



Final

Street Master Plan

May 2007



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1. INTRODUCTION

On December 12, 2005, the City of Hughson General Plan was adopted by the City Council. The General Plan is a comprehensive, long-term plan for development within the City of Hughson. The General Plan identifies the location, type, and intensity of future land uses within the City and its sphere of influence. The transportation system is addressed specifically in the Transportation and Circulation Element (Chapter 3) of the General Plan. One key component of the Transportation Element is the identification of major roadway improvements that should be constructed in the course of development between now and the year 2030 to accommodate projected travel demand on City-owned and maintained roadways. Another key component is identifying policies and actions for guiding the location and nature of future infrastructure.

Action C-1.2 in the General Plan directs the City to develop and adopt a Street Master Plan (SMP) for arterial, collector, and local streets. This is the first step in implementing the roadway improvement recommendations of the Transportation Element. The City and its consultant have prepared the SMP to fulfill the following objectives:

- Identify roadway operational deficiencies under existing (2004) and 2030 conditions;
- Propose roadway improvements necessary to provide adequate traffic operations consistent with the goals and policies outlined in the Transportation and Circulation Element;
- Document programmed and planned roadway improvements already identified by the City or County;
- Provide conceptual cost estimates for roadway improvements; and
- Identify possible funding sources to pay for roadway improvements.

This report addresses each objective listed above and contains the technical information used in developing the proposed roadway improvements. Readers should note that this report focuses solely on roadways because the *City of Hughson General Plan* addresses other components of the transportation system such as travel via public transit, bicycle, and walking in the Transportation Element. The SMP study is limited to the area within the City limits and its sphere of influence.

The remainder of this report contains the following eight sections:

- Chapter 2 - Existing and Future Year Conditions
- Chapter 3 - Roadway and Intersection Improvements
- Chapter 4 - Conceptual Cost Estimates and Financing Alternatives
- Chapter 5 - Access Guidelines
- Chapter 6 - Street Design Guidelines
- Chapter 7 - Street Master Plan Implementation

2. EXISTING AND FUTURE YEAR CONDITIONS

Existing and future capacity deficiencies are presented in this chapter. In addition, existing traffic safety deficiencies are presented.

CAPACITY DEFICIENCIES

Analysis Methodology

The General Plan evaluates roadway segments and intersections using the level of service (LOS) concept. Level of service (LOS) is a description of the quality of a roadway's or intersection's operation, ranging from LOS A (free-flow traffic conditions with little or no delay) to LOS F (over-saturated conditions where traffic flows exceed design capacity). Policy C-1.2 presented in the General Plan indicates that the City should strive to maintain LOS D or better on major streets and intersections.

Roadway Segments

The roadways in the City of Hughson are currently categorized into one of three functional classifications - arterials, collectors, and local streets. As part of this street master plan, a fourth roadway classification (expressway) will be added to roadway system. Some of the current arterials will be reclassified as expressways. Table 1 summarizes the current roadway classifications in the City of Hughson.

TABLE 1 ROADWAY CLASSIFICATIONS		
Functional Class	Roadways	Function
Arterial	Santa Fe Avenue Geer Road Hatch Road Whitmore Avenue Service Road	Primarily intended to serve major movements and long trips between different land uses or different parts of the City.
Collector	Mountain View Road Tully Road ¹ Charles Street 7 th Street Euclid Avenue Fox Road Locust Street Hughson Avenue Roeding Road	Primarily intended to connect local streets with arterial streets and serve moderate length trips.
Local Street	All other roadways not classified as arterials or collectors	Primarily intended to serve abutting properties and provide connections to collectors and arterials.
¹ Except between Hughson Avenue and Whitmore Avenue, where it is an arterial.		

Table 2 identifies the maximum service flow rate by level of service (LOS) for arterials and collectors. A maximum service flow rate is not presented for local streets because the quality of life along the local street would be impacted at a far lower rate than the actual physical carrying capacity of the roadway.

TABLE 2 ROADWAY LEVEL OF SERVICE THRESHOLDS BASED ON DAILY VOLUME					
Street Classification	Lanes	Control	Daily Volume Threshold		
			C	D	E
Collector	2	Undivided	7,700	11,600	12,900
Arterial	2	Undivided	9,200	13,700	15,450
Arterial	4	Divided	20,100	30,200	33,200

Source: City of Hughson General Plan, December 12, 2005.

Intersections

The General Plan focused on nine key intersections under Existing conditions and an additional six intersections under Future conditions. The intersections include the following:

- 1) Santa Fe Avenue/Hatch Road
- 2) Santa Fe Avenue/Tully Road
- 3) Santa Fe Avenue/Whitmore Avenue
- 4) Santa Fe Avenue/7th Street
- 5) Santa Fe Avenue/Geer Road
- 6) Hatch Road/7th Street
- 7) 7th Street/Whitmore Avenue
- 8) Geer Road/Hatch Road
- 9) Geer Road/Whitmore Avenue
- 10) Mountain View Road/Hatch Road
- 11) Santa Fe Avenue/Mountain View Road
- 12) Whitmore Avenue/Tully Road
- 13) Whitmore Avenue/Euclid Avenue
- 14) Santa Fe Avenue/Euclid Avenue
- 15) Santa Fe Avenue/Service Road

Table 3 summarizes the relationship between the average control delay per vehicle and LOS for signalized and unsignalized intersections.

TABLE 3 INTERSECTION LEVEL OF SERVICE THRESHOLDS			
Level of Service	Signalized Intersection Control Delay (sec/veh) ¹	Unsignalized Intersection Control Delay (sec/veh) ¹	General Description
A	0 - 10.0	0 - 10.0	Little to no congestion or delays.
B	10.1 - 20.0	10.1 - 15.0	Limited congestion. Short delays.
C	20.1 - 35.0	15.1 - 25.0	Some congestion with average delays.
D	35.1 - 55.0	25.1 - 35.0	Significant congestion and delays.
E	55.1 - 80.0	35.1 - 50.0	Severe congestion and delays.
F	> 80.0	> 50.0	Total breakdown with extreme delays.

Notes:
¹ Control delay includes initial deceleration delay, queue move-up time, stopped delay, and acceleration delay.

Source: *Highway Capacity Manual*, Chapter 16 (*Signalized Intersections*) and Chapter 17 (*Unsignalized Intersections*), Transportation Research Board, 2000.

Existing and Future Year Traffic Operations

Roadways

Table 4 presents the existing and future year roadway traffic operations. As shown in Table 3, all of the roadways currently operate at acceptable LOS D conditions or better. However, under future year conditions, several roadways are anticipated to degrade to unacceptable service levels. The following roadways are anticipated to degrade to LOS E or worse under future year conditions:

- Hatch Road west of Santa Fe Avenue
- Whitmore Avenue west of Tully Road
- Santa Fe Avenue from north of Hatch Road to south of Geer Road
- Tully Road from Santa Fe Avenue to Whitmore Avenue
- Geer Road from north of Hatch Road to Whitmore Avenue and south of Santa Fe Avenue

TABLE 4 2004 AND FUTURE YEAR ROADWAY TRAFFIC OPERATIONS								
Road	From	To	Classification	Year 2004		Future		
				Lanes	Daily Volume	LOS	Daily Volume	LOS
East-West Roads								
Hatch Road	West of Santa Fe Avenue		Arterial	2	10,525	D	16,900	F
	Santa Fe Avenue	Tully Road	Arterial	2	8,168	C	13,300	D
	Tully Road	7 th Street	Arterial	2	7,001	C	9,500	D
	7 th Street	Geer Road	Arterial	2	5,725	C	6,900	C
Alamos Drive	East of Santa Fe Avenue		Local		1,164	C	2,450	C
Fox Road	Tully Road	7 th Street	Collector	2	2,443	C	4,750	C
	7 th Street	Euclid Avenue	Collector	2	2,000	-	4,600	C
	Euclid Avenue	Geer Road	Collector	2	1,388	C	2,775	C
Locust Street	Tully Road	7 th Street	Local	2	630	C	1,750	C
Pine Street	Tully Road	7 th Street	Local	2	411	C	1,450	C
Hughson Avenue	Santa Fe Avenue	7 th Street	Local	2	2,150	C	2,850	C
Whitmore Avenue	West of Tully Road		Arterial	2	6,117	C	14,400	E
	Tully Road	Santa Fe Avenue	Arterial	2	4,235	C	10,850	D
	Santa Fe Avenue	7 th Street	Arterial	2	3,000	-	8,000	C
	7 th Street	Euclid Avenue	Arterial	2	2,742	C	8,520	C
	Euclid Avenue	Geer Road	Arterial	2	2,000	-	3,800	C
Service Road	West of Tully Road		Arterial	2	1,938	C	8,000	C
	Tully Road	Santa Fe Avenue	Arterial	2	2,000	C	8,900	C
	Santa Fe Avenue	Geer Road	Arterial	2	1,500	C	6,500	C
North-South Roads								
Santa Fe Avenue	North of Hatch Road		Arterial	2	9,225	D	17,385	F

**TABLE 4
2004 AND FUTURE YEAR ROADWAY TRAFFIC OPERATIONS**

Road	From	To	Classification	Year 2004		Future		
				Lanes	Daily Volume	LOS	Daily Volume	LOS
	Hatch Road	Alamos Drive	Arterial	2	7,764	C	18,325	F
	Alamos Drive	Tully Road	Arterial	2	7,500	C	19,500	F
	Tully Road	Whitmore Avenue	Arterial	2	8,000	C	19,400	F
	Whitmore Avenue	7 th Street	Arterial	2	6,693	C	19,550	F
	7 th Street	Service Road	Arterial	2	6,700	C	18,900	F
	Service Road	Geer Road	Arterial	2	6,704	C	20,800	F
	South of Geer Road		Arterial	2	6,700	C	18,100	F
	Hatch Road	Narcisco Way	Collector	2	2,251	C	5,375	C
	Narcisco Way	Fox Road	Collector	2	2,545	C	7,800	C-D
	Fox Road	Santa Fe Avenue	Collector	2	3,000	C	9,580	D
	Santa Fe Avenue	Whitmore Avenue	Collector	2	7,605	C	13,350	E
	Whitmore Avenue	Service Road	Collector	2	1,728	C	7,500	C
	Service Road		Collector	2	1,500	C	6,250	C
Charles Street	Whitmore Road	Fox Road	Local	2	1,326	C	2,700	C
5 th Street	Whitmore Road	Elm Street	Local	2	543	C	1,000	C
	Hatch Road	Chantilly Way	Collector	2	2,754	C	3,850	C
	Chantilly Way	Fox Road	Collector	2	2,095	C	5,875	C
	Fox Road	Whitmore Avenue	Collector	2	2,762	C	8,975	D
	Whitmore Avenue	Santa Fe Avenue	Collector	2	1,242	C	6,800	C
	Santa Fe Avenue	Service Road	Collector	2	6,825	C	8,250	D
	Hatch Road	Fox Road	Collector	2	77	C	1,750	C
	Fox Road	Whitmore Avenue	Collector	2	100	C	2,000	C
Euclid Avenue	Whitmore Avenue	Service Road	Collector	2	-	-	6,300	C

**TABLE 4
2004 AND FUTURE YEAR ROADWAY TRAFFIC OPERATIONS**

Road	From	To	Classification	Year 2004		Future		
				Lanes	Daily Volume	LOS	Daily Volume	LOS
Geer Road	North of Hatch Road		Arterial	2	11,805	-	19,600	F
	Hatch Road	Fox Road	Arterial	2	8,359	C	15,350	E
	Fox Road	Whitmore Avenue	Arterial	2	8,000	C	15,400	E
	Whitmore Avenue	Service Road	Arterial	2	6,949	C	13,000	D
	Service Road	Santa Fe Avenue	Arterial	2	7,000	C	13,175	D
	South of Santa Fe Avenue		Arterial	2	10,630	D	17,850	F

Source: Hughson 2005 General Plan EIR - Public Review Draft (June 30, 2005).

Intersections

Table 5 presents the existing intersection traffic operations, while Table 6 presents the future year intersection traffic operations. The General Plan evaluated nine critical existing intersections and expanded the analysis to 15 critical intersections in the future. As shown in Table 5, all of the intersections currently operate at LOS D or better. However, as indicated in Table 6, several intersections are anticipated to degrade to LOS E or worse conditions in the future. The following intersections would operate at LOS E or worse conditions in the future:

- Santa Fe Avenue/Hatch Road
- Santa Fe Avenue/Tully Road
- Santa Fe Avenue/Whitmore Avenue
- Santa Fe Avenue/7th Street
- Santa Fe Avenue/Geer Road
- 7th Street/Whitmore Avenue
- Geer Road/Hatch Road
- Geer Road/Whitmore Avenue
- Santa Fe Avenue/Mountain View Road
- Whitmore Avenue/Tully Road
- Santa Fe Avenue/Service Road

TABLE 5 EXISTING PEAK HOUR LEVELS OF SERVICE								
Intersection			Control	A.M. Peak Hour		P.M. Peak Hour		Signal Warranted?
				Avg Delay or v/c	LOS	Avg Delay or v/c	LOS	
1	Santa Fe Avenue	Hatch Road	All-Way Stop	59.3 sec	F	46.0 sec	E	Yes
2	Santa Fe Avenue	Tully Road	All-Way Stop	11.9 sec	B	11.0 sec	B	No
3	Santa Fe Avenue	Whitmore Ave	All-Way Stop	11.1 sec	B	13.1 sec	B	No
4	Santa Fe Avenue	7 th Street	NB / SB Stop	2.3 sec	A	2.2 sec	A	No
5	Santa Fe Avenue	Geer Road	All-Way Stop	15.5 sec	C	30.9 sec	D	No
6	Hatch Road	Tully Road	NB Stop	2.7 sec	A	2.5 sec	A	No
7	7 th Street	Whitmore Ave	All-Way stop	11.1 sec	B	9.3 sec	B	No
8	Geer Road	Hatch Road	Traffic Signal ¹	15.1 sec	B	15.3 sec	B	N/A
9	Geer Road	Whitmore Ave	All-Way Stop	12.3 sec	B	13.9 sec	B	No

1. Control and level of service reflects recent improvements at this intersection not included in the Hughson 2005 General Plan EIR.

Source: Hughson 2005 General Plan EIR - Public Review Draft (June 30, 2005) and Fehr & Peers.

**TABLE 6
FUTURE PEAK HOUR LEVELS OF SERVICE
WITHOUT IMPROVEMENTS**

	Intersection		Control	A.M. Peak Hour		P.M. Peak Hour		Signal Warranted?
				Avg Delay or v/c	LOS	Avg Delay or v/c	LOS	
1	Santa Fe Avenue	Hatch Road	All-Way Stop	>200 sec	F	>200 sec	F	Yes
2	Santa Fe Avenue	Tully Road	All-Way Stop	>200 sec	F	>200 sec	F	Yes
3	Santa Fe Avenue	Whitmore Ave	All-Way Stop	>200 sec	F	>200 sec	F	Yes
4	Santa Fe Avenue	7 th Street	NB / SB Stop	62.1 sec	F	>200 sec	F	Yes
5	Santa Fe Avenue	Geer Road	All-Way Stop	>200 sec	F	>200 sec	F	Yes
6	Hatch Road	Tully Road	NB Stop	5.3 sec	A	30.2 sec	D	Yes
7	7 th Street	Whitmore Ave	All-Way stop	139.6 sec	F	121.6 sec	F	Yes
8	Geer Road	Hatch Road	All-Way Stop	67.4 sec	F	112.2 sec	F	Yes
9	Geer Road	Whitmore Ave	All-Way Stop	90.9 sec	F	167.5 sec	F	Yes
10	Mountain View Rd	Hatch Road	NB Stop	2.1 sec	A	18.5 sec	C	Yes
11	Santa Fe Ave	Mountain View Rd	WB Stop	1.8 sec	A	37.0 sec	E	Yes
12	Whitmore Ave	Tully Rd	NB/SB Stop	>200 sec	F	>200 sec	F	Yes
13	Whitmore Ave	Euclid Ave	NB/SB Stop	14.4 sec	B	15.7 sec	C	No
14	Santa Fe Ave	Euclid Ave	WB Stop	12.6 sec	B	23.7 sec	C	Yes
15	Santa Fe Ave	Service Rd	EB/WB Stop	>200 sec	F	>200 sec	F	Yes

Source: Hughson 2005 General Plan EIR - Public Review Draft (June 30, 2005).

EXISTING TRAFFIC SAFETY DEFICIENCIES

The Institute of Transportation Studies (UC Berkeley) prepared a report for the City entitled *City of Hughson - A Traffic Safety Evaluation* in 2005. This report summarized accident data and presented several recommendations related to improvements that the City could make with respect to tracking and documenting accidents. Key findings from the study include:

- The frequency of collisions involving pedestrians is about half the statewide average (about 1 per year). No action is necessary from the City with respect to reducing pedestrian-related accidents.
- Only two bicycle accidents were reported in the five-year study period (2000-2004). No action is necessary from the City with respect to reducing bicycle-related accidents.

- When compared to 11 similar sized cities, the City of Hughson has the lowest ratio of fatality and injury collisions per 1,000 people.

Although the study did not find that the City had accident trends higher than the statewide average, it did identify one location that had a substantially higher number of accidents when compared to the intersection with the second most number of accidents. The report indicated that the intersection of Santa Fe Avenue/Tully Road had a total of 19 accidents between 2000 and 2004, while the intersection with the second most accidents had only 8. The primary causes of the accidents were identified as right-of-way violations and unsafe turns. The study did not identify any intersection modifications to reduce accidents at this location.

The Santa Fe Avenue/Tully Road intersection is a five-legged intersection with stop control on three of the five approaches (Santa Fe Avenue has no traffic control). The five-legged design increases the complexity of the intersection and the number of vehicle conflicts. Furthermore, the intersection has several sharp turns that increase the difficulty of maneuvering through the intersection.

Although the safety report did not provide any roadway modifications to help improve safety, it did provide some general recommendations to keep accident rates low as the City continues to grow. These include the following:

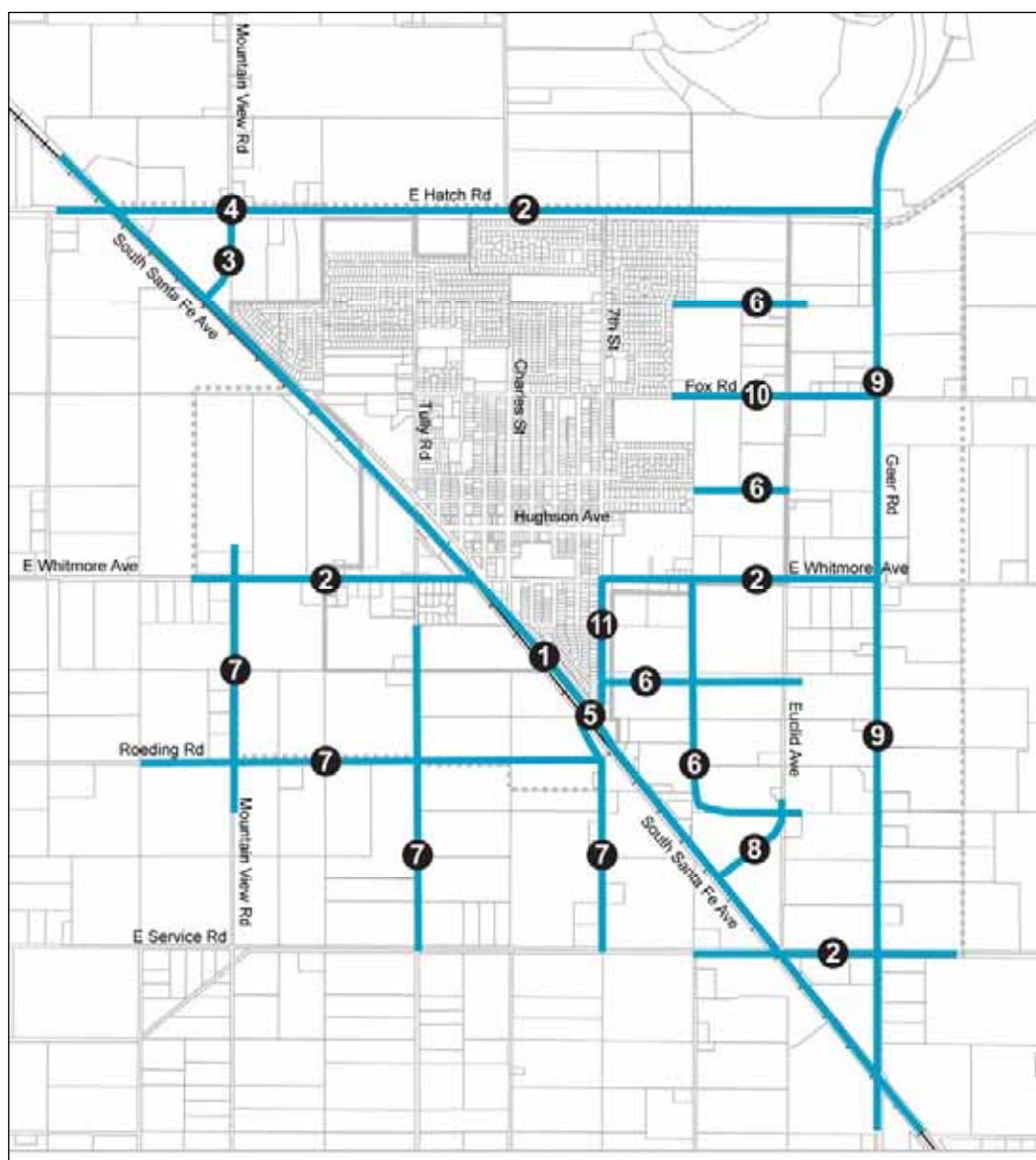
- Collision reporting and analysis system
- Traffic control device inventory
- Engineering and traffic survey
- Traffic impact study requirements/procedures

3. ROADWAY AND INTERSECTION IMPROVEMENTS

The City of Hughson General Plan identified several roadway and intersection improvements to maintain acceptable levels of service under General Plan buildout. Each of the improvements is summarized below.

ROADWAY IMPROVEMENTS (1 through 11)

The figure below presents the location of the roadway improvements.



① Santa Fe Avenue Widening

The feasibility of widening Santa Fe Avenue to four lanes where there is existing development has not yet been determined. Nevertheless, future development on Santa Fe Avenue should assume it will eventually be widened to four lanes. During the Santa Fe Avenue widening design, consideration should be given to eliminating on-street parking, reducing the inside lane widths to 11 feet, and eliminating the median between intersections to minimize the curb-to-curb distance at locations where there is existing development.

② Hatch Road, Service Road, and Whitmore Avenue Widening

Hatch Road, Service Road, and portions of Whitmore Avenue (west of Santa Fe Avenue and between 7th Street and Geer Road) should be widened to four lanes.

③ Mountain View Road Extension

Mountain View Road should be extended as a four lane arterial across the Hatch Road Canal and connect to Santa Fe Avenue.

④ Canal Crossing

A new four-lane canal crossing should be provided at Mountain View Road.

⑤ 7th Street Railroad Crossing Improvements

7th Street should be realigned on both sides of Santa Fe Avenue to create a continuous major collector across Santa Fe Avenue.

⑥ New Minor Collectors

The current ¼ mile grid system should be extended to the northeast of the railroad to provide additional east-west minor collectors from 7th Street to Euclid Avenue and a new north-south collector from Whitmore Avenue to Euclid Avenue.

⑦ New and Expanded Industrial Area Collectors

Tully Road should be improved south of Joe Ruddy Court to serve as a major collector. Roeding Road and Mountain View Road south of Santa Fe Avenue should be planned to serve as major collectors when the industrial area eventually builds out.

⑧ Euclid Avenue Realignment

Euclid Avenue at Santa Fe Avenue should be realigned at a minimum ¼ mile to the north to reduce the number of roadways intersecting the current five-way Santa Fe Avenue/Euclid Avenue/Service Road intersection.

9 Geer Road Widening

Geer Road should be widened to six lanes.

10 Fox Road Widening

Fox Road should be widened from about Fox Glen Drive to Geer Road from its current two-lane rural configuration to a constrained major collector.

11 7th Street Widening Between Whitmore Avenue and Santa Fe Avenue

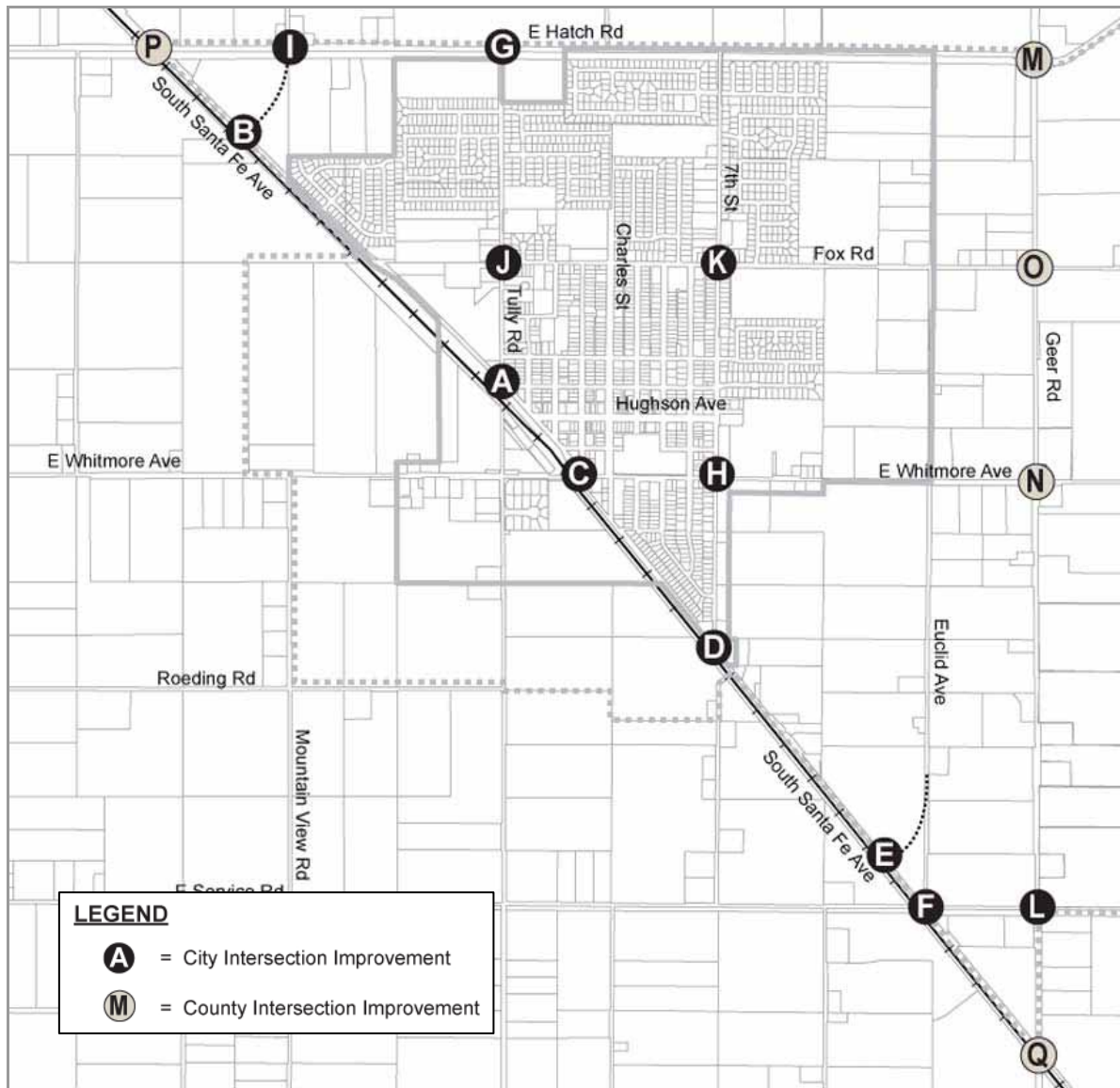
7th Street between Santa Fe Avenue and Whitmore Avenue should be widened from its current two-lane configuration to a major collector.

INTERSECTION IMPROVEMENTS (A through Q)

The figure on the next page presents the locations of City and County intersection improvements. While none of the City intersection improvements have been funded, all of the County intersection improvements have been funded and are in the process of being implemented. For the City intersection improvements, a conceptual schematic of the general intersection layout is presented as guidance for each intersection. At locations where turn-pocket vehicle storage lengths are provided, they should be interpreted as minimum requirements; upward adjustments, if necessary, should be made based on traffic studies performed for new developments.

The Street Master Plan is a planning level document intended to provide general information such as traffic control, number of lanes, and general configuration of the intersection. The final configuration and location of the intersection will be based on a formal design that incorporates critical information such as right-of-way. For example, Santa Fe Avenue is a constrained corridor with limited opportunities to widen because of the railroad right-of-way on the west side and existing structures on the east side. It is anticipated that the widening of Santa Fe Avenue will likely need to oscillate between the west side and the east side to avoid encroaching on the railroad right-of-way on the west side and existing structures on the east side.

Intersections that have been identified for improvements will eventually require signalization. Signalization of an intersection should only be implemented after a detailed traffic signal warrant evaluation has been performed. Chapter 4C of the 2003 *Manual on Uniform Traffic Control Devices* (MUTCD) or most recent update should be consulted to review the signal warrants. Intersections that do not meet the traffic signal warrants may be considered for multi-way stop control. Chapter 2B (Section 2B.07) of the MUTCD provides guidance on the application of multi-way stop control. In general, multi-way stop control should be provided where volumes on all approaches are generally equal. Furthermore, multi-way stop control should not be used for speed control.



City Intersection Improvements

A Santa Fe Avenue/Tully Road/Pine Street

To improve traffic operations and reduce the complexity of this intersection, Pine Street access to Santa Fe Avenue should be eliminated. The intersection would be reduced from a five-legged to a four-legged intersection. The figure below presents the recommended geometric layout for Santa Fe Avenue/Tully Road/Pine Street intersection.



The following lane configurations would need to be provided:

- *Santa Fe Avenue Northwest Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Santa Fe Avenue Southeast Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Tully Road Northbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Tully Road Southbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Pine Street Westbound Approach: cul-de-sac*

B Santa Fe Avenue/Mountain View Road

The Santa Fe Avenue/Mountain View Road intersection will be a new intersection intended to relieve traffic from the Santa Fe Avenue/Hatch Road intersection. The exact location of the intersection will depend on future development in the local area; however, it should be located at least ¼ mile from the Santa Fe Avenue/Hatch Road intersection. The figure below presents the recommended geometric layout for Santa Fe Avenue/Mountain View Road.



The following lane configurations would need to be provided:

- *Santa Fe Avenue Northwest Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Santa Fe Avenue Southeast Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Mountain View Southwest Approach: 1 left-turn lane and 1 shared through/right-turn lane*

C Santa Fe Avenue/Whitmore Avenue

Due to the proximity of Third Street to the Santa Fe Avenue/Whitmore Avenue intersection, it is recommended that Third Street near Santa Fe Avenue be restriped and signed for outbound right-turn only. This will allow for smoother traffic flow at the Santa Fe Avenue/Whitmore Avenue intersection. The figure below presents the recommended geometric layout for Santa Fe Avenue/Whitmore Avenue.



The following lane configurations would need to be provided:

- *Santa Fe Avenue Northwest Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Santa Fe Avenue Southeast Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Whitmore Avenue Westbound Approach: 1 shared through/left-turn lane and 1 shared through/right-turn lane*
- *Whitmore Avenue Eastbound Approach: 1 shared through/left-turn lane and 1 right-turn lane*

D Santa Fe Avenue/7th Street

7th Street on the north side and south side of Santa Fe Avenue should be realigned to form a single intersection. The roadways should be designed to intersect at an angle between 75° and 90°. The figure below presents the recommended geometric layout for Santa Fe Avenue/7th Street.



The following lane configurations would need to be provided:

- *Santa Fe Avenue Northwest Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Santa Fe Avenue Southeast Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *7th Street Northeast Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *7th Street Southwest Approach: 1 left-turn lane and 1 shared through/right-turn lane*

E Santa Fe Avenue/Euclid Avenue

The Santa Fe Avenue/Service Road/Euclid Avenue intersection is a five-legged intersection. The Euclid Avenue leg should be relocated to the north to reconfigure the existing five-legged intersection to a four-legged intersection and improve traffic operations. The relocation of Euclid Avenue will form a new intersection with Santa Fe Avenue. The exact location of the intersection will depend on future development in the local area; however, it should be located at least ¼ mile from the Santa Fe Avenue/Service Road intersection. The figure below presents the recommended geometric layout for Santa Fe Avenue/Euclid Avenue.



The following lane configurations would need to be provided:

- *Santa Fe Avenue Northwest Approach: 1 through lane and 1 shared through/right-turn lane*
- *Santa Fe Avenue Southeast Approach: 1 left-turn lane, 2 through lanes*
- *Euclid Avenue Southwest Approach: 1 left-turn lane and 1 right-turn lane*

F Santa Fe Avenue/Service Road

As discussed before, the Euclid Avenue leg should be relocated to the north to reconfigure the existing five-legged intersection to a four-legged intersection and improve traffic operations. The figure below presents the recommended geometric layout for Santa Fe Avenue/Service Road.



The following lane configurations would need to be provided:

- *Santa Fe Avenue Northwest Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Santa Fe Avenue Southeast Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Service Road Westbound Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Service Road Eastbound Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*

G Hatch Road/Tully Road

This intersection should be widened to provide additional capacity and conform to the future widening of Hatch Road from two lanes to four lanes. The figure below presents the recommended geometric layout for Hatch Road/Tully Road.



The following lane configurations would need to be provided:

- *Hatch Road Westbound Approach: 1 left-turn lane, 2 through lanes*
- *Hatch Road Eastbound Approach: 1 through lane and 1 shared through/right-turn lane*
- *Tully Road Northbound Approach: 1 left-turn lane and 1 right-turn lane*

H Whitmore Avenue/7th Street

The intersection should be widened and restriped to provide additional capacity and conform to the future widening of Whitmore Avenue from two lanes to four lanes east of 7th Street. Due to limited right-of-way, no widening is anticipated on the west and north legs of the intersection. However, additional capacity will be achieved on these legs by striping exclusive left-turn lanes. Additional widening is anticipated to occur primarily on the southeast quadrant. Widening on the north side of Whitmore Avenue east of 7th Street will only be necessary if on-street parking is desired. Otherwise, on-street parking would need to be eliminated on the north side near the intersection. The figure below presents the recommended geometric layout for Whitmore Avenue/7th Street.



The following lane configurations would need to be provided:

- *7th Street Northbound Approach: 1 left-turn lane, 1 through lane, and 1 right-turn lane*
- *7th Street Southbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Whitmore Avenue Westbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Whitmore Avenue Eastbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*

I Hatch Road/Mountain View Road

The intersection should be widened to provide additional capacity and conform to the future widening of Hatch Road from two lanes to four lanes. As part of the Mountain View Road extension from Hatch Road to Santa Fe Avenue, a new four-lane bridge across the canal will be necessary. The figure below presents the recommended geometric layout for Hatch Road/Mountain View Road.



The following lane configurations would need to be provided:

- *Mountain View Road Northbound Approach: 1 left-turn lane and 1 through/right-turn lane*
- *Mountain View Road Southbound Approach: 1 shared left/through/right-turn lane*
- *Hatch Road Westbound Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Hatch Road Eastbound Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*

J Fox Road/Tully Road

The intersection should be widened and restriped to provide additional capacity. The figure below presents the recommended geometric layout for Fox Road/Tully Road.



The following lane configurations would need to be provided:

- *Tully Road Northbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Tully Road Southbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Fox Road Westbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Fox Road Eastbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*

K Fox Road/7th Street

The intersection should be restriped to provide exclusive left-turn lanes on all approaches. The figure below presents the recommended geometric layout for Fox Road/7th Street.

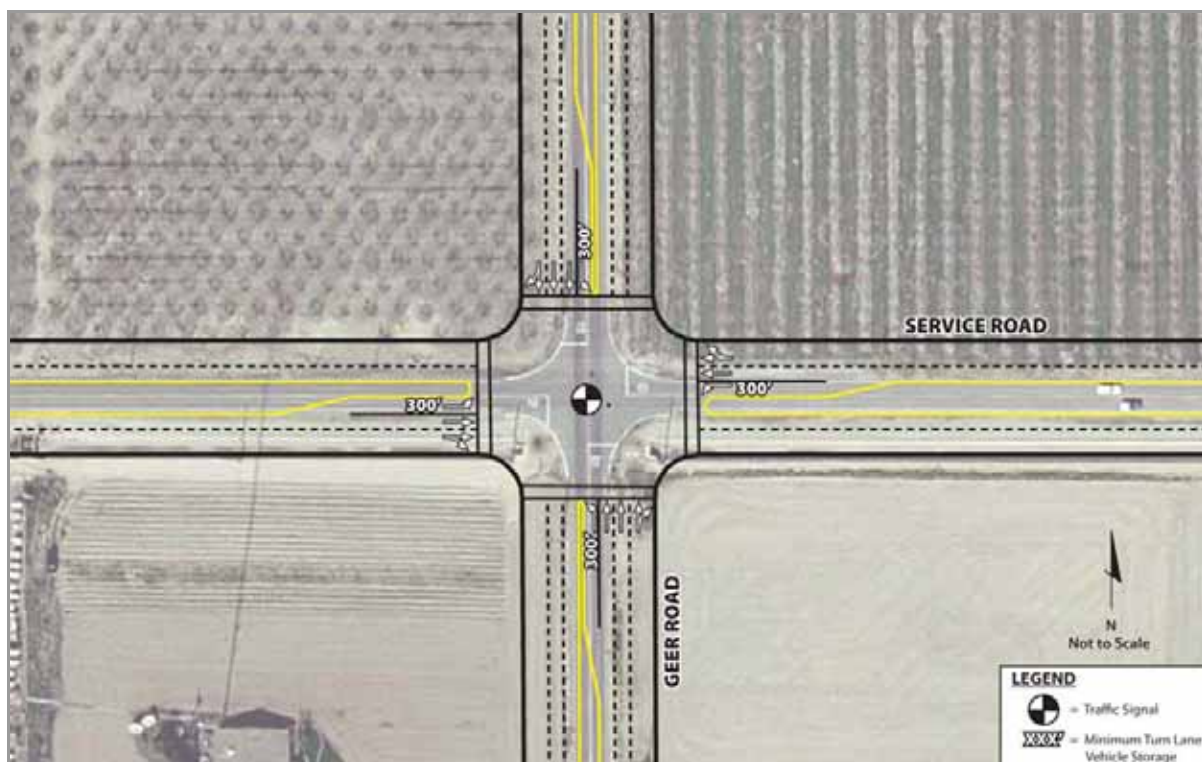


The following lane configurations would need to be provided:

- *7th Street Northbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *7th Street Southbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Fox Road Westbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*
- *Fox Road Eastbound Approach: 1 left-turn lane and 1 shared through/right-turn lane*

L Service Road/Geer Road

The intersection should be widened to provide additional capacity and conform to the future widening of Geer Road from two lanes to six lanes, and Service Road from two lanes to four lanes. The figure below presents the recommended geometric layout for Service Road/Geer Road.



The following lane configurations would need to be provided:

- *Geer Road Northbound Approach: 1 left-turn lane, 2 through lanes, and 1 shared through/right-turn lane*
- *Geer Road Southbound Approach: 1 left-turn lane, 2 through lanes, and 1 shared through/right-turn lane*
- *Service Road Westbound Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*
- *Service Road Eastbound Approach: 1 left-turn lane, 1 through lane, and 1 shared through/right-turn lane*

County Intersection Improvements

The following intersection improvements have been funded and are currently being implemented by the County.

M Geer Road/Hatch Road

This intersection was recently signalized and widened on all approaches to provide a through lane in each direction and a dedicated free right-turn movement from southbound Geer Road to westbound Hatch Road.

N Geer Road/Whitmore Avenue

This intersection is planned to be signalized and widened on all approaches to provide a through lane and a left-turn lane in each direction.

O Geer Road/Fox Road

This intersection is currently under construction and is being widened to provide a left-turn lane as well as a through lane on each leg of Geer Road.

P Santa Fe Avenue/Hatch Road

This intersection is planned to be signalized and widened on all approaches to provide a through lane in each direction, a left-turn lane in each direction, and a dedicated free right-turn movement on each leg of Santa Fe Avenue. The existing railroad signals are also being upgraded.

Q Santa Fe Avenue/Geer Road

This intersection is planned to be signalized and widened on all approaches to provide a through lane in each direction, a left-turn lane in each direction, and a dedicated free right-turn movement on each leg of Geer Road. The existing railroad signals are also being upgraded.

4. CONCEPTUAL COST ESTIMATES AND FINANCING ALTERNATIVES

Table 7 on the following page presents the conceptual construction cost estimates for roadway improvements. Estimates include intersection improvements along the roadway, design support, and construction management costs. Right-of-way (ROW) costs are not included in these estimates.

As shown in Table 7, the major cost items include the Hatch Road, Santa Fe Avenue, and Geer Road widening. When combined, these three roadway improvements represent about 46% of the total improvement costs. These roadways are anticipated to serve both local and county traffic.

Some of the financing alternatives available to the City include the following:

- Capital Facilities Fees (Road Development Fee) - Road Development Fees are one-time charges on new development to pay for required public facilities, and to mitigate impacts created by the development reasonably related to it. There are a number of approaches to charging developers for the provision of public facilities. In all cases, the fees must be clearly related to the costs incurred as a result of the development. AB 1600, which was passed to govern the imposition of development fees, requires that a nexus or rational connection be made between a fee and the type of development on which the fee is based. Furthermore, development fees cannot be used to correct existing problems or pay for improvements needed for existing development.
- Community Facilities Districts (CFDs) - These special districts can be established and operated by the City Council under the Mello-Roos Community Facilities District Act of 1982 (Government Code section 53311 et seq.).
- Transportation Development Act (TDA) - Local Transportation Fund (LTF) - These funds are available for transit, roadway, bicycle, maintenance, and pedestrian purposes. LTFs are derived from ¼-cent of the California state sales tax. These funds are returned to local jurisdictions by the state and are intended to be used first for unmet transit needs that are reasonable to meet. Approximately 2% of the LTF is set aside for pedestrian and bicycle projects. Any amounts not used for transit and bicycle/pedestrian improvements can be used for other transportation improvements, including street and road improvements.
- Congestion Mitigation and Air Quality Program (CMAQ) - This program funds projects or programs that will contribute to attainment of National Ambient Air Quality Standards with a focus on ozone and carbon monoxide. Approximately \$150 million is available statewide. Typical projects are public transit improvements; high occupancy vehicle lanes; traffic flow improvement programs; shared ride parking facilities; and bicycle and pedestrian facilities. Local road improvements that can demonstrate air quality benefits such as signal timing improvements or signal interconnection can qualify for CMAQ funding.

**TABLE 7
ROADWAY IMPROVEMENTS**

Roadway	From	To	Buildout	Total Current Cost ^{1,2}
Hatch Road	Santa Fe Avenue	Geer Road	Four-lane expressway	\$20,400,000
Whitmore Avenue	Mountain View Rd	Santa Fe Avenue	Four-lane Arterial	\$5,550,000
Whitmore Avenue	7th Street	Geer Road	Four-lane Arterial	\$9,450,000
Service Road	Santa Fe Avenue	Geer Road	Four-lane expressway	\$4,600,000
New E-W Roadway	Thomas Taylor Dr	Euclid Avenue	Two-lane Minor Collector	\$2,800,000
Fox Road	Fox Glen Drive	Geer Road	Two-lane Constrained Major	\$5,550,000
Locust Street Extension	Dominic Avenue	Euclid Avenue	Two-lane Minor Collector	\$2,500,000
5th Street Extension	7th Street	Euclid Avenue	Two-lane Minor Collector	\$4,500,000
Roeding Road	Mountain View Rd	Tully Road	Two-lane Major Collector	\$3,950,000
Roeding Road Extn	Tully Road	7th Street	Two-lane Major Collector	\$5,750,000
Santa Fe Avenue	Hatch Road	N. Current City Limit	Four-lane Expressway	\$10,400,000
Santa Fe Avenue	N. Current City Limit	S. Current City Limit	Four-lane Arterial	\$7,400,000
Santa Fe Avenue	S. Current City Limit	Geer Road	Four-lane Expressway	\$13,900,000
Geer Road	Hatch Road	Santa Fe Avenue	Six-lane Expressway	\$27,700,000
Mtn View Road Extn A	Hatch Road	Santa Fe Avenue	Four-lane Major Arterial	\$4,700,000
Mountain View Road	Whitmore Avenue	Roeding Road	Two-lane Major Collector	\$3,550,000
Mtn View Road Extn B	Santa Fe Avenue	Whitmore Avenue	Two-lane Major Collector	\$7,550,000
Tully Road	Santa Fe Avenue	Whitmore Avenue	Two-lane Arterial - no parking	\$1,300,000
Tully Road	Joe Ruddy Court	Service Road	Two-lane Major Collector	\$5,950,000
7th Street	Whitmore Avenue	Santa Fe Avenue	Two-lane Major Collector	\$3,600,000
7th Street	Santa Fe Avenue	Service Road	Two-lane Major Collector	\$2,700,000
New N-S Roadway A	Whitmore Avenue	Euclid Avenue	Two-lane Minor Collector	\$6,650,000
Euclid Avenue	Hatch Road	Santa Fe Avenue	Two-lane Major Collector	\$15,500,000
BRIDGE IMPROVEMENTS				
Roadway	From	To	Buildout	Total Current Cost ^{1,2}
Mountain View Road	Across Hatch Rd Canal		Four-lane Bridge	\$1,350,000
Tully Road	Across Hatch Rd Canal		Three-lane Bridge	\$1,000,000
			TOTAL ROADWAY COST	\$178,300,000

1. Bridge & intersection improvement costs, design support, construction management, and right-of-way costs are included in the roadway improvement costs above.

2. Future year costs can be estimated by applying a 5% per year escalation factor to current costs.

Source: Nolte, 2007.

5. ACCESS GUIDELINES

ACCESS MANAGEMENT

Access management controls the spacing of driveways, intersections, and other street connections along a roadway in order to preserve the functionality and safety of the roadway by reducing the number of conflict points. The functional classification of roadways specifies the travel speed, volume thresholds, intersection and driveway spacing, and land connectivity. Local roads and collectors make up approximately 60-80% of the overall street network, have the lowest speed limits, and provide for the most direct land access. Arterials and expressways emphasize mobility and traffic movement over land access, typically with higher speeds and larger traffic volumes.

Guidelines for intersection and driveway spacing can vary according to speed, intersection design, and standards set out by the City or State. Streets with a lower functional class, such as local streets and collectors, tend to have closely spaced intersections. These streets offer more access to driveways and local roads while limiting the amount of through traffic. Larger streets, including arterials and expressways have higher speed limits and adjacent intersections are spaced farther apart. These streets offer high mobility while limiting the amount of direct access to local roads. Intersections that are closely spaced on streets with high speed limits typically see increased accident rates as vehicular mobility is impaired.

To provide reasonable recommendations for intersection and driveway spacing standards for the City of Hughson, standards from Stanislaus County, the City of Modesto, and national guidelines published by the Institute of Transportation Engineers (ITE) and the Transportation Research Board (TRB) were reviewed. A summary of these standards are provided below, followed by the recommended City of Hughson intersection and driveway spacing standards.

LITERATURE REVIEW OF STANDARDS AND GUIDELINES

Table 8 presented on the next page presents a summary of the driveway and intersection spacing standards from the research. The main function of driveways, local streets, and collectors is to provide direct land access while discouraging through traffic. The main function of arterials and expressways is to emphasize mobility and the movement of traffic, while decreasing direct access to fronting properties.

**TABLE 8
GENERAL INTERSECTION SPACING GUIDELINES FROM VARIOUS SOURCES**

Intersection Spacing/ Roadway Type	City of Modesto ¹ (feet)	ITE ²	TRB ³	Stanislaus County ^{4,5}
Expressway to Expressway	n/a	n/a	1 mile	1 mile (1 mile) [1 mile]
Expressway to Arterial	n/a	n/a	n/a	1 mile (1 mile) [1 mile]
Expressway to Collector	n/a	n/a	n/a	1 mile (1/4 - 1/2 mile right-in/right out only) [1/4 - 1/2 mile]
Expressway to Local Street	n/a	n/a	n/a	1 mile (1/4 - 1/2 mile right-in/right out only) [1/4 - 1/2 mile]
Expressway to Driveway	350 (350) [350]	n/a	n/a	not permitted (not permitted [> 300 feet right-in/right out only])
Arterial to Arterial	300	≥ 1 Mile	1/2 mile	≥ 500 Feet
Arterial to Collector	n/a	≥1/2 Mile	n/a	≥ 500 Feet
Arterial to Local Street	n/a	500 to 600 Feet	n/a	≥ 500 Feet
Arterial to Driveway	n/a	n/a	n/a	350 Feet
Collector to Collector	200	n/a	1/4 mile	200 Feet
Collector to Local Street	n/a	n/a	n/a	200 Feet
Collector to Driveway	150 (150) [150]	n/a	n/a	150 Feet
Local Street to Local Street	100	n/a	300 feet	200 Feet
Local Street to Driveway	50 (150) [100]	n/a	as needed	150 Feet
Driveway to Driveway	30 (75) [75]	n/a	as needed	30 Feet

n/a = not available

¹ City of Modesto, Standard Specifications, 2006. Driveway spacing is presented in the following format: residential driveways (commercial driveways) [industrial driveways].

² Institute of Transportation Engineers (ITE), FHWA and US DOT, *Access Management*, April 2004.

³ Transportation Research Board (TRB) *Transportation Research Circular: Driveway and Street Intersection Spacing*, March 1996.

⁴ Stanislaus County, Standards and Specifications, July 1998 and Stanislaus County General Plan, 2006.

⁵ Expressway standards are based on expressway class and presented in the following format: Class A (Class B) [Class C].

CITY OF HUGHSON INTERSECTION SPACING STANDARDS

The City of Hughson intersection spacing guidelines are presented in Table 9. They are based in part on the information presented in Table 8 and on existing intersection spacing in the City of Hughson. Where situations limit the ability to conform to the City of Hughson intersection and driveway spacing standards, engineering judgment should be applied in determining the most appropriate spacing to preserve the road's ability to handle traffic efficiently and safely. The spacing recommendations should be interpreted to represent the minimum allowable spacing between the proposed roadway and roadways of equal or higher functional class. For example, a proposed commercial driveway should be spaced at a minimum of 330 feet from other commercial driveways or higher functional class roadways if the driveway will intersect a major collector/two-lane arterial. If it intersects a four-lane arterial, the spacing should be 330 feet if right-in/right-only access is desired or 660 feet if full access is desired.

TABLE 9 RECOMMENDED MINIMUM INTERSECTION SPACING ¹						
		Intersecting Roadway				
		Local Street / Minor Collector	Major Collector / Two-Lane Arterial	Four-Lane Arterial	Expressway Class C	Expressway Class B
Proposed Roadway	Single-Family Driveway	as needed	50 feet	Not Permitted	Not Permitted	Not Permitted
	Multi-Family ² / Commercial / Industrial Driveway	165 feet	330 feet	330 feet (right in/right out only) 660 feet (full access)	330 feet (right in/right out only) 660 feet (full access)	Not Permitted
	Local Street/ Minor Collector	330 feet	330 feet	660 feet	660 feet	¼ mile (right in/right out only)
	Major Collector / Two-Lane Arterial	660 feet	660 feet	660 feet	660 feet	¼ mile (right in/right out only) ½ mile (full access)
	Four-lane Arterial	¼ mile	½ mile	½ mile	½ mile	1 mile

¹ Measured from centerline to centerline of roadway. Traffic signals should be spaced a minimum of 660 feet when traffic signal warrants are satisfied.

² Multi-family is defined as a single or multiple buildings with a total of at least 10 units.

Source: Fehr & Peers, 2007.

Based on the information presented in Table 9, an interconnected grid spacing pattern is recommended with local/minor collector streets - 330 feet apart, major collector/two-lane arterials - 660 feet apart, four-lane arterials - 2,640 feet apart (½ -mile), and expressways - 1 mile apart.

The following policy in the City's General Plan relates to the connectivity of the roadway system.

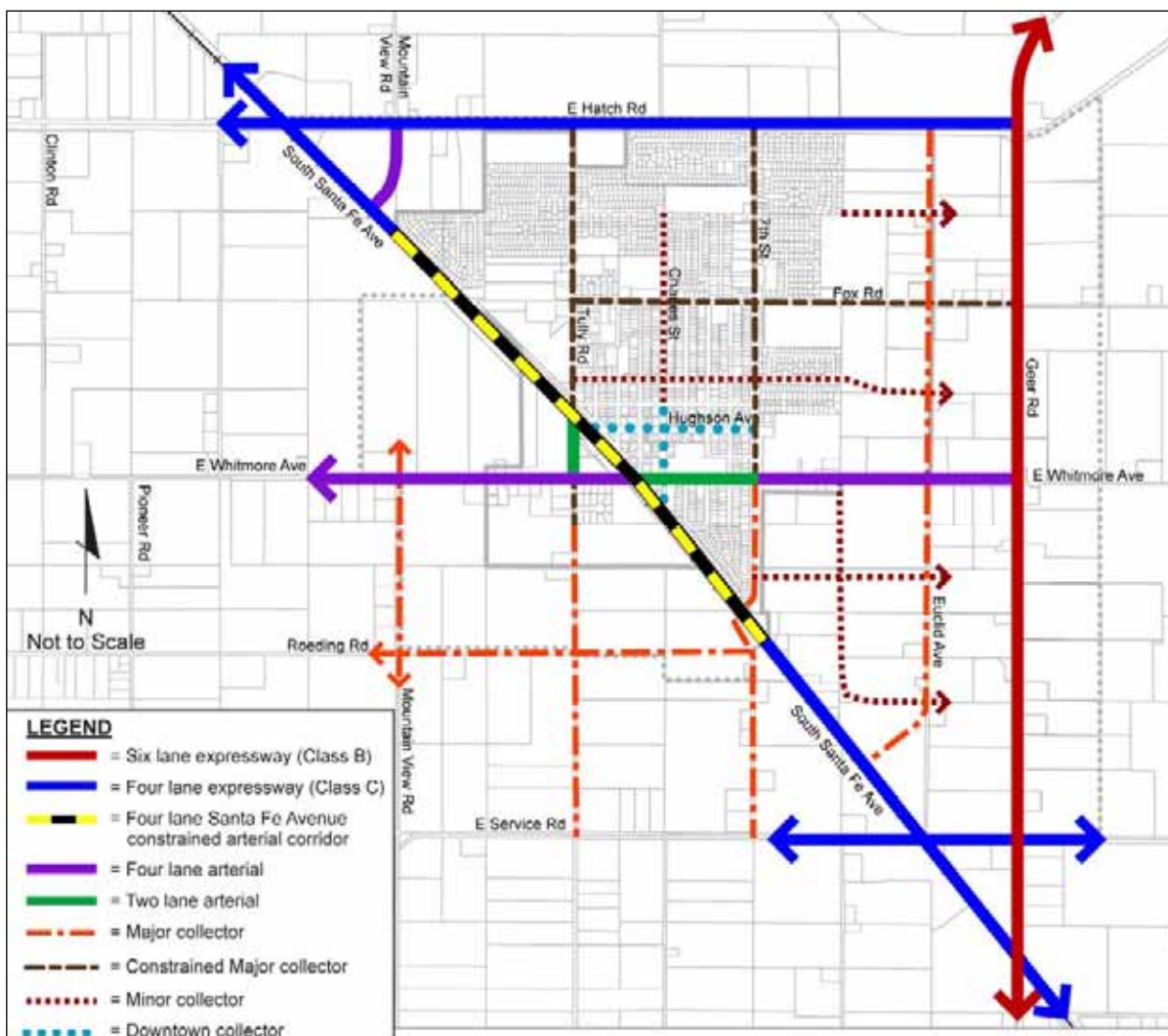
Policy C-1.5: New development should be designed with a grid or modified grid pattern with a variety of block size and street length to facilitate traffic flows and to provide multiple connections to arterial streets.

With this policy in mind, the following are minimum standards that should be applied to new development:

- Every collector should connect to at least two other roadways of the same or higher functional class
- At least 75% of local streets should extend ¼-mile or more, connecting with at least three streets of equal or higher functional class
- Cul-de-sac roadways should represent no more than 25% of the local street system

6. STREET DESIGN GUIDELINES

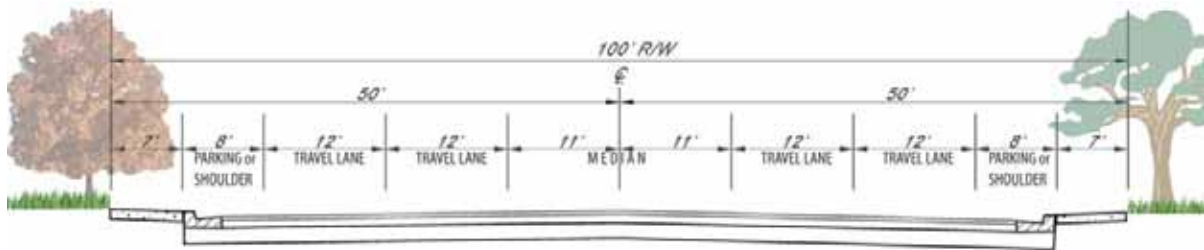
Each of the roadways in Hughson’s street system can be categorized according to a typology known as functional classification. Functional classification is a method used to classify a roadway based on its function. Based on the City’s General Plan and Memorandum of Understanding entered by the City with the County, the City’s ultimate roadway plan, with general functional classifications, is presented on the figure below.



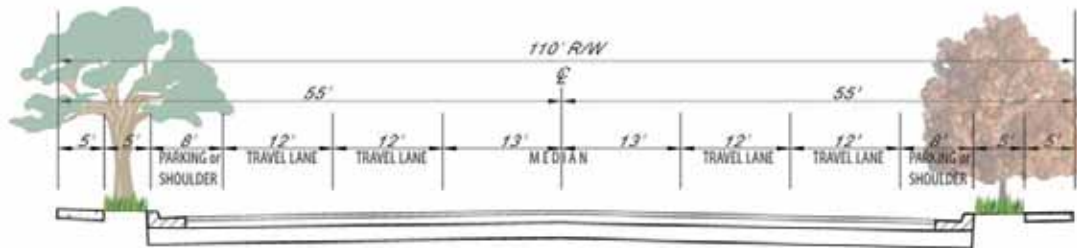
Roadways need to be designed based on their functional classification. A brief summary of the roadway classifications are presented below along with the cross sections portraying the required elements within each street classification under the proposed standards.

Expressways - The function of an expressway is to move high volumes of people and goods between urban areas within the county at high speeds. Expressways link the City to neighboring cities and SR 99. Expressways are large roadways designed to gather traffic from arterials, collectors, and local streets. Direct access to abutting property is specified within the standard of each expressway class. The expressway classes are presented below:

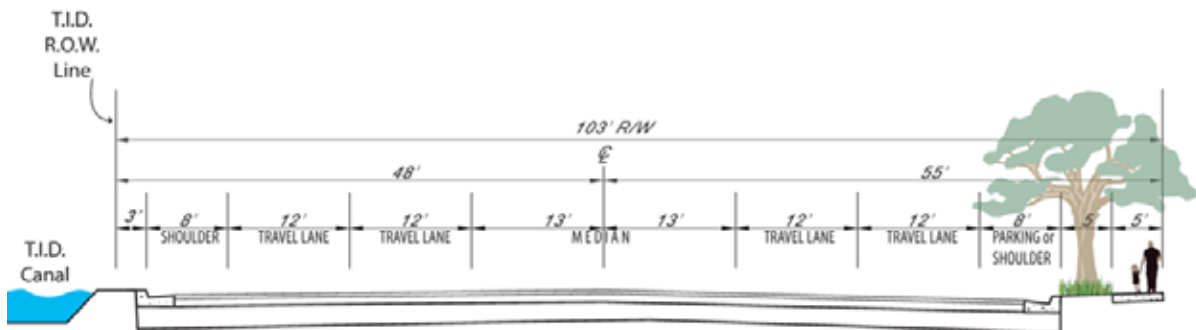
- **Class A** - Class A expressways are fully access-controlled roads with grade separated interchanges at intervals of approximately one mile to other expressways or arterials.
- **Class B** - Class B expressways are partially access-controlled roads with traffic-controlled intersections at arterials and other expressways. Collectors and local roads are permitted right-in/right-out access at ¼- to ½-mile intervals.
- **Class C** - Class C expressways are limited access-controlled roads with traffic-controlled intersections at arterials and other expressways. Intersections at collectors or local roads may or may not be controlled by a traffic signal.



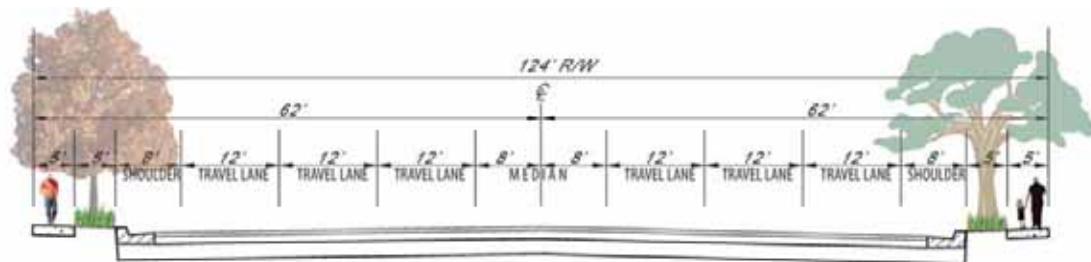
Four Lane Expressway with Limited 100-foot Row



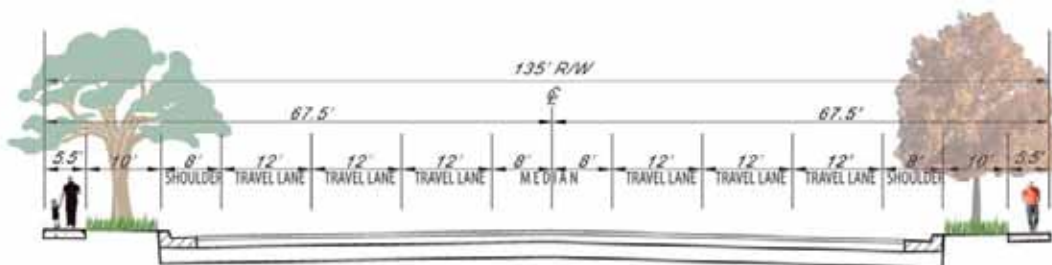
Four Lane Expressway with 110-foot Row



Hatch Road Four Lane Expressway

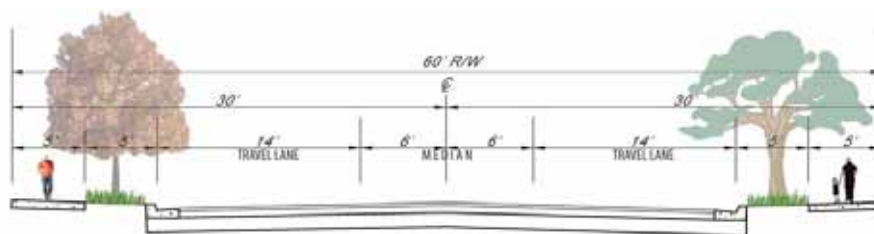


Six Lane Expressway with Limited 124-foot Row

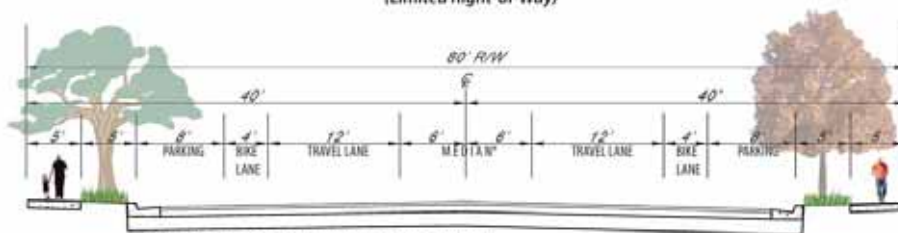


Six Lane Expressway with 135-foot Row

Arterial Streets - The function of an arterial is to serve major movements and long trips between different land uses or different parts of the City. Arterials are typically larger roadways designed for high speeds and large traffic volumes. Residential driveways and local street connections are not typically provided on arterials. Arterials are subdivided into two-lane or four-lane arterials depending on various factors including required capacity and right-of-way constraints.

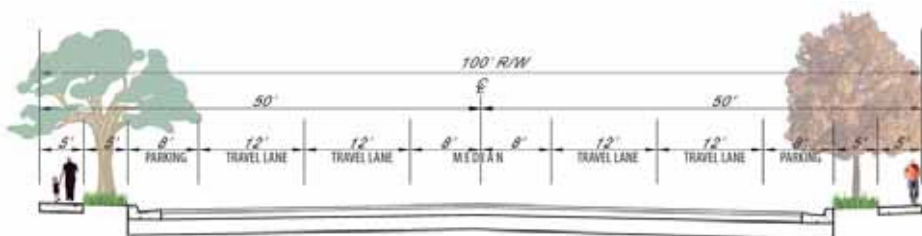


Two Lane Arterial with No Parking
(Limited Right-of-Way)

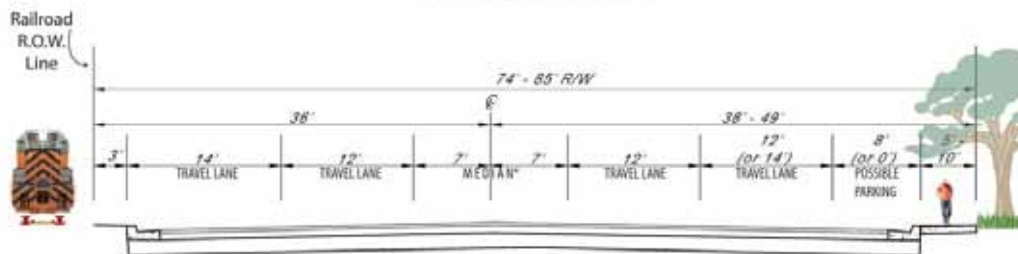


* Reduce R/W from 80' to 72' when bicycle lanes are not desired.

Two Lane Arterial with Parking

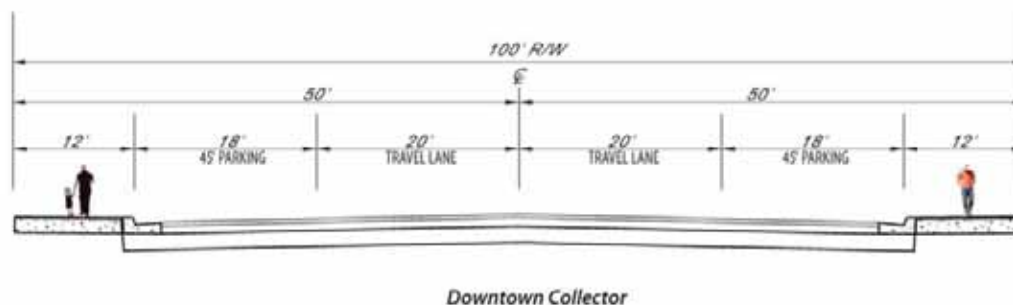
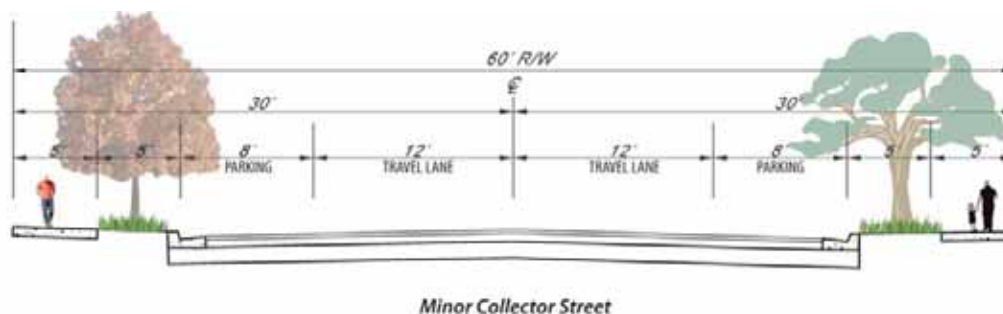


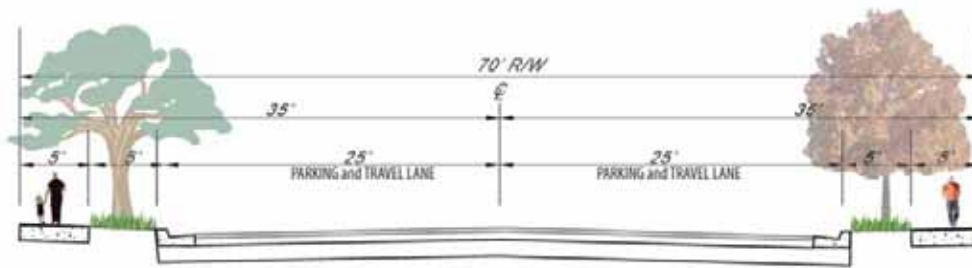
Four Lane Arterial with Parking



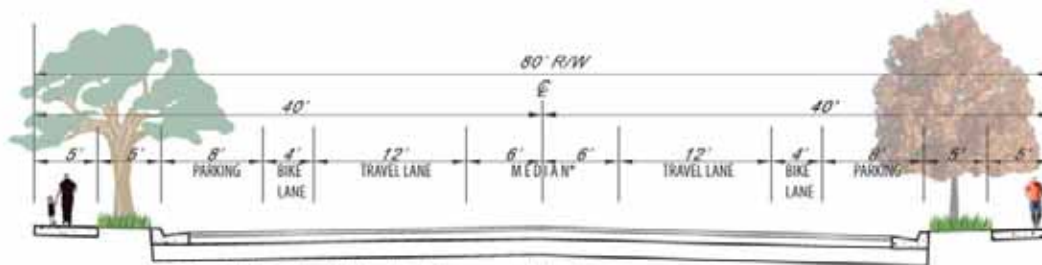
Santa Fe Avenue Constrained Arterial Corridor

Collector Streets - The function of a collector is to connect local trips with arterial streets or expressways and serve moderate length trips. Collector streets are subdivided into major collectors, constrained major collectors, minor collectors, and downtown collectors. Constrained major collectors are primarily existing collectors in built-out areas of the City, while major collectors are located at the periphery of the City. The existing constrained major collectors were designed based on current collector standards which include 40 feet of curb-to-curb distance and sidewalk on both sides of the road. These collectors were designed with consideration for the existing setting which primarily includes fronting single-family homes. The current design of the constrained major collectors remains appropriate in consideration of the existing setting and projected traffic volumes. The major collectors that can provide 40 feet of curb to curb distance (60 feet right-of-way) include Tully Road north of Santa Fe Avenue and between Whitmore Avenue and Joe Ruddy Court, 7th Street north of Whitmore Avenue, and Fox Road. As will be presented later, the new major collector standard will include up to 60 feet of curb-to-curb distance (80 feet right-of-way). The new standards are necessary to accommodate the anticipated growth in traffic, allow for maximum flexibility in design, and provide adequate access to abutting properties. The major collectors that should provide 80 feet of right-of-way include Mountain View Road, Tully Road south of Joe Ruddy Court, 7th Street south of Santa Fe Avenue, Euclid Avenue, and Roeding Road.



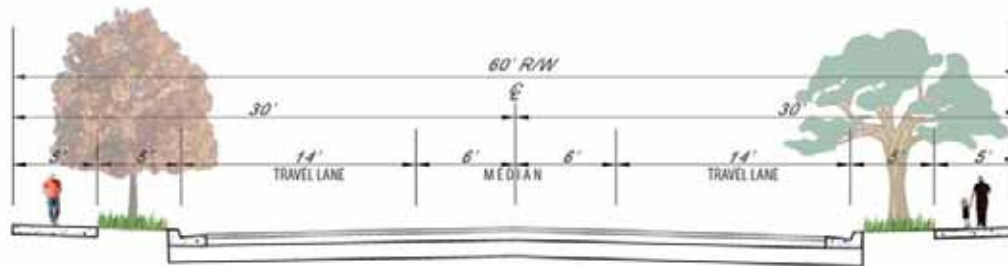


Industrial Street



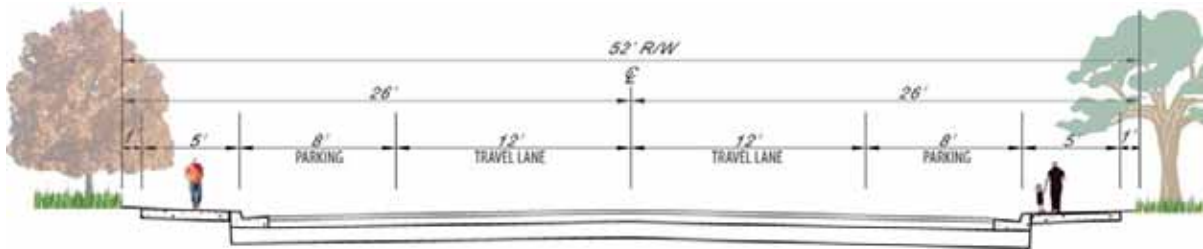
* Reduce R/W from 80' to 72' when bicycle lanes are not desired.

Major Collector Street

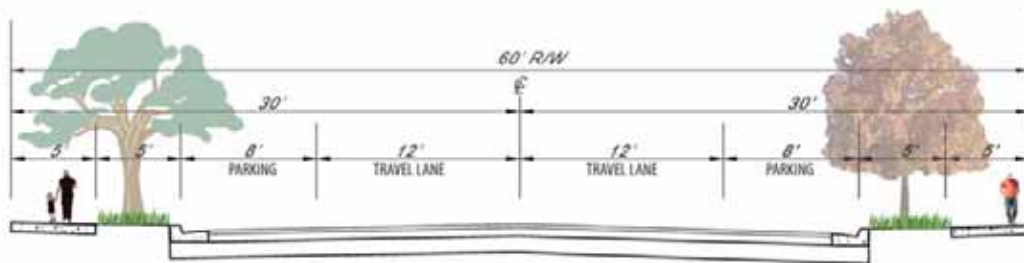


Constrained Major Collector
 (On-street Parking Not Permitted)

Local Streets - The function of a local street is to serve abutting properties and connect to collectors and arterials. Local streets are generally all other roadways not classified as expressways, arterials, or collectors.



Local Residential Street with Rollover Curb or Vertical Curb



Local Commercial Street

7. STREET MASTER PLAN IMPLEMENTATION

The Street Master Plan identifies the facilities needed for buildout of all properties within the City's sphere of influence. As with all long-range plans, a near-term plan is necessary to begin the process of planning and programming the first phases of the long-range improvements.

