CORE AREA TRAFFIC STUDY

IN THE

CITY OF LAFAYETTE

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TABLE OF CONTENTS

APPENDICES

TABLE OF CONTENTS

TABLES — FOLLOWING PAGE

FIGURES

INTRODUCTION

This report presents the findings for the *City of Lafayette Core Area Traffic Capacity Study*. The results of the capacity analysis are presented for the Existing, Existing plus Approved Project, Existing plus Approved Project plus Moraga Cumulative, and Build-Out traffic scenarios. Mitigation measures and cost estimates are presented for the build-out case.

EXISTING CONDITIONS

Existing traffic conditions during the a.m. peak hour, midday peak hour, and p.m. peak hour were manually counted on weekdays between December 7, 1988 and December 16, 1988. The results of the intersection capacity analysis for existing conditions are summarized in Table I. According to the *1985 Highway Capacity Manual* signalized intersection method, 8 of the 14 study intersections are operating with a Level of Service F, indicating jammed conditions under existing traffic conditions.

The "Signalized Intersection Operations Method" and "Unsignalized Intersection Method" from the *1985 Highway Capacity Manual* (Special Report 209) by the Transportation Research Board, 1985, were used to analyze the intersection capacity as requested by the City of Lafayette staff.

The level of service classification system ranks street and roadway operations based on the amount of traffic and traffic conditions. Briefly, the level of service is a scale with a range of Level of Service A (LOS A) through LOS F. Level A represents free-flow with slight or no delay and Level F represents jammed conditions.

It should be noted that the method used may result in a calculated level of service worse than actual conditions. According to the TJKM Intersection Capacity Analysis Method, all of the study intersections are operating with a Level of Service D or better during the three peak hours. Field observations generally confirm the latter calculations. All of the study intersections were analyzed using the TJKM Intersection Capacity Analysis under all of the future traffic scenarios. The results of the analysis are included in the Appendices.

For intersections controlled by STOP signs, the analysis methodology is also described in the *Highway Capacity Manual.* Deer Hill Road/Happy Valley Road is controlled by STOP signs on Deer Hill Road. Deer Hill Road/Oak Hill Road and Deer Hill Road/State Route 24 westbound off-ramp are currently controlled by all-way STOP signs. These two intersections were analyzed using a manual method for all-way STOP intersections described in the *1985 Highway Capacity Manual.* For the three intersections, STOP signs are designed to assign the right-of-way to the major street traffic or to control all of the four approaches. Drivers on the minor must use judgment when selecting gaps in the major street flow to execute their maneuvers. Thus, the minor street traffic and left turns from the major street may be subjected to delay, and no delay is experienced by the through traffic on the major street.

TABLE I

EXISTING LEVELS OF SERVICE

	Intersection	A.M. Peak Hour	Mid-Day Peak Hour	P.M. Peak Hour
1.	Mt. Diablo Blvd./Mt. View Dr.	C	C	D
2.	Mt. Diablo Blvd./Happy Valley Rd.	*	B	*
3.	Mt. Diablo Blvd./Lafayette Cr.	C	*	E
4.	Mt. Diablo Blvd./Moraga Rd.	D	E	*
5.	Mt. Diablo Blvd./First St.	E	*	C
6.	Mt. Diablo Blvd./Second St.	B	B	B
7.	Mt. Diablo Blvd./Almanor Ln.	B	C	C
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	B	C	C
9.	Deer Hill Rd./Happy Valley Rd.	See Calculation Below		
10.	Deer Hill Rd./Oak Hill Rd.	See Calculation Below		
11.	Deer Hill Rd./SR 24 WB Off-Ramp	See Calculation Below		
12.	Deer Hill Rd./First St.	*	*	*
13.	Moraga Rd./School St.-Brook St.	D	C	*
14.	Moraga Rd./St. Marys Rd.	*	D	*

Unsignalized Intersection Capacity Analysis		Adjusted Volume	Capacity	Reserved Capacity	Approximate LOS	Signals Warranted?
9. Deer Hill Rd./ Happy Valley Rd. (Westbound Left)	A.M.	499	305	-195	F	Yes
	M.D.	299	484	185	D	No
	P.M.	279	410	130	D	No

Multi-Way Stop Control Method		Adjusted Volume	Capacity	Approximate LOS	Signals Warranted?
10. Deer Hill Rd./ Oak Hill Rd.	A.M.	1,667	2,840	C	Yes
	M.D.	1,218	2,840	B	No
	P.M.	1,627	2,840	C	No
11. Deer Hill Rd./ SR 24 WB Off-Ramp	A.M.	1,744	2,840	C	Yes
	M.D.	1,270	2,840	B	No
	P.M.	1,733	2,840	C	Yes

* Volume-to-capacity ratio greater than 1.20, delay and level of service not meaningful

FUTURE LAND USE, TRIP GENERATION, AND ASSIGNMENT

Land use data and maps were obtained from the City. The study area was divided into 14 zones. Traffic was then generated using the rates described below. Traffic generated by land uses to be removed was estimated and subtracted from the total for each zone. The net traffic generation for each zone was then assigned to both local and regional destinations. The amount of approved project traffic volumes and remaining build-out traffic volumes at the each of the study intersections are included in the appendix. It should be noted that in Appendix A which contains the traffic assignment, Intersection 13 represents Moraga Road/School Street while Intersection 15 represents Moraga Road/Brook Street.

Traffic was generated using the trip generation rates summarized in Table II. These rates are based on information from the *ITE Trip Generation Manual*, 1987 and *San Diego Traffic Generators*, 1987. These rates have been reduced to account for passer-by trips for the retail, commercial services, and service station uses. Because information was not available on midday peak hour rates, this peak was estimated at 95 percent of the p.m. peak hour. This percent is based on existing traffic conditions in the City of Lafayette during the midday and p.m. peak hour.

TABLE II

TRIP GENERATION RATES

Land Use		Units	Daily Trips Unit	A.M. Peak Hour			Mid-day Peak Hour			P.M. Peak Hour		
				Peak %	% In	% Out	Peak %	% In	Out %	Peak %	% In	% Out
1.	Office	k.s.f.	15	14	87	13	13.30	16	84	14	16	84
2.	Retail	k.s.f.	50	2	85	15	7.60	48	52	8	48	52
3.	Commercial Services	k.s.f.	45	2	85	15	7.60	48	52	8	48	52
4.	Restaurant	k.s.f.	150	9.5	56	44	9.50	53	47	10	53	47
5.	Civic Center	k.s.f.	25	9	89	11	10.83	31	69	11.4	31	69
6.	Single-Family	d.u.	10	7.5	27	73	9.50	63	37	10	63	37
7.	Multi-Family	d.u.	8	7.5	16	84	9.50	67	33	10	67	33
8.	Warehouse	k.s.f.	4.88	11.7	69	31	19.00	37	63	20	37	63
9.	Auto Parts/ Repair	k.s.f.	60	8	60	40	9.50	40	60	10	40	60
10.	Manufacturing	k.s.f.	3.85	20	93	7	18.53	53	47	19.5	53	47
11.	Furniture Store	k.s.f.	4.35	4	80	20	8.55	50	50	9	50	50
12.	Service Station	station	374	2.8	50	50	3.14	50	50	3.3	50	50
13.	Building Materials	k.s.f.	30.56	7.3	62	38	8.36	51	49	8.8	51	49
14.	Nursery	k.s.f.	36.17	3.4	60	40	10.26	50	50	10.8	50	50

d.u. = dwelling unit
k.s.f. = 1,000 square feet
Source: ITE *Trip Generation Manual*, 1987; *San Diego Traffic Generation*, 1987 San Diego Associated Governments

CUMULATIVE TRAFFIC

The cumulative traffic generated in the Town of Moraga was included in the analysis. These traffic projections were obtained from the *Preston Ranch EIR* by Wilbur Smith and Associates. It should be noted that the results of the EIR are not yet final. The cumulative traffic includes the Preston Ranch Project, other planned or currently constructed projects in the Town of Moraga, and other residential development in the vicinity of the Moraga Road/St. Marys Road intersection. The cumulative scