to thirty percent during the peak-hour.



The peak-hour traffic volumes on Crestview Drive have a similar directional flow that mimics that of California Avenue, except that the afternoon and evening peak-period traffic volumes are considerably higher than those of the morning peak-hour. The northbound (heading towards North Drive) peak-hour traffic volume in the afternoon is more than twice that of the southbound (heading towards 6<sup>th</sup> Street) traffic in the morning. It is also interesting to note that the afternoon peak-hour traffic flow of more than two cars a minute is relatively consistent throughout the entire stretch of Crestview Drive suggesting that some motorists may be by-passing traffic congestion or traffic delays on California Avenue by driving easterly along 6<sup>th</sup> Street to turn left onto Crestview to continue to North Drive and then on to the City of Riverside. When observing afternoon peak-hour traffic flows in the field, a traffic engineer did follow a number of vehicles that turned onto Crestview Drive from 6<sup>th</sup> Street and then proceeded to drive its entire stretch to turn right onto North Drive and continue on to the City of Riverside. While in the field the traffic engineer also observed some motorists displaying aggressive driver behavior in crossing the centerline and edge line markings and rolling through stop signs, especially at the intersection of Crestview Drive and 8<sup>th</sup> Street. The traffic engineer didn't observe many motorists excessively exceeding the 25mph speed limit; however, some motorists were driving in a manner that could be considered excessive for the geometric and/or roadway conditions. Based on the high directional peak-hour traffic volumes combined with the field observations of traffic flows it is clear that some motorists are using Crestview Drive as an alternative commute route to reach the City of Riverside in the evening. There is much less traffic making the reverse trip in the morning, suggesting that the left-turn arrow at the North Drive and Crestview Drive traffic signal may be a deterrent for some commuters that don't want to wait for the green arrow but rather choose to continue on to California Avenue under a green light.

### **Turning Movement Counts**

Turning movement counts were taken at the intersections of North Drive and California Avenue and at North Drive and Crestview Drive. The summary of those traffic counts can be found within Figure 5. It is interesting to note that the left-turn volumes from westbound North Drive to southbound Crestview Drive are consistent for both the morning and afternoon peak-hours at about thirty cars each. Based on the number of residential homes that take access from Crestview Drive a traffic volume of thirty vehicles an hour suggests that the vast majority of that traffic is local traffic destined to the homes along the street. This low turning volume further confirms the contention that the left-turn arrow of the traffic signal may be a deterrent for commuters using Crestview Drive as a by-pass to California Avenue. It is also significant to note the northbound right-turn volume at that same North Drive and Crestview Drive intersection. During the morning peak-hour the number of vehicles making the right-turn on to North Drive to travel on to the City of Riverside is less than forty, which again would be consistent with the number of homes that take access from Crestview Drive. However, during the evening peak-hour the number of motorists making that same right-turn is more than three times higher suggesting that a majority of that traffic did not originate from the homes that take access from the street.

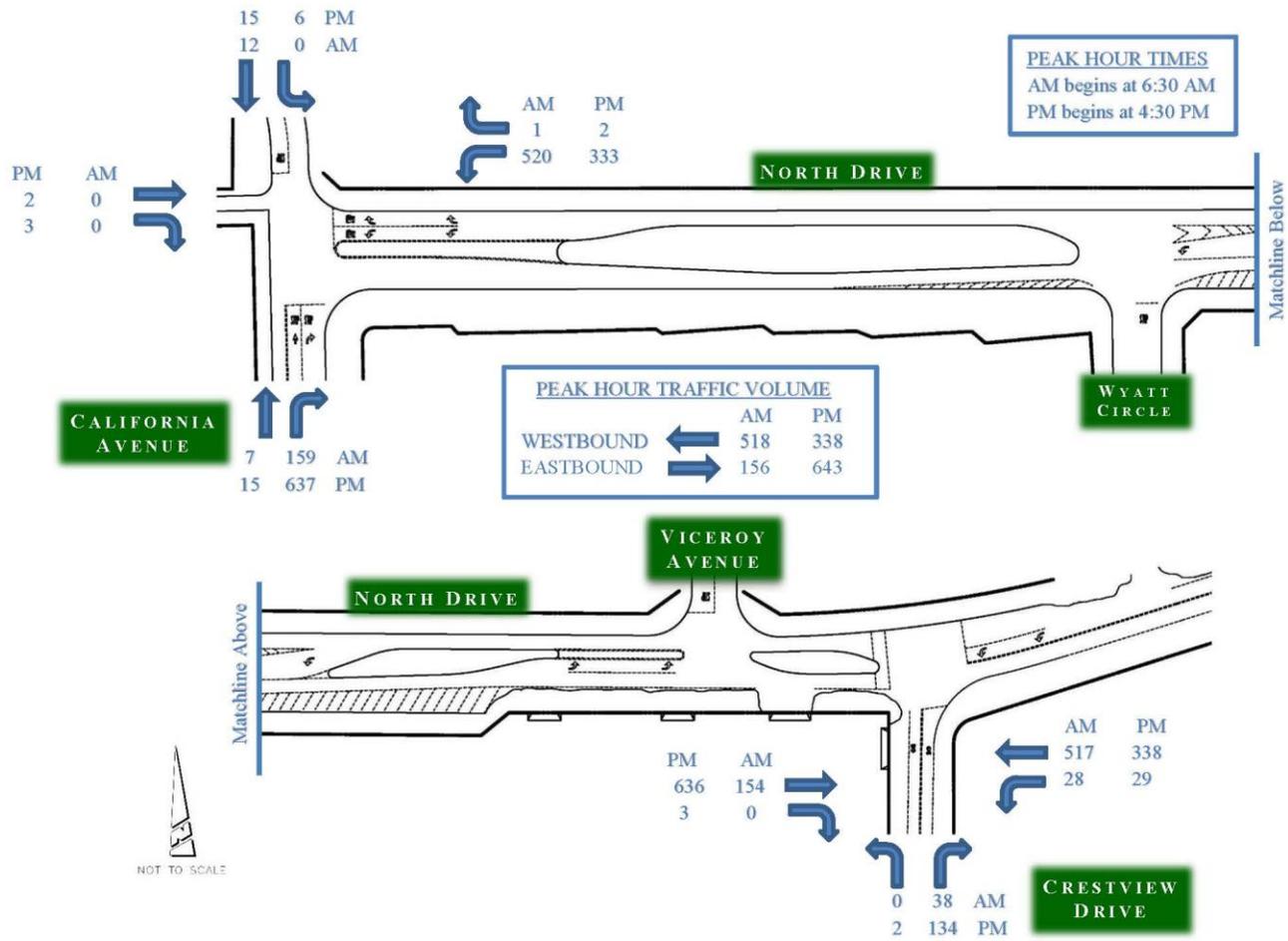


Figure 5: North Drive Peak Hour Traffic Flow

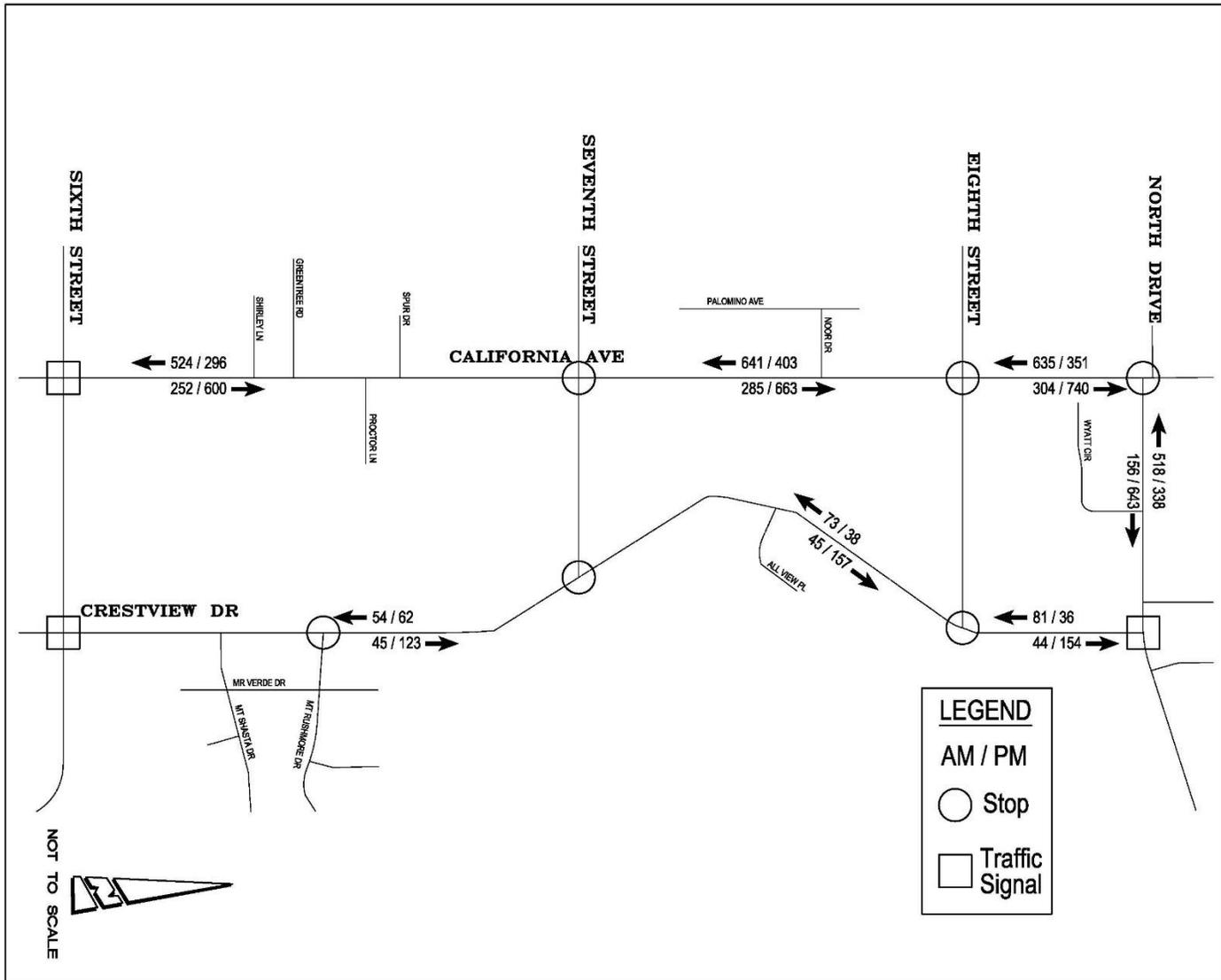


Figure 6: California Avenue and Crestview Drive Peak Hour Traffic Flow





### 3.2 Traffic Collisions

The safety performance of a stretch of highway or roadway is generally gauged by comparison of its traffic collision rate per million vehicle miles traveled to other roadways of similar type and characteristics. The State of California monitors collision rates across the State through the *Statewide Integrated Traffic Records System (SWITRS)* which is essentially a database of all reported collisions in the State for which police reports were generated. Traffic engineers can then use this data to make statistical comparisons of collision rates for various types of roadways. It is generally understood that many minor collisions or property damage only collisions go unreported and are not a part of the SWITRS database; however, the data does provide traffic engineers with excellent comparative information albeit not necessarily a complete picture. The statewide statistics are commonly used by traffic engineers to measure the safety performance of various roadways, to recommend speed limits, and a variety of other traffic control decisions.

Traffic collision data from June 2010 through May 2015 (5-years) was obtained from SWITRS for the three roadway segments under study. SWITRS collision data summary sheets are provided in Appendix B. Based on the data obtained, traffic collision rates were then determined and are summarized below:

#### North Drive

- California Avenue to East City Limits – 3 mid-block collisions / 5 intersection collisions  
Calculated Mid-Block Collision Rate: **0.865**

#### California Avenue

- North Drive to 7<sup>th</sup> Street – 10 mid-block collisions / 3 intersection collisions  
Calculated Mid-Block Collision Rate: **1.55**
- 7<sup>th</sup> Street to 6<sup>th</sup> Street – 7 mid-block collisions / 2 intersection collisions  
Calculated Mid-Block Collision Rate: **1.83**

#### Crestview Drive

- North Drive to 7<sup>th</sup> Street – 4 mid-block collisions  
Calculated Mid-Block Collision Rate: **4.61**
- 7<sup>th</sup> Street to 6<sup>th</sup> Street – 3 mid-block collisions / 1 intersection collision  
Calculated Mid-Block Collision Rate: **9.46**

According to the latest available statewide collision statistics, the three roadways segments under study in Norco are expected to experience 2.8 collisions per million vehicle miles traveled. As a comparison, the five year collision performance for North Drive and California Avenue are lower than the statewide expected rate and thus out performing their counterpart roadways in the State. However, the calculated collision rates for Crestview Drive are significantly higher than the statewide expected rate and thus Crestview Drive is more accident prone than its counterpart roadways in the State. The segment between North Drive and 7<sup>th</sup> Street is 64% higher than the statewide average and the segment between 7<sup>th</sup> Street and 6<sup>th</sup> Street is more than twice the statewide average.

In reviewing the SWITRS collision records for all three study roadways, it was clear that unsafe speed was the primary contributing factor in about 50% of all collisions. Furthermore, other poor driver decisions such



as driving on the wrong side of the road, driving under the influence, and improper movements were also primary contributing factors in about 30% of all collisions. Therefore, it can be concluded that 80% of all collisions on the three roadways were caused by willful driver decisions to illegally speed, drive erratically, or drive while under the influence. Such a high percentage of collisions linked to willful illegal driving activity is uncommon for suburban residential communities in Southern California. Another unique characteristic of the collision statistics was that almost 60% of all accidents involved a single vehicle colliding with a fixed roadside object. It is also rare for this type of collision to be the predominate type of collision for roadways in Southern California. Most residential areas in Southern California experience a significant percentage of collisions from drivers making bad driving decisions such as failing to abide by traffic controls or turning left in front of another vehicle; however, those types of collisions appear to be somewhat underrepresented in the collision statistics for the three study roadways.

SWITRS intersection traffic collision information for the past five years was also reviewed for each of the intersections along North Drive, California Avenue, and Crestview Drive. Generally, intersection collision frequency was found to be low along all three streets with the majority of intersections experiencing less than one reported collision over the past five years. Traffic collision rates of less than one collision per year per intersection considering the volume of traffic on North Drive and on California Avenue suggests that the safety performance of the intersection traffic controls is adequate. The highest intersection traffic collision frequency was found to be at or near the intersection of California Avenue and 7<sup>th</sup> Street where there were five reported traffic collisions in the past five years. The five collisions were all of different types and circumstances and thus didn't present a pattern of accidents that could be correctable by changes to the existing traffic controls or the addition of supplementary measures. The intersection has all-way stop controls with supplementary pavement markings and there is adequate sight visibility for motorists of both the stop signs and the conflicting traffic movements. Only one of the reported collisions at the intersection was related to a motorist that violated a stop sign suggesting that motorists are well aware of the existing stop controls. Based on the review of the collision records and an engineering review of the intersection no additional traffic control measures are recommended at this time.

Although the traffic collision analysis suggests that both North Drive and California Avenue are performing well from a traffic safety perspective, Crestview Drive on the other hand is experiencing traffic collisions at a remarkable rate. In reviewing the traffic collision records for Crestview Drive, the predominate type of collision involves a single vehicle traveling at an unsafe speed and striking a fixed object. Other notable collision characteristics were that two of the eight collisions involved drivers under the influence and five others were classified as hit and run collisions. Matter-of-fact, only one of the eight reported traffic collisions was a traditional intersection collision involving two vehicles. This pattern of accidents suggests the cause of the high collision rate along Crestview Drive is aggressive motorist behavior of individuals willfully and knowingly breaking the law. The higher than expected traffic collision rate on both segments of Crestview Drive suggests that traffic control actions are needed to address the elevated collision rate. Recommendations to enhance traffic safety along Crestview Drive are outlined in the Conclusions and Recommendation section of this report.

### 3.3 Speed Survey

Speed surveys are conducted on streets to determine how fast motorists are driving and to determine the most appropriate speed limit. Reasonable and effective speed limits are based on the premise that the established speed limit conforms to the actual behavior of the majority of motorists. Arbitrarily setting lower speed limits on a roadway may not improve safety and could be considered a speed trap by the courts and thus unenforceable.



Speed limits are normally established at the five mile per hour increment nearest the 85<sup>th</sup> percentile speed as determined by field radar measurements of motorists driving on the road. In setting speed limits, traffic engineers can also consider other factors such as traffic collision history, safe stopping sight distance, physical characteristics of the roadway, adjacent land use, pedestrians, cyclists, and in the City of Norco the presence of equestrians. However, the procedures and rules for the setting of speed limits in California are dictated by Caltrans and as a consequence those rules provide traffic engineers very little flexibility in recommending speed limits that are not within close proximity to the 85<sup>th</sup> percentile speed. Detailed information on the rules regarding the setting of speed limits can be found in Appendix C.

As a part of this study, traffic engineers at AGA conducted radar speed surveys on North Drive, California Avenue, and Crestview Drive to gauge the speed of traffic on those roadways and to determine if the posted speed limits are appropriate or if they could be lowered. Appendix D contains the field data and computation sheets from the survey. Below is a summary of the speed information gathered and a determination if the existing speed limit can be lowered, should remain the same, or be raised.

**North Drive**

California Avenue – East City Limits

- Posted Speed Limit: 40 mph
- 85<sup>th</sup> Percentile: 43 mph
- 50<sup>th</sup> Percentile: 39 mph
- 10-mile Pace: 36-45 mph
- Recommendation: **No Change**

**California Avenue**

6<sup>th</sup> Street – 7<sup>th</sup> Street

- Posted Speed Limit: 35mph
- 85<sup>th</sup> Percentile: 37 mph
- 50<sup>th</sup> Percentile: 34 mph
- 10-mile Pace: 30-39 mph
- Recommendation: **No Change**

7<sup>th</sup> Street – North Drive

- Posted Speed Limit: 35 mph
- 85<sup>th</sup> Percentile: 38 mph
- 50<sup>th</sup> Percentile: 34 mph
- 10-mile Pace: 32-41 mph
- Recommendation: **No Change**

**Crestview Drive**

North Drive – 7<sup>th</sup> Street

- Posted Speed Limit: 25 mph
- 85<sup>th</sup> Percentile: 25 mph
- 50<sup>th</sup> Percentile: 22 mph
- 10-mile Pace: 19-28 mph
- Recommendation: **No Change**



7<sup>th</sup> Street – 6<sup>th</sup> Street

- Posted Speed Limit: 25 mph
- 85<sup>th</sup> Percentile: 27 mph
- 50<sup>th</sup> Percentile: 23 mph
- 10-mile Pace: 20-29 mph
- Recommendation: **No Change**

Based on the speed surveys conducted, it is recommended, at this time, that the existing speed limits on all three streets be retained. That being said, it is the belief of the engineering team at AGA that based on the roadway geometry of North Drive that a 35mph speed limit would be more appropriate than the current 40mph speed limit. Since lowering the speed limit is not a viable option based on Caltrans mandated speed limit setting procedures; it is recommended that traffic calming measures be pursued in order to influence motorists to drive slower and thus permit the lowering of the speed limit.



## CONCLUSIONS AND RECOMMENDATIONS

Based upon traffic data collected, collision history reviewed, and first-hand engineering field observations, the engineering team at Albert Grover & Associates has developed a list of recommended traffic control strategies designed to improve and calm traffic flows along North Drive and address commuter cut-through traffic and traffic safety issues along Crestview Drive.

Changing driver behavior to get motorists to choose a more appropriate commute route or to drive more safely in a residential neighborhood is never a simple or easy proposition. In some ways motorists are like cats if you attempt to force a behavior with traffic controls that frustrate them they rebel and often times the fix is worse than the problem. The key to successfully influencing motorist behavior is much the same as with a cat, you have to get the cat, or in this case, the motorist, to want to behave in a manner we desire without them knowing we are influencing their very behavior. A good example of this can be illustrated with the left-turn arrow at the North Drive and Crestview Drive traffic signal. The left-turn arrow seems to the average motorists to be a reasonable traffic control device considering the speed of traffic and other safety factors. Although the arrow is reasonable, it also introduces delay to those commuters that wish to use Crestview Drive as a shortcut because they would have to wait for it to turn green before they could continue on their way so many of those motorists choose upon their own accord to forgo turning left to continue straight under a green light. The end result is that many commuters don't take Crestview Drive in the morning thus producing the desired motorist behavior!

The list of recommendations developed under this study is designed much like that left-turn arrow, to successfully obtain the desired motorist behavior through the smart application of reasonable traffic controls that will be respected by the very motorists that will be driving them every day. The following recommendations are categorized into six groups comprising a variety of subtle traffic signage, marking, and signaling changes that as a group have an excellent chance of successfully addressing the traffic and safety issues reported by the residents and confirmed by this study.

### **ALL-WAY STOP CONTROL IMPROVEMENTS**

***Installation of New All-way Stop Controls at Crestview Drive and Mt. Shasta Drive:*** In an effort to enhance traffic safety along Crestview Drive it is recommended that all-way stop controls be installed at the intersection of Crestview Drive and Mt. Shasta Drive. The intersection is located one block north of 6<sup>th</sup> Street and it provides direct access for residents that live in the neighborhood just east of Crestview Drive. Mt. Shasta Drive and Mt. Rushmore Drive are both "T" intersections providing primary access to the same neighborhood east of Crestview Drive. Mt. Rushmore is currently all-way stopped; however, Mt. Shasta provides direct access to more homes. All-way stopping the Crestview Drive and Mt. Shasta intersection would be consistent with traffic controls installed at other primary residential access intersections along Crestview Drive and it could enhance safety by discouraging cut-through traffic.



## **SIGNAGE IMPROVEMENTS**

***Install Additional 25mph Speed Limit Signs on Crestview Drive:*** Although 25mph speed limit signs are posted on the southern portion of Crestview Drive in the vicinity of 6<sup>th</sup> Street and 7<sup>th</sup> Street additional speed limit signs posted on the northern portion of the street could serve to remind motorists driving on that section of the roadway of the applicable speed limit. It is recommended that new 25mph speed limit signs be installed for southbound traffic on Crestview Drive at approximately 150 feet south of North Drive and at approximately 150 feet south of 8<sup>th</sup> Street. It is also recommended that a new 25mph speed limit sign be installed for northbound traffic on Crestview Drive at approximately 150 feet north of 8<sup>th</sup> Street.

***Install Additional 40mph Speed Limit Signs:*** There is only one speed limit sign posted on North Drive for westbound motorists as they enter the City east of Crestview Drive. It is recommended that two new 40mph speed limit signs be installed on North Drive, one for eastbound traffic at approximately 150 feet east of California Avenue and one for westbound traffic at approximately 150 feet west of Viceroy Avenue.

***Install “No-Turn on Red 4pm-6pm” Signs for Northbound Crestview Drive at North Drive:*** In observing traffic movements at the intersection of North Drive and Crestview Drive during the afternoon peak period, traffic engineers witnessed a number of motorists that appeared to be commuters destined to the City of Riverside aggressively roll through the red traffic light or miss judge cross traffic heading eastbound on North Drive and pull-out in front of them. In addition, there is a large bush on the southwest corner of the intersection partially blocking cross traffic visibility for motorists stopped behind the northbound limit line of the intersection. For these reasons it is recommended that “No-Turn on Red 4pm-6pm” signs be installed for northbound Crestview Drive at North Drive. An added benefit of such a turning prohibition is that it will add delay to commuters that will now have to wait for the traffic signal to turn green before they can turn on to North Drive. By adding this seemingly minor delay at the traffic signal some commuters may decide it simply isn’t worth the wait and will choose to not drive on Crestview Drive any longer. This minor traffic signal induced delay for the afternoon commute is essentially similar to the delay caused by the traffic signal for westbound left-turns in the morning, with hopefully similar results.

***Install Dynamic Speed Feedback Signs on North Drive:*** Speed studies conducted by various cities in Southern California have shown that dynamic speed feedback signs, such as shown in the picture below, can have a dramatic positive effect on driver behavior. Speed feedback signs can be mounted to an existing streetlight pole and be solar powered thus reducing installation costs and facilitating relocation if so desired. The presence of such signs let motorists know their true travel speed and they also send a “silent message” motorists that speeding on the roadway is not acceptable and that both the residents and the City expect drivers to obey the posted speed limit. The signs also facilitate traffic enforcement since it is difficult for motorists to plead with a Deputy or the court that they didn’t know what the speed limit was or that they were exceeding it. Another potential positive outcome that some cities have experienced is a general calming of traffic speeds in the vicinity of the signs of up to three miles an hour on average. Such a reduction in travel speeds



can then, over a period of time, allow a city to reduce the speed limit. If such a reduction could be obtained through the installation of such signs on North Drive, it may be possible in a few years for the City to lower the posted speed limit on North Drive to 35mph. In the judgement of the engineering team at AGA, a speed limit of 35mph for North Drive is a more appropriate speed considering the unique roadway characteristics and the fact that it is discontinuous at 6<sup>th</sup> Street. It is; therefore, recommended that two dynamic speed feedback signs be installed on North Drive one for westbound traffic just east of the traffic signal at Crestview Drive as motorists enter the City and one for eastbound traffic in the vicinity of Wyatt Circle. Based on traffic flow observations, it is believed that the signs would be most effective in calming traffic speeds at the two location identified; however, the signs can be relocated as needed. It is also suggested that a follow-up speed survey be conducted after four to six months of operation to determine if the signs have been effective in calming traffic speeds and if a reduction of the 40mph speed limit is possible.



*Example of a Dynamic Speed Feedback Sign*

**FOCUSED TRAFFIC ENFORCEMENT**

Based on the speed data collected and observations of traffic engineers in the field, higher travel speeds on North Drive and Crestview Drive were noted on weekdays between the hours of 2:00pm and 5:00pm. However, with the installation of the dynamic speed display signs it is possible to record speed data for weeks at a time and generate reports identifying times when speeding is most prevalent. It is; therefore, recommended that the Sherriff be periodically provided copies of the speed reports from the dynamic speed display signs, so that Deputies can adjust their periodic traffic enforcement efforts and patrols along North Drive, California Avenue, and Crestview Drive to target times when speeding is most prevalent, thus increasing the effectiveness of signage and enforcement efforts.



## ROADWAY MARKING IMPROVEMENTS

***Renew Pavement Markings along North Drive, California Avenue, and Crestview Drive:*** Many of the pavement markings delineating centerlines, edge lines, crosswalks, and limit lines are faded on the three streets reviewed as a part of this study. Generally, there tends to be better motorist compliance of traffic controls especially at night and in poor weather when pavement markings are clearly visible. It is recommended that as a minimum that the limit lines, crosswalks, and STOP legends be renewed along California Avenue and Crestview Drive at North Drive, 8<sup>th</sup> Street, and at 7<sup>th</sup> Street. Consideration should also be given to renewing the pavement markings at the all-way stop at Crestview Drive and Mt. Rushmore Drive at the same time that the new all-way stop is installed at Crestview Drive and Mt. Shasta Drive.

## TRAFFIC SIGNAL IMPROVEMENTS

***Implement Rest-in-Red Operation at the North Drive and Crestview Drive Traffic Signal:*** The rest-in-red operation of a traffic signal is commonly used as a way to curtail motorist speeding along a roadway. The majority of traffic signals are green for one direction or another at all times; however, traffic signals that operate in a rest-in-red mode can display red for all directions of traffic when there is no traffic at the intersection then they can quickly turn to green to serve an approaching vehicle. Some traffic signals even delay the onset of the green for approaching vehicles to stop those motorists that are speeding while allowing those that are not speeding to continue on without stopping. This mode of operation can be very effective at reducing traffic speeds during periods of light traffic while it is rarely activated during peak-periods when traffic demand is brisk. Most motorists are unaware that the traffic signal is operating in a manner to cause them to subconsciously reduce their speed to be rewarded with a green light. Those motorists that are speeding end up being stopped by the traffic signal but they too believe the traffic signal is very responsive because as soon as they stop it turns green for them to continue on their way. This traffic signal strategy has been used to calm traffic speeds in large cities such as Los Angeles and Long Beach with much success in controlling excessive speeds, racing, and reckless driving. This strategy could also result in overall lower average speeds thus working in concert with dynamic speed feedback signs in potentially supporting lowering the speed limit on North Drive in the future. It is; therefore, recommended that the traffic signal at North Drive and Crestview Drive be modified to operate in the rest-in-red mode initially between the hours of 8pm at night and 6am in the morning. It is also suggested that a follow-up review of the operation be conducted after four to six months of operation to determine the effectiveness of the operation and to determine if the hours of operation should be extended to address daytime motorist speeds as well.

***Implement Protected-Permissive Left-Turn Arrow for Eastbound 6<sup>th</sup> Street at California Avenue:*** The traffic signal at 6<sup>th</sup> Street and California Avenue has fully protected left-turn arrows for eastbound and westbound traffic. Fully protected left-turn arrows only allow traffic to turn left on a green arrow otherwise turning vehicles must wait. Fully protected left-turn arrows are commonly used when turning motorists cannot fully see oncoming traffic or there are dual left-turn lanes. Since the predominate traffic movement at the 6<sup>th</sup> Street and California Avenue traffic signal is eastbound left-



turns and southbound right-turns heading to and from the I-15 freeway and the City of Riverside some motorists that do not want to wait for the green left-turn arrow at California Avenue continue easterly on 6<sup>th</sup> Street to Crestview Drive to turn left where there is no left-turn arrow and they can turn without delay. It is the opinion of the AGA engineering team that the fully protected left-turn arrow at 6<sup>th</sup> Street and California is a contributing factor to the afternoon commute traffic observed on Crestview Drive. If the fully-protected left-turn arrow were to be replaced with a protected-permissive left-turn arrow, the time advantage some commuters perceive they have in using Crestview Drive will be significantly reduced since left turning traffic at California Avenue would have less of a wait since they will be free to make left-turns both on the green arrow, as they do today, but also under the green ball when conflicting traffic has cleared. This change in traffic signal operation can be implemented in two ways. The first is to install what is commonly referred to a “dog house” left-turn indication that not only displays the green arrow but can simultaneously display a green ball allowing left-turning vehicles to turn after the green arrow has been terminated. The second way is to add a flashing yellow arrow to the traffic signal indications for left-turning motorists. The flashing yellow arrow would be activated when the green arrow is terminated so that left-turning traffic can continue to turn left when there are gaps in the westbound traffic. The flashing yellow operation is less common in Southern California but has been extensively implemented in the State of Oregon, the State of Washington, and the Midwest with much fanfare and success. In Southern California there are a limited number of cities that have installed flashing yellow arrows with the most being deployed by the City of Fullerton with more than a dozen operational. In order to improve the efficiency of the traffic signal operation at 6<sup>th</sup> Street and California and reduce the likelihood of motorists using Crestview Drive as an alternate to California Avenue, it is recommended that the eastbound fully protected left-turn arrow at 6<sup>th</sup> Street and California Avenue be converted to a protected-permissive operation.

## **MEDIAN IMPROVEMENTS**

***Install a Center Island Median and Stop Sign for Westbound North Drive at California Avenue:*** Based on observations of traffic flow at the intersection of North Drive and California Avenue, traffic engineers saw many motorists making westbound left-turns roll through the stop sign and “cut the corner” to continue on their way southbound on California Avenue. This behavior contributes to faster driving through the intersection and places other motorists, pedestrians, and bicyclists at risk for a collision. Therefore, it is recommended that a small median island be constructed in the center of the roadway for the purpose of installing a center mounted stop sign similar to the picture below. Such an installation will eliminate the ability for motorists to “cut the corner” and many will then come to a complete stop on their own accord to make what amounts to a “sharper” left turn. The median can be designed as to not impede the movement of large vehicles and pick-up trucks towing trailers. An added advantage of the center island mounted retroreflective stop sign is that it will be clearly visible by approaching traffic from hundreds of feet away at night, thereby minimizing the risk that a driver unfamiliar with the area or one that is under the influence will blow through the intersection thinking that the roadway continues westerly at California Avenue when it does not.



*Example of a Center Island Stop Sign*

**North Drive Median Island Improvements:** North Drive has a wide unlandscaped median along the majority of its length. The median is an effective tool in reducing roadway width; however, its traffic calming potential is limited because there are no vertical elements in the median. Vertical elements such as trees, landscaping, art work, and monument signs serve to break up the wide open expanse of the street narrowing and concentrating the drivers view to the roadway directly in front of him or her. This narrowing of the driver's vision is what subconsciously slows motorist's speeds. For example, on a freeway there is typically more than one hundred feet of wide open view and motorist feel comfortable driving at 65 miles per hour. However, on an arterial roadway that may have that same twelve foot wide travel lane as on the freeway but has a landscaped median and two story buildings on the side of road that same motorist may only feel comfortable driving a speeds of 35mph or less. So traffic calming a roadway has less to do about the roadway's width than it does the drivers visual perception of what is a comfortable travel speed. Therefore, in order to maximize the traffic calming effect of the existing wide medians on North Drive it is recommended that the City retain a consultant with expertise in designing landscaped medians to install vertical elements such as trees and art work in the median to visually break up the wide open expanse of the street. It is also suggested that the wide median might be an excellent place to construct a large monument sign welcoming travelers to the City of Norco or wishing them well as they leave the City. Such median treatments also signify to motorists that they have arrived at a community that cares and thus many motorists have a tendency to drive more reasonable and prudent in such communities.

# Traffic Calming Study Review and Discussion



**Council Study Session  
March 23, 2016**

# Traffic Issues

- **Hamner Ave – Dual left onto 6<sup>th</sup> Street**
- **6<sup>th</sup> Street – Right on I-15**
- **Hamner Ave – Dual left onto 2<sup>nd</sup> Street**
- **2<sup>nd</sup> Street – Right onto I-15**
- **2<sup>nd</sup> Street – Pedestrian walkway at I-15**
- **Hamner Ave – Dual left onto Hidden Valley**
- **Hidden Valley – Left into Hobby Lobby**
- **Crestview – Traffic Calming Study**

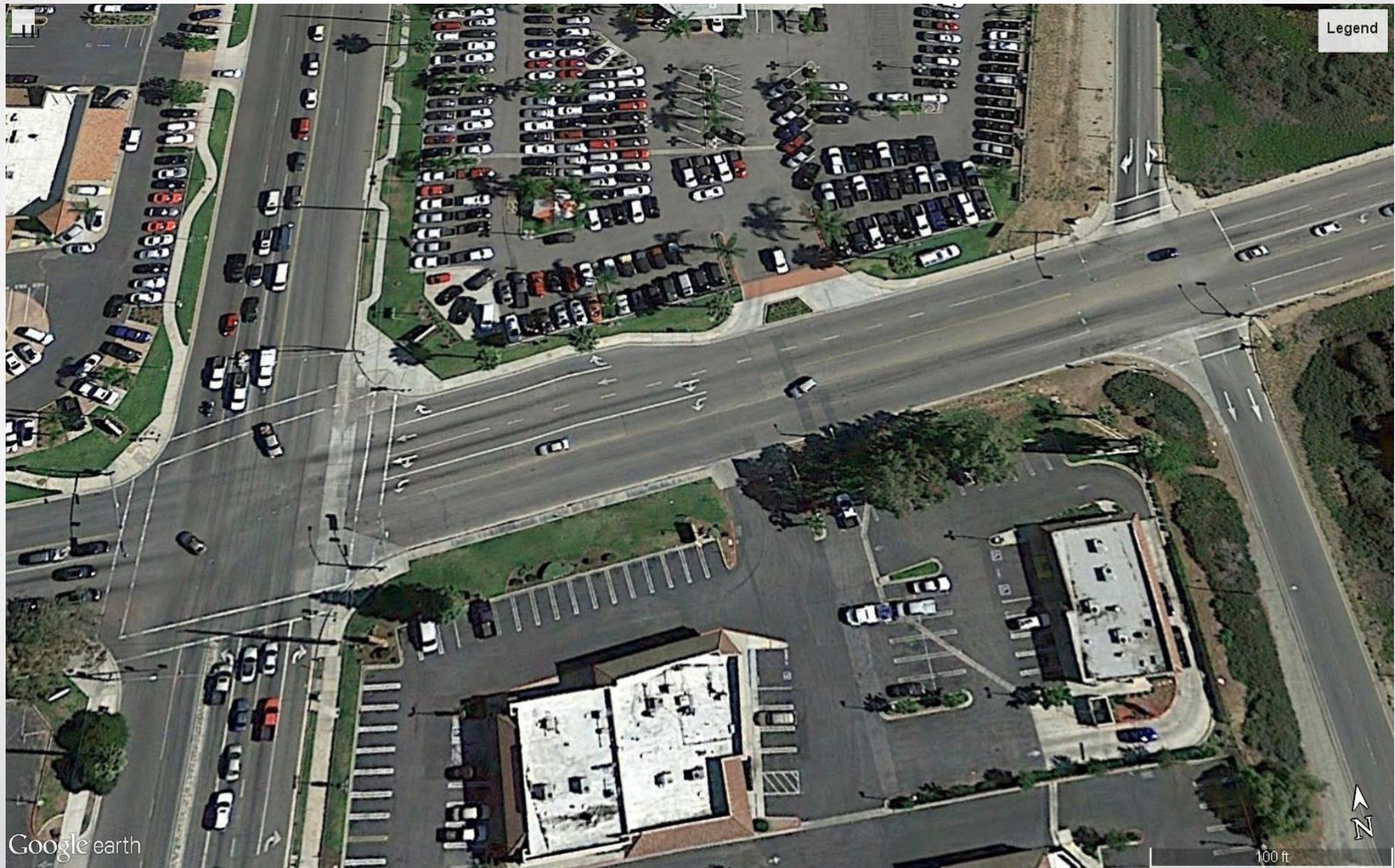
# Hamner Ave – Dual left onto 6th



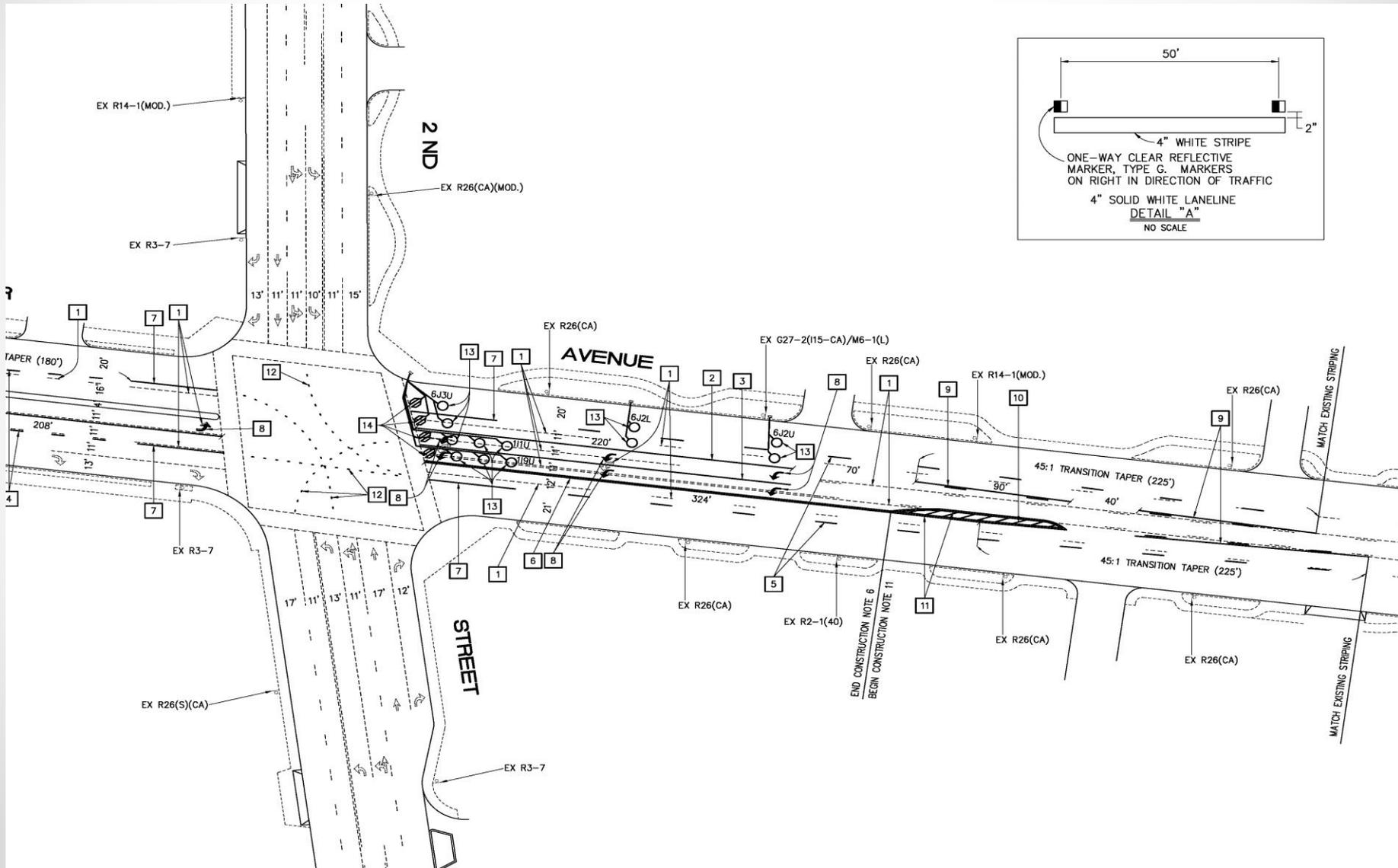
# Comments

- **Traffic signing and striping plan proposal currently being prepared by Albert Grover**
- **Dual left turn lanes are possible but excessive vehicle weaving expected on 6<sup>th</sup> St unless additional lane on 6<sup>th</sup> St is added**
- **Caltrans currently looking at design options**
- **May require additional lane on 6<sup>th</sup> Street by removing portion of the parkway adjacent to Starbucks**
- **Costs TBD**

# Hamner Ave – Dual left onto 2nd



# Hamner Ave – Dual left onto 2nd



# Comments

- **Traffic signing and striping plan completed by Albert Grover**
- **Dual left turn lanes are possible but excessive vehicle weaving expected on 2<sup>nd</sup> St unless additional lane on 2<sup>nd</sup> St is added**
- **Caltrans currently looking at design options**
- **May require additional lane on 2<sup>nd</sup> Street by removing portion of the parkway adjacent to Burger King**
- **Costs estimated at \$30,000 (dual-left only)**

# 2<sup>nd</sup> St - Sidewalk Improvement



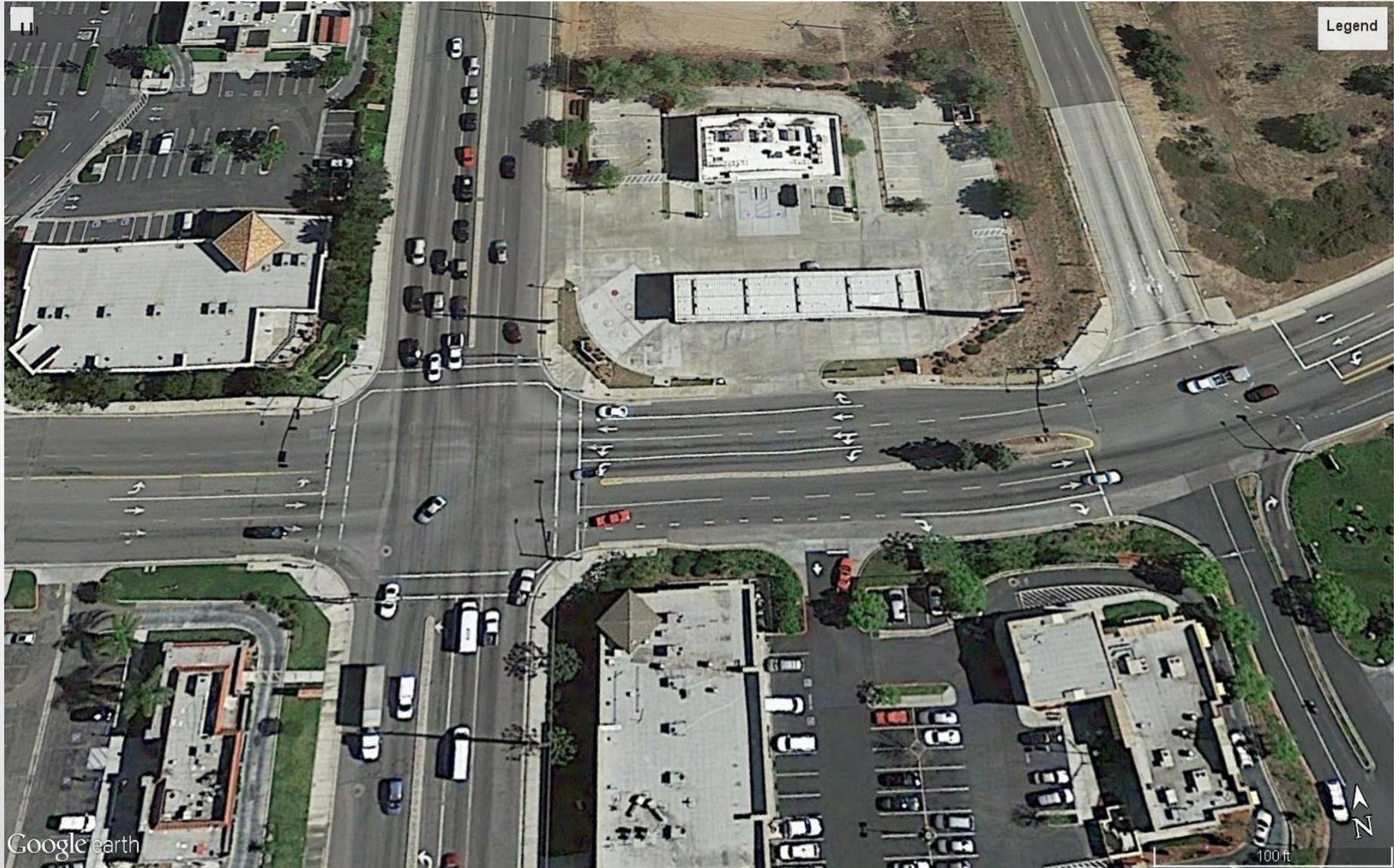
# 2<sup>nd</sup> St - Sidewalk Improvement



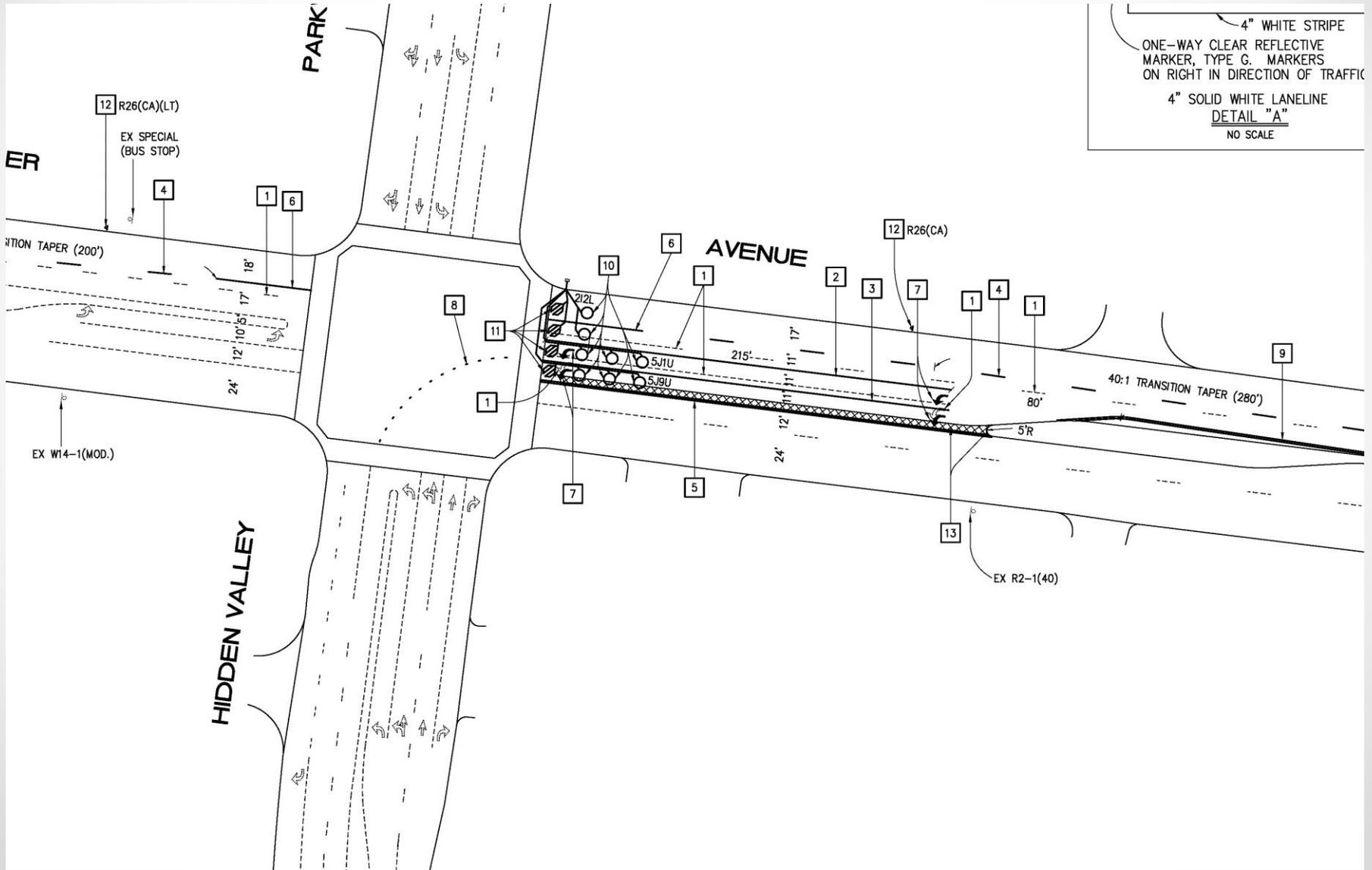
# Comments

- **Caltrans controls the off-ramp at I-15**
- **\$250,000 has been dedicated by Caltrans for the sidewalk improvements**
- **Total projects cost estimated at \$520,000**
- **Improvements would likely coincide with the additional lane work on 2<sup>nd</sup> St due to dual left turn from Hamner**
- **Sidewalk would be pedestrian only due to Caltrans rules for funding**

# Hamner Ave – Dual left onto HV



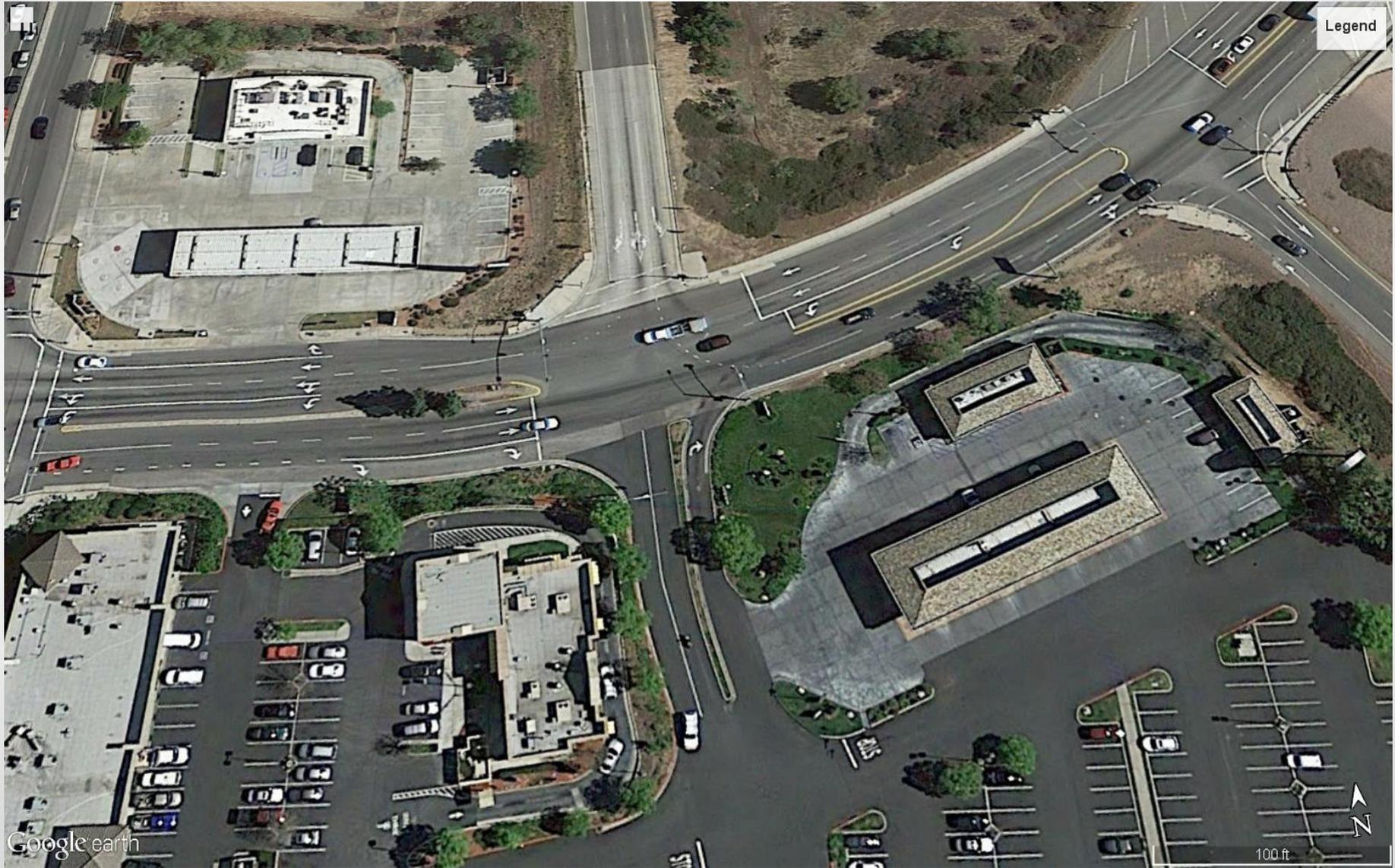
# Hammer Ave – Dual left onto HV



# Comments

- **Traffic signing and striping plan completed by Albert Grover**
- **Dual left turn lanes are possible without any additional road adjustments on Hidden Valley**
- **Cost estimated at \$55,000**
- **If directed by City Council this project will be included in FY 2016-17 Measure A CIP**

# HV - Left into Hobby Lobby



# Comments

- **Traffic signing and striping plan completed by Albert Grover**
- **This intersection controlled by Caltrans**
- **Caltrans agrees the unprotected left turn lane into parking lot has a blind spot from oncoming traffic due to median trees**
- **Caltrans has tentatively agreed to provide a protected left turn lane into parking lot**
- **Potentially no cost to the City**

# North & Crestview Traffic Calming

## *GOAL*

**Develop measures that will reduce cut-through traffic and speed of vehicles using North Dr. and Crestview Dr.**



NORTH DRIVE

8 TH STREET

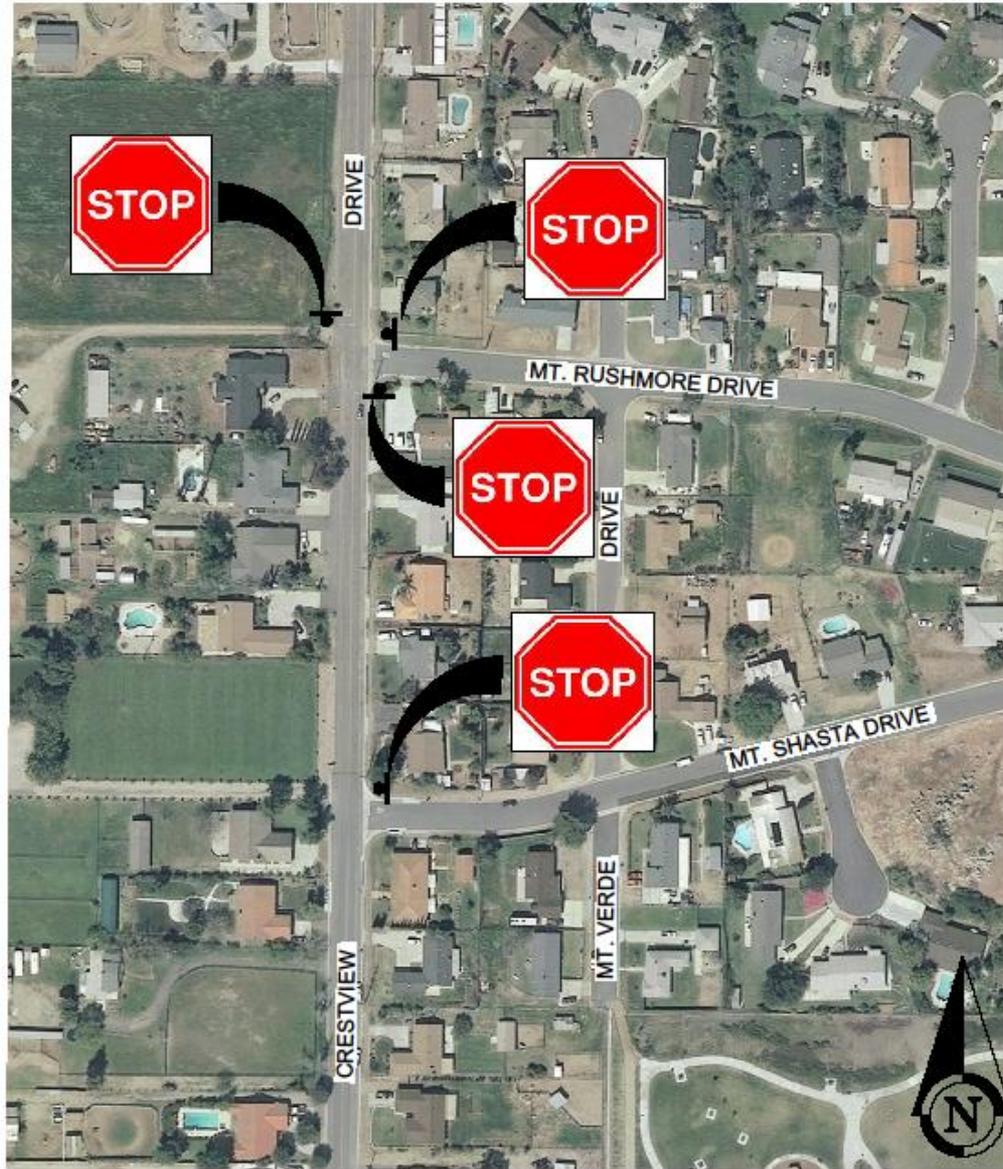
CALIFORNIA AVENUE

7 TH STREET

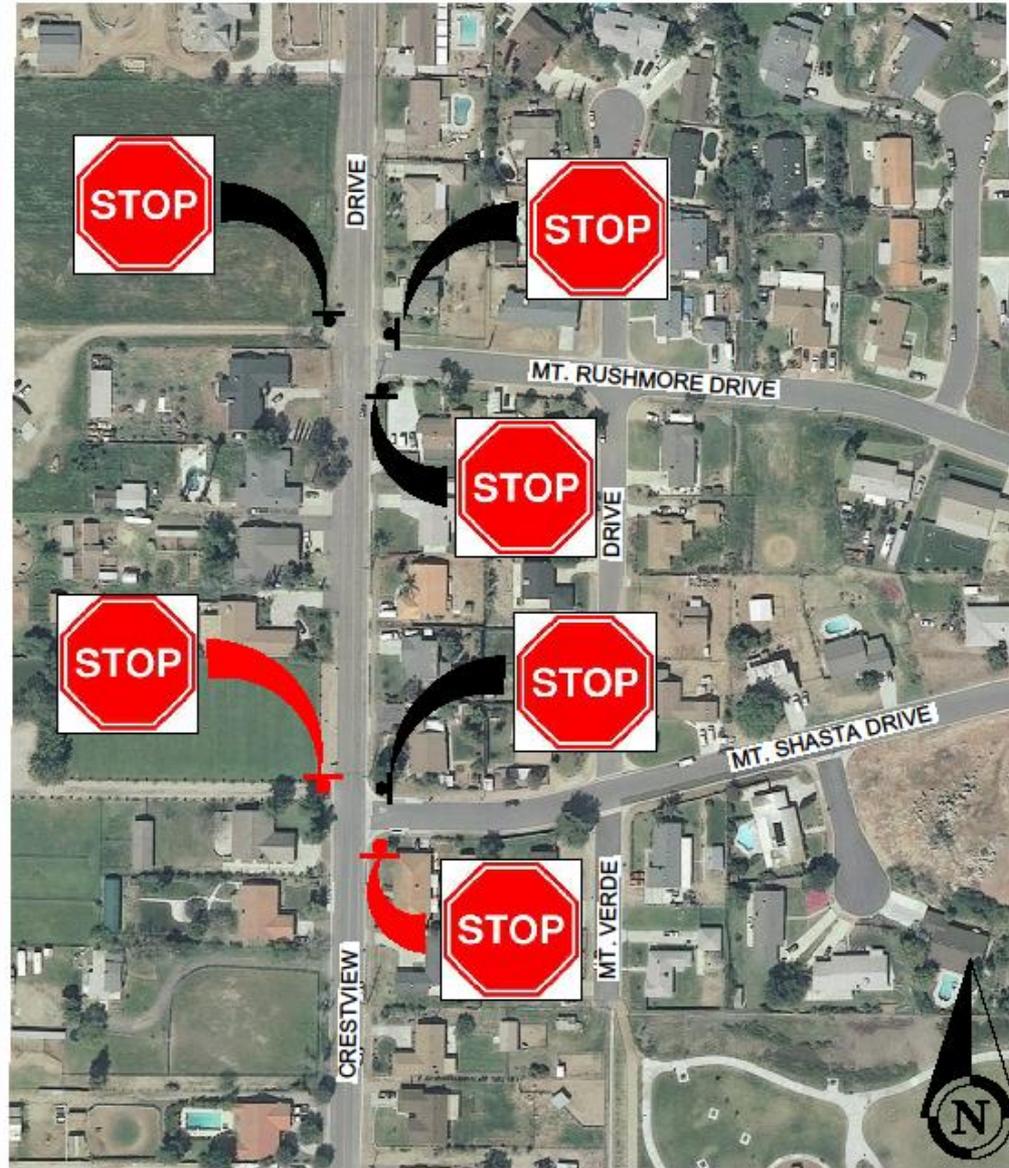
CRESTVIEW DRIVE

6 TH STREET

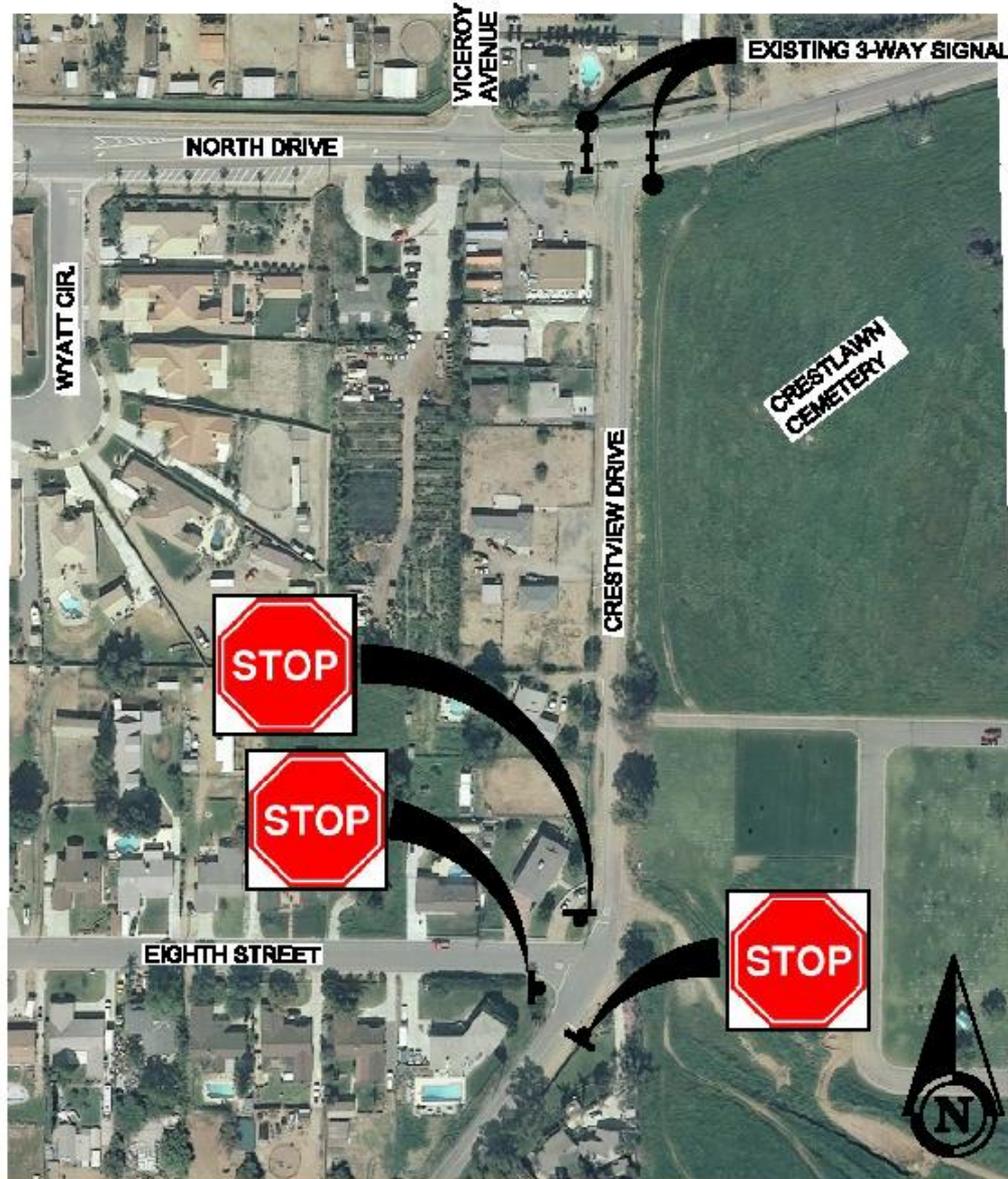
***ALL-WAY STOP CONTROL IMPROVEMENTS  
(EXISTING CONDITIONS)***



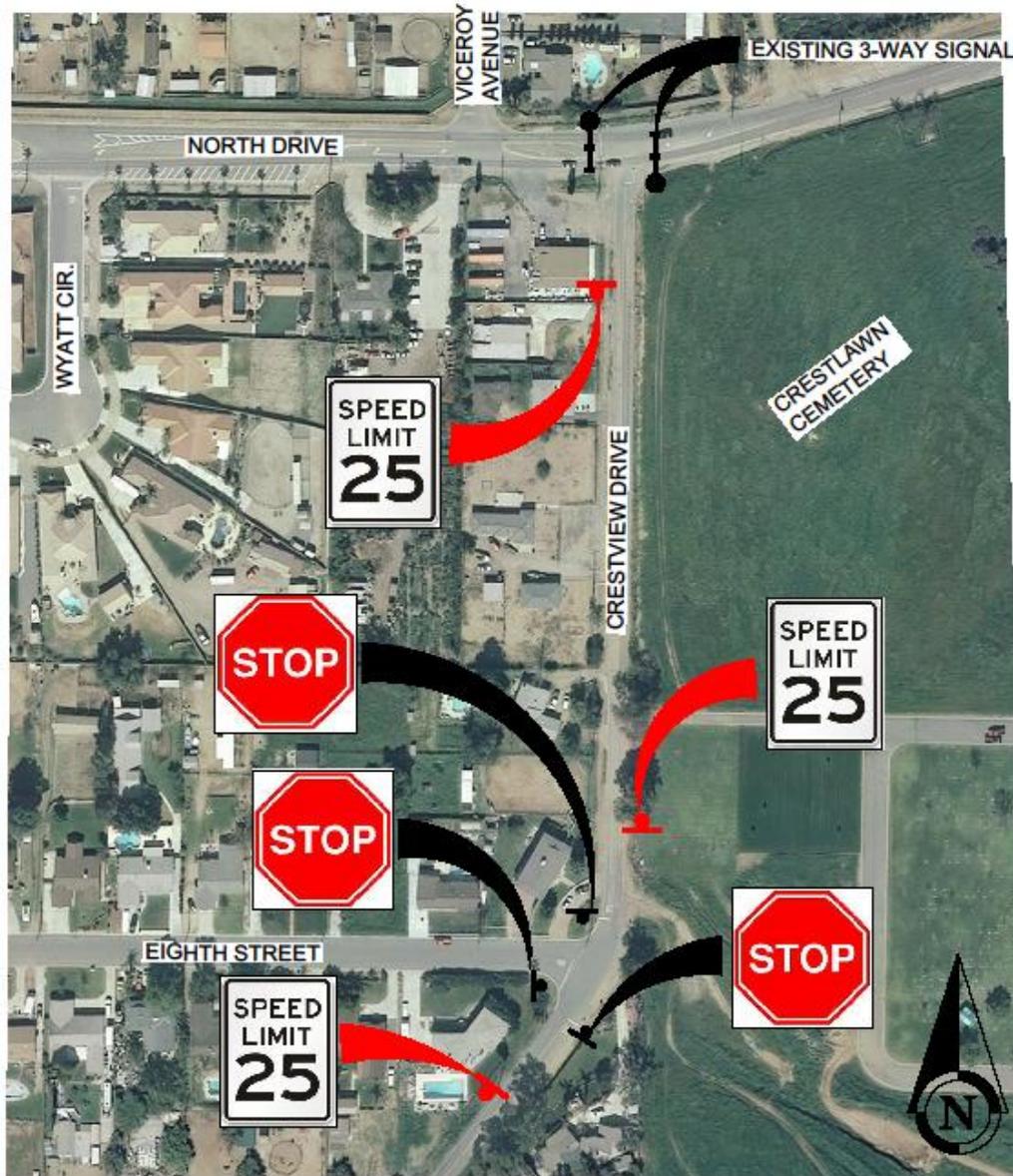
***ALL-WAY STOP CONTROL IMPROVEMENTS  
(PROPOSED CONDITIONS)***



# ***SIGNAGE IMPROVEMENTS (EXISTING CONDITIONS)***



**SIGNAGE IMPROVEMENTS  
25 MPH SPEED LIMIT SIGNS (CRESTVIEW)  
(PROPOSED CONDITIONS)**



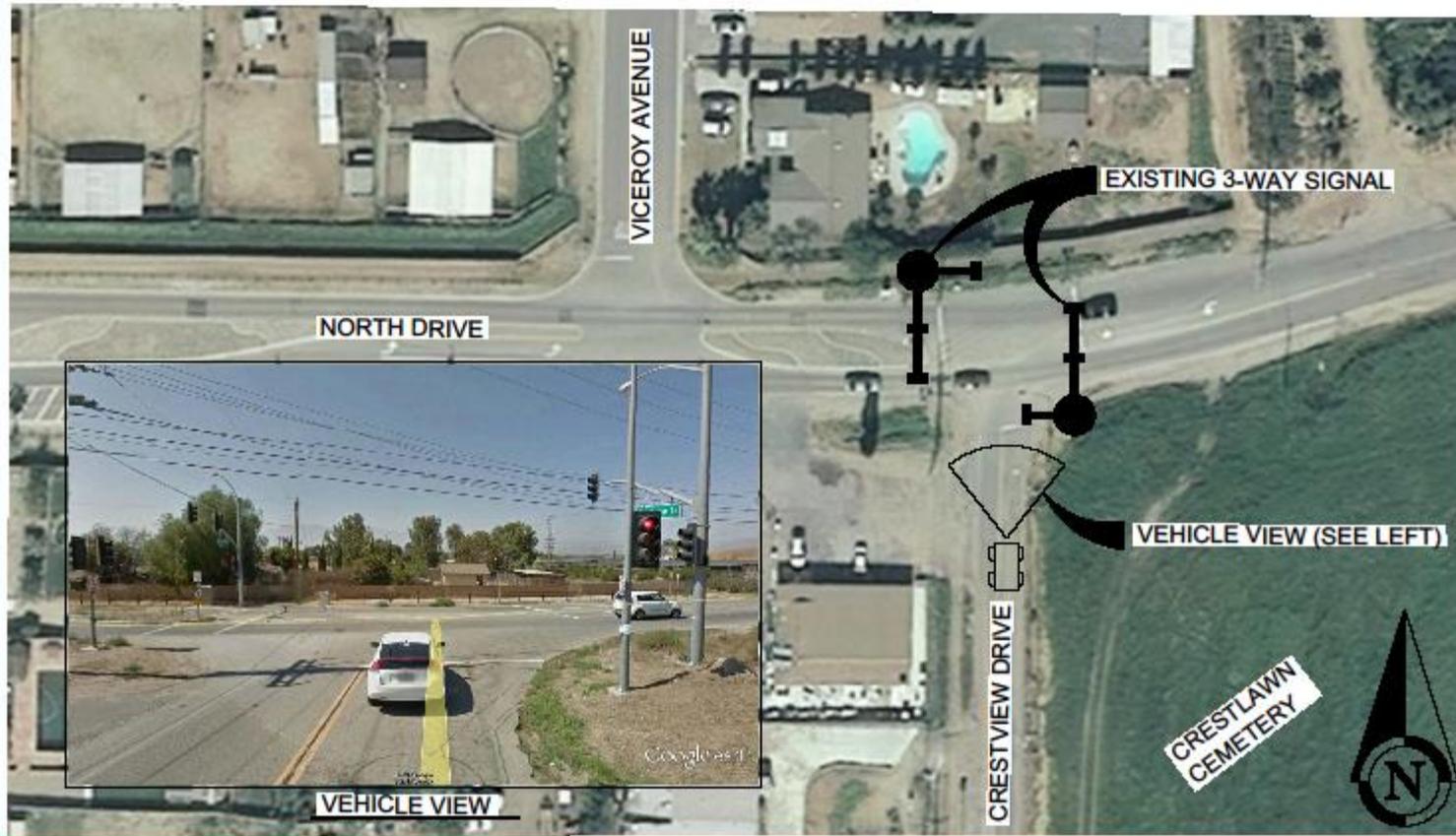
# ***SIGNAGE IMPROVEMENTS (EXISTING CONDITIONS)***



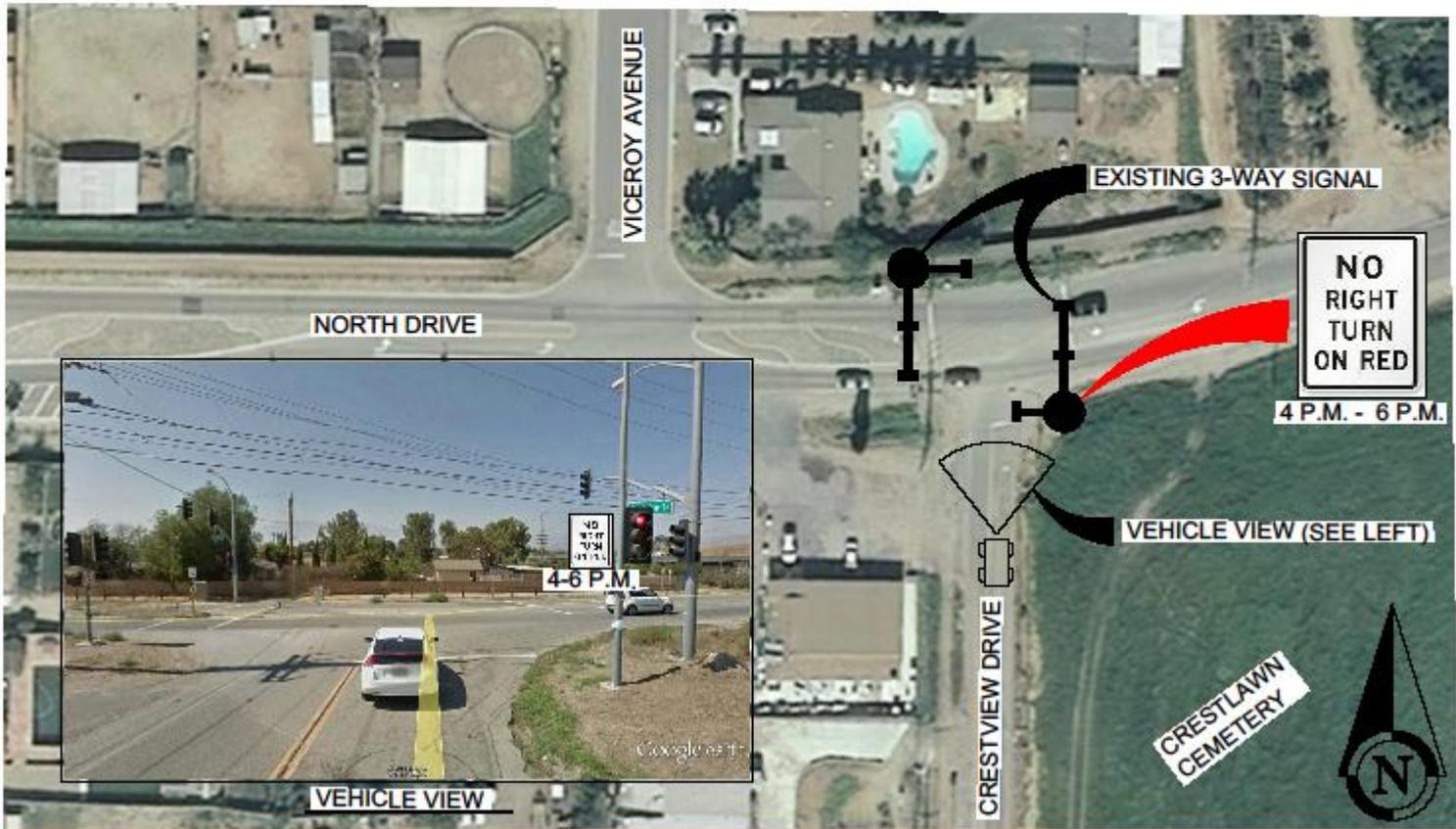
***SIGNAGE IMPROVEMENTS  
40 MPH SPEED LIMIT SIGNS (NORTH DR.)  
(PROPOSED CONDITIONS)***



***SIGNAGE IMPROVEMENTS  
(CRESTVIEW AVE. & NORTH DR. INTERSECTION)  
(EXISTING CONDITIONS)***



**SIGNAGE IMPROVEMENTS**  
**"NO TURN ON RED 4 P.M. - 6 P.M."**  
**(CRESTVIEW AVE. & NORTH DR. INTERSECTION)**  
**(PROPOSED CONDITIONS)**



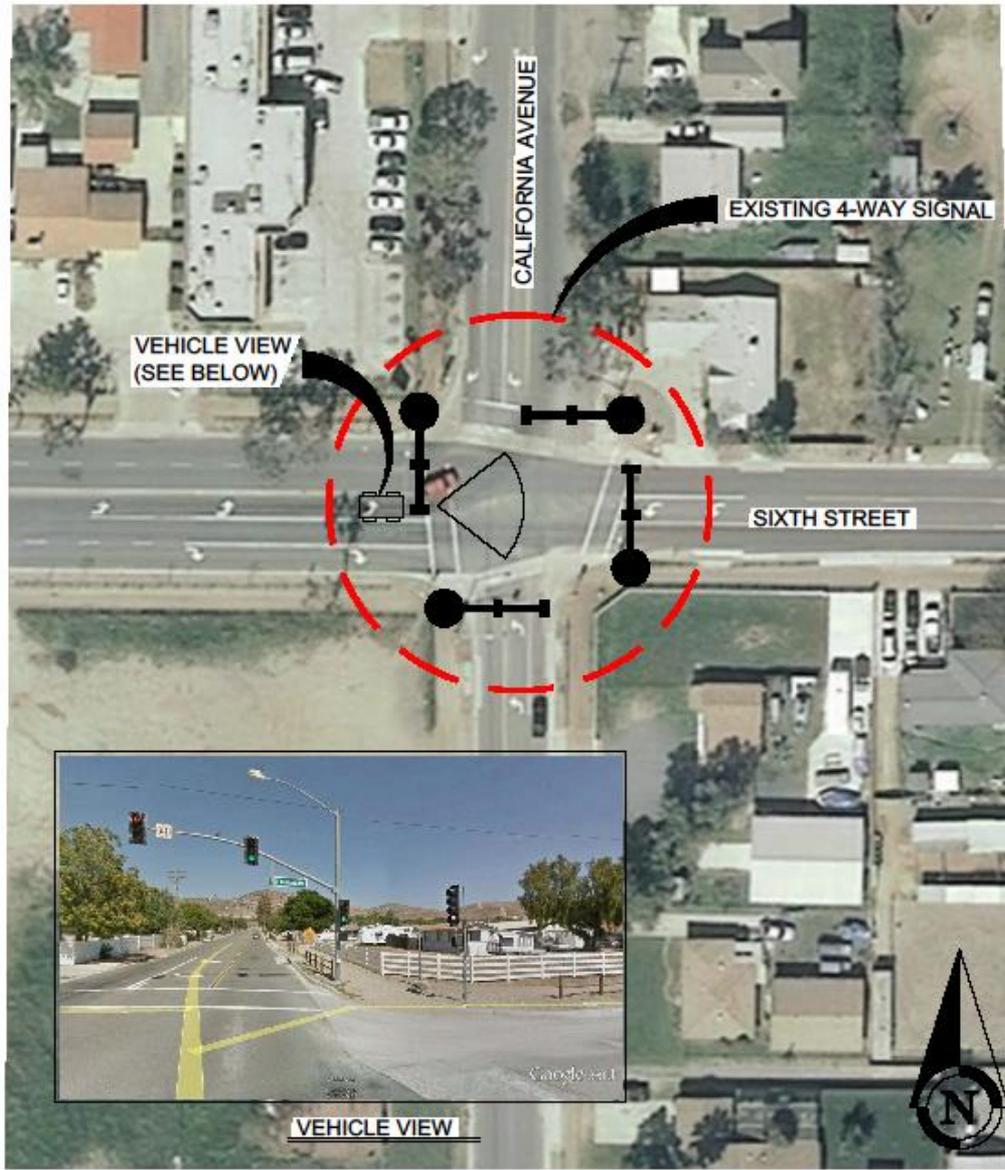
# ***SIGNAGE IMPROVEMENTS (EXISTING CONDITIONS)***



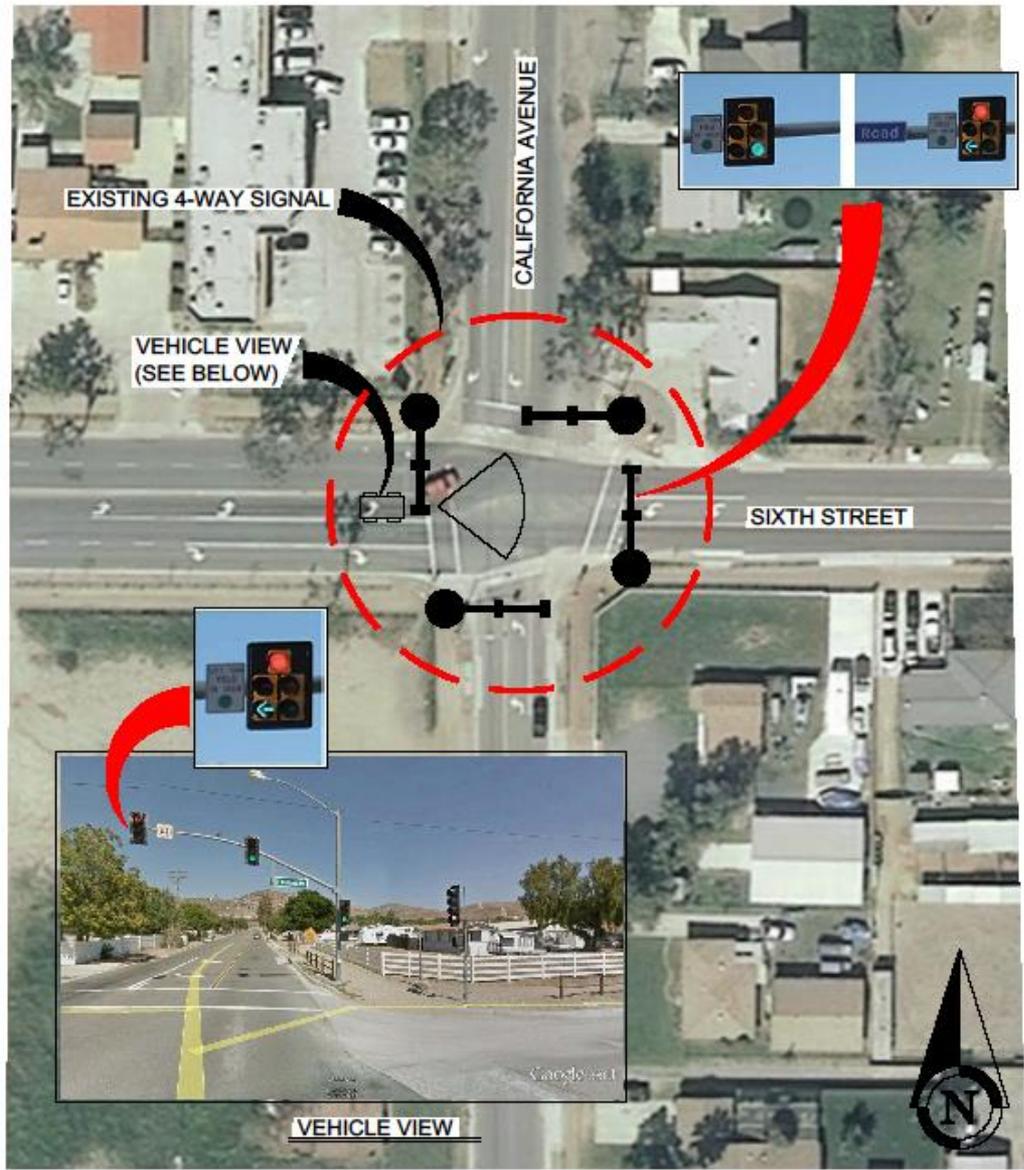
***SIGNAGE IMPROVEMENTS  
DYNAMIC SPEED FEEDBACK SIGN (NORTH DR.)  
(PROPOSED CONDITIONS)***



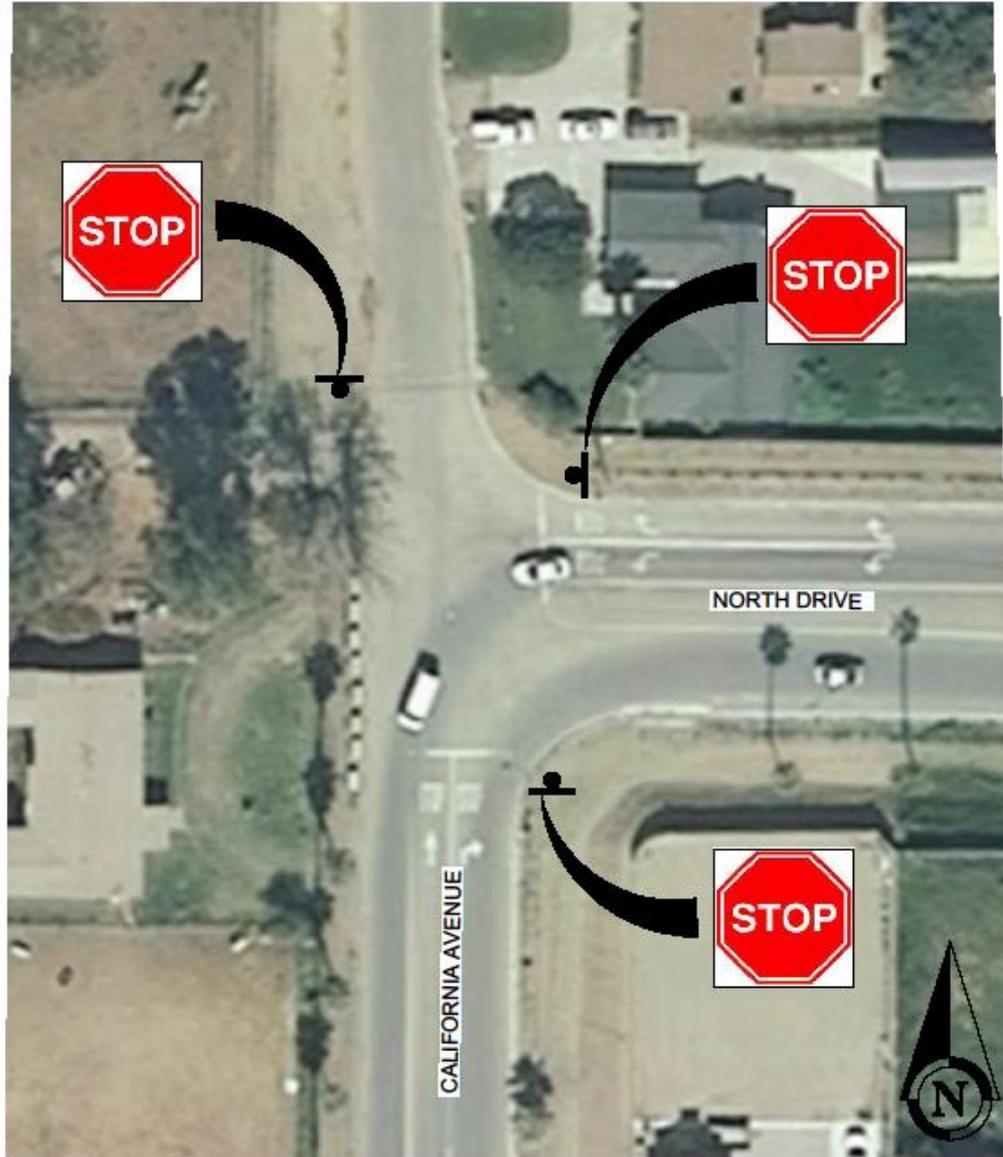
# TRAFFIC SIGNAL IMPROVEMENTS (EXISTING CONDITIONS)



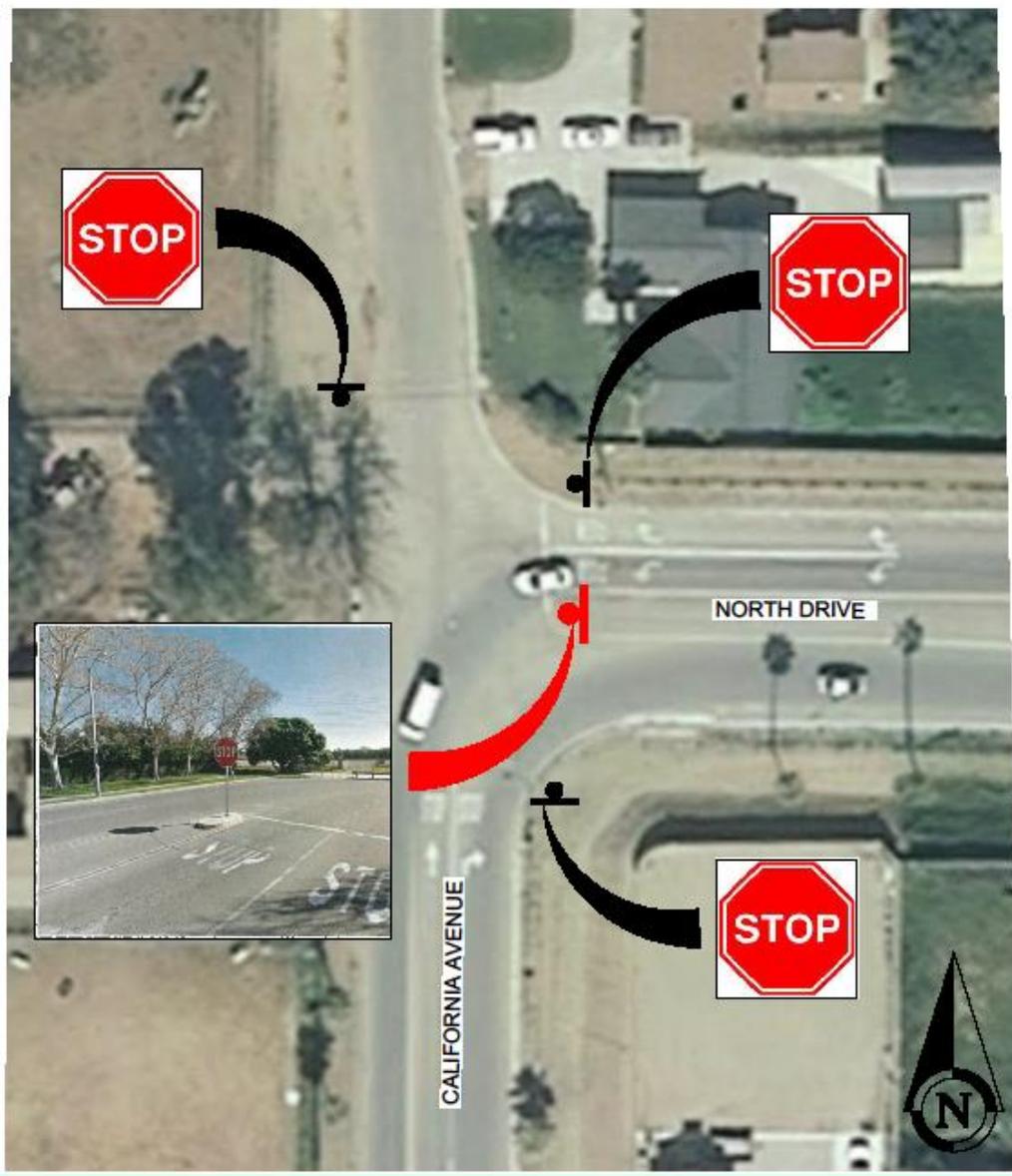
**TRAFFIC SIGNAL IMPROVEMENTS  
(PROTECTED-PERMISSIVE LEFT TURN)  
(PROPOSED CONDITIONS)**



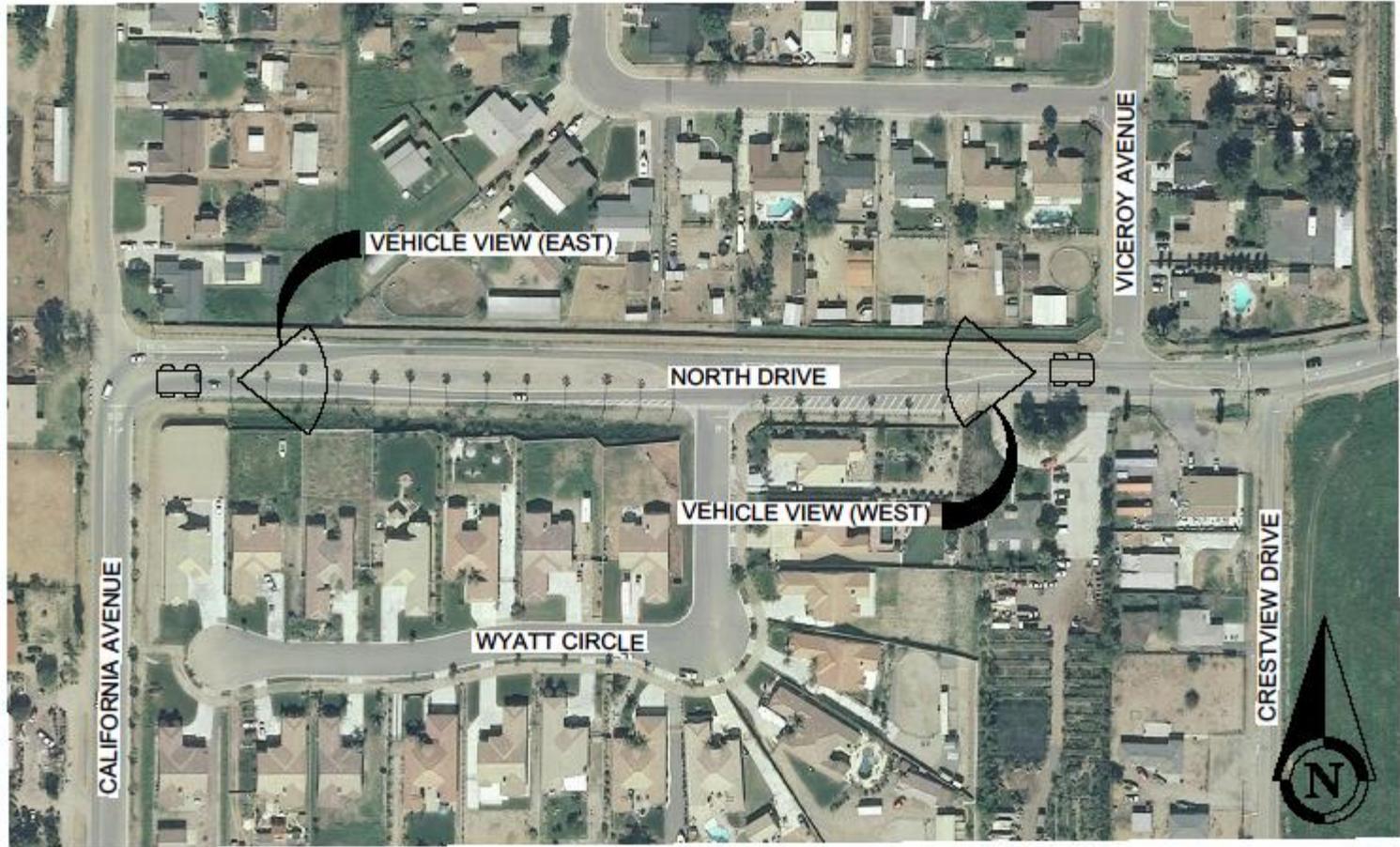
***MEDIAN IMPROVEMENTS  
(EXISTING CONDITIONS)***



***MEDIAN IMPROVEMENTS  
(CENTER ISLAND MEDIAN & STOP SIGN)  
(PROPOSED CONDITIONS)***



# ***MEDIAN IMPROVEMENTS (CENTER ISLAND MEDIAN)***



***MEDIAN IMPROVEMENTS  
(CENTER ISLAND MEDIAN)  
(EAST VIEW)***



***MEDIAN IMPROVEMENTS  
(CENTER ISLAND MEDIAN)  
(WEST VIEW)***



# **Other Traffic Measures**

- **Focused Traffic Enforcement**
- **Roadway Marking Improvements**
- **Rest-in-Red Operation at North Drive and Crestview Drive Traffic Signal**

**Questions?**

# Bluff Reservoir Review and Discussion



**Council Study Session  
March 23, 2016**

# Project Description

- **Construct two (2) 1.2 million gallon reservoirs (space for third reservoir)**
- **Add boosters and chemical feed equipment**
- **Upgrade critical components and processes for the existing treatment plant**
- **Add backup power for operation of boosters and current treatment plant**
- **Construct retention basin for collection of onsite run-off**

# Project Benefits

- **Provides additional reservoir capacity to allow better management of the water system**
- **Upgrade of critical treatment components will improve overall efficiency of the existing treatment plant**
- **Improve blending of sources and overall water quality**
- **Enables the reduction of current high temperature of the groundwater**

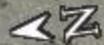


# Current Site Conditions



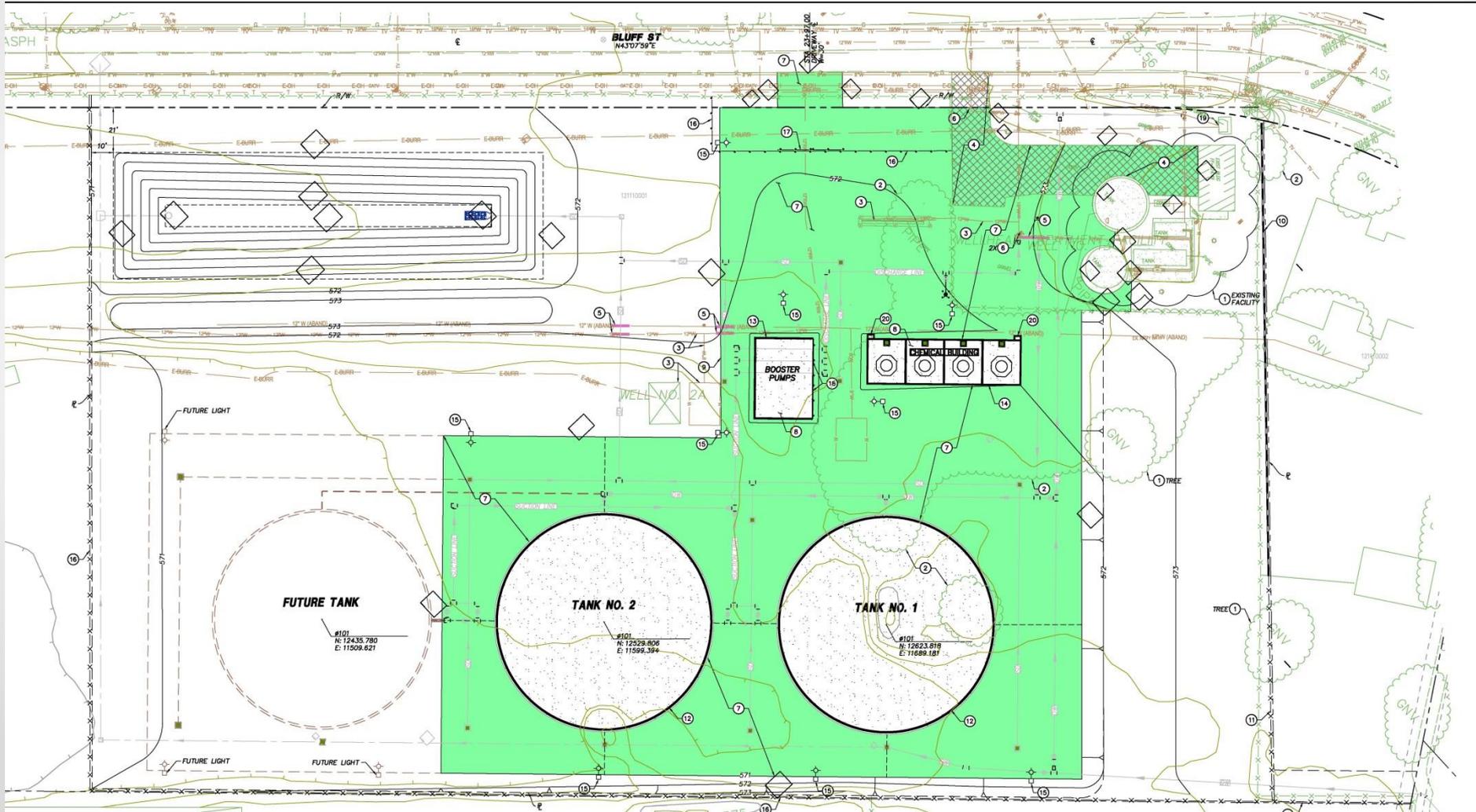
Google earth

© 2016 NECI  
© 2016 Google



7.77 ft

# Proposed Plan



# Bolted Tank Option



# Welded Tank Option



# Are There Options To Hide The Reservoirs

## Underground

- **Out of public view but at 3 - 4 times the cost**
- **Concrete acts as insulator and will not reduce the temperature of groundwater**
- **Initial reservoir would need to be built larger capacity because we can't expand later**

## Façade

- **Additional expense, limited vendors, vandalism**

**Questions?**