One way of planning and programming projects for the next ten years is through a capital improvement program (CIP). In addition to capital improvement projects, there are several tasks that the City must undertake within the next five years to permit the smooth implementation of several future (beyond five years) capital improvements. These tasks, such as identifying right-of-way needs and right-of-way preservation will give the City a head-start in future capital improvements. Table 10, presented on page 49, presents the capital improvement program which should be implemented over the next ten years. A brief description of each item is presented along with estimated costs. The estimated costs presented assume that the City will be the lead in the implementation, but that outside sources (i.e., contractors, consultants, etc.) will perform the work.

UPDATE THE CITY'S TRAFFIC MODEL

As stated in the *City of Hughson Transportation Impact Analysis Standards*, the City will be required to provide a copy of the City's traffic model for transportation impact studies. The City cannot fully implement their standards without updating the model. The traffic model was developed as part of the General Plan update using TRAFFIX software (TRAFFIX model). The TRAFFIX model will be used to estimate future volumes and determine project impacts. The TRAFFIX model needs to be updated to reflect the latest land use projections, trip distribution (from County's General Plan model), roadway network, through trips (from County's General Plan Model), and existing traffic volumes. The model should be updated every three years to adjust the key inputs including land use. It is anticipated that as development occurs the land use projections within the TRAFFIX model will need to be reduced to reflect the fact that traffic from new development has been captured in the traffic counts collected during that period. The TRAFFIX model should also serve to establish a development inventory.

Estimated Cost: \$25,000 (updated every three years and \$5,000 added to cost)

PAVEMENT RESURFACING

According to the San Joaquin Valley Air Pollution Control District Rule 8061, the City should implement a pavement resurfacing strategy to limit fugitive dust emissions.

Estimated Planning Level Costs: \$40,000

Estimated Design Costs: \$40,000

Estimated Construction Costs: \$350,000 per year

COLLECT CITY-WIDE TRAFFIC COUNTS

The City should continually monitor volumes along its key roadways and intersections to assess the need for roadway widening and/or intersection improvements. The volumes can also be used to establish the seasonal traffic count adjustment factors for transportation impact studies as directed by the *City of Hughson Transportation Impact Analysis Standards*. Furthermore, the volumes can be used to assist in the City's traffic model update. The following data should be collected:

Two week 24-hour tube counts at the following locations

- Hatch Road west of Tully Road
- Fox Road west of Charles Street
- Whitmore Avenue west of 4th Street
- Service Road west of Geer Road
- Santa Fe Avenue north of Tully Road
- Tully Road north of Fox Road
- 7th Street south of Fox Road
- Geer Road south of Fox Road

AM (7-9 AM) and PM (4-6) peak period intersection counts at the following locations

- Hatch Road/Tully Road
- Fox Road/Tully Road
- Fox Road/7th Street
- Santa Fe Avenue/Tully Road
- Whitmore Avenue/Santa Fe Avenue
- Whitmore Avenue/7th Street
- Santa Fe Avenue/7th Street
- Service Road/Santa Fe Avenue
- Service Road/Geer Road

The tube counts should be collected every three years during the winter, spring, summer, and fall seasons. The winter counts should be collected during the first two weeks of December or from mid-January to end of February; the spring counts should be collected between March and May; the summer counts should be collected between June and September; and the fall counts should be collected between October and November. This data should be used to determine average daily traffic volumes on key roadways and also used to develop the seasonal traffic count adjustment factors.

The intersection counts should be collected every three years and only once during the year. The seasonal adjustment factors should be applied to these counts and used to establish existing levels of service and incorporated in the City's traffic model.

Estimated Cost: \$40,000 (updated every three years and \$5,000 added to cost)

BICYCLE MASTER PLAN

Per the General Plan, the City should develop a bicycle master plan. The bicycle master plan should identify existing bicycle facilities as well as future bicycle facilities.

Estimated Cost: \$30,000

CITYWIDE PLAN LINES AND RIGHT-OF-WAY PRESERVATION

Citywide plan lines should be developed to establish the alignment and right-of-way requirements for roadways that will be widened in the future. The plan lines should be used to begin immediate right-of-way preservation and acquisition even if roadway widening is not anticipated in the near future. Based upon established agreements between the City and the County, plan lines for Geer Road, Hatch Road, Santa Fe Avenue, Service Road, Tully Road, and Whitmore Avenue should be developed cooperatively between the City and County.

Estimated Cost to Develop Plan Lines: \$100,000

Estimated Cost for Right-of-Way Preservation and Acquisition: Unknown at this time

DOWNTOWN PARKING STUDY

The City should perform a downtown parking study to document the number of parking spaces and types (i.e., metered, handicap, etc.), parking availability, and provide recommendations for improving parking conditions. The exact scope of the study should be developed in consultation with downtown businesses to ensure it addresses their concerns.

Estimated Cost: \$50,000

DOWNTOWN TRUCK LOADING PLAN

Per the General Plan, the City should develop a downtown truck loading plan. The plan will explore opportunities to improve truck access to the rear of Hughson Avenue, as well as limiting the hours that businesses can load and unload along Hughson Avenue to non-peak traffic periods. The plan should be developed in consultation with downtown businesses.

Estimated Cost: \$35,000

ENGINEERING AND TRAFFIC SPEED SURVEY

An engineering and traffic speed survey was recommended in the *City of Hughson - A Traffic Safety Evaluation* for the purpose of realistically posting regulatory speed limits. The report indicated that the surveys should be completed every five years.

Estimated Cost: \$30,000 (updated every five years and \$5,000 added to cost)

RECONFIGURE SANTA FE AVENUE/TULLY ROAD

The Santa Fe Avenue/Tully Road intersection is a five-legged intersection with stop control on three of the five approaches (Santa Fe Avenue has no traffic control). The five-legged design increases the complexity of the intersection and the number of vehicle conflicts. Furthermore, the intersection has several sharp turns that increase the difficulty of maneuvering through the intersection. This intersection should be reconfigured to a standard four-legged intersection by eliminating Pine Street access to Santa Fe Avenue.

Estimated Planning Level Costs: \$70,000

Estimated Design Costs: \$270,000

Estimated Construction Costs: \$1,380,000

WIDEN GEER ROAD TO FOUR LANES

Geer Road should be widened to four lanes by 2013 to accommodate the projected traffic growth.

Estimated Planning Level Costs: \$1,600,000

Estimated Design Costs: \$4,060,000

Estimated Construction Costs: \$31,910,000

COLLISION REPORTING AND ANALYSIS SYSTEM

The City should develop a collision reporting and analysis system to help track high accident locations and implement safety measures if necessary. The specifics of the system are documented in the report prepared by The Institute of Transportation Studies (UC Berkeley) entitled *City of Hughson - A Traffic Safety Evaluation*. As documented in the report, a single person could be in charge of this program.

Estimated Cost: \$20,000 (updated yearly and \$1,000 added to cost)

7th STREET RELOCATION AT SANTA FE AVENUE

7th Street on the north side and south side of Santa Fe Avenue should be realigned to form a single intersection. The roadways should be designed to intersect at an angle between 75° and 90°.

Estimated Planning Level Costs: \$100,000

Estimated Design Costs: \$370,000

Estimated Construction Costs: \$1,930,000

TRAFFIC CONTROL DEVICE INVENTORY

The development of a traffic control device inventory was recommended in the *City of Hughson - A Traffic Safety Evaluation*. The specifics of what the inventory should include are documented in the report including the possibility of transferring the information to GIS.

Estimated Cost: \$30,000

EUCLID AVENUE RELOCATION AT SANTA FE AVENUE

The Santa Fe Avenue/Service Road/Euclid Avenue intersection is a five-legged intersection. The Euclid Avenue leg should be relocated to the north to reconfigure the existing five-legged intersection to a four-legged intersection. The relocation of Euclid Avenue will form a new intersection with Santa Fe Avenue. The exact location of the intersection will depend on future development in the local area; however, it should be located at least ¼ mile from the Santa Fe Avenue/Service Road intersection.

Estimated Planning Level Costs: \$90,000

Estimated Design Costs: \$330,000

Estimated Construction Costs: \$1,730,000

WIDEN SANTA FE AVENUE TO FOUR LANES

Santa Fe Avenue should be widened to four lanes by 2016 to accommodate projected traffic growth.

Estimated Planning Level Costs: \$2,040,000

Estimated Design Costs: \$5,170,000

Estimated Construction Costs: \$40,640,000

WIDEN HATCH ROAD TO FOUR LANES

Hatch Road should be widened to four lanes by 2017 to accommodate projected traffic growth.

Estimated Planning Level Costs: \$1,350,000

Estimated Design Costs: \$3,440,000

Estimated Construction Costs: \$27,080,000

Table 10 Capital Improvement Program										
Improvement/Implementation	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17
Update City's traffic model	P			P			P			P
Perform pavement resurfacing per pavement management strategy	P	D	C	C	C	C	C	C	C	C
Collect city-wide traffic counts for monitoring	P			P			P			P
Develop Bicycle Master Plan	P									
Develop city-wide plan lines and begin right-of-way preservation		P								
Perform downtown parking study		P								
Develop a downtown truck loading plan		P								
Perform an engineering and traffic speed survey			P					P		
Reconfigure Santa Fe Avenue/Tully Road intersection to a four-legged intersection			P	D	C					
Widen Geer Road between Hatch Road and Santa Fe Avenue to four lanes				P	D	C				
Develop collision reporting and analysis system					P	P	P	P	P	P
7 th Street Relocation at Santa Fe Avenue					P	D	C			
Develop a traffic control device inventory						P				
Euclid Avenue Relocation at Santa Fe Avenue						P	D	C		
Widen Santa Fe Avenue between Hatch Road and Geer Road to four lanes							P	D	C	
Widen Hatch Road between Santa Fe Avenue and Geer Road to four lanes								P	D	C

P = Planning, D = Design, C = Construction

Table 11
Capital Improvement Program Cost Summary

Cost Type	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	Total
Planning Level Costs ¹	\$135,000	\$185,000	\$100,000	\$1,675,000	\$120,000	\$141,000	\$2,147,000	\$1,408,000	\$24,000	\$120,000	\$6,055,000
Design Level Costs ²	\$0	\$40,000	\$0	\$270,000	\$4,060,000	\$370,000	\$330,000	\$5,170,000	\$3,440,000	\$0	\$13,680,000
Construction Costs ³	\$0	\$0	\$350,000	\$350,000	\$1,730,000	\$32,260,000	\$2,280,000	\$2,080,000	\$40,990,000	\$27,430,000	\$107,470,000
Total	\$135,000	\$225,000	\$450,000	\$2,295,000	\$5,910,000	\$32,771,000	\$4,757,000	\$8,658,000	\$44,454,000	\$27,550,000	\$127,205,000

¹ Planning level costs include environmental studies, engineering studies, traffic studies, etc.

² Design level costs include PR/ED and PS&E support.

³ Construction costs include right-of-way, utilities, construction, and construction management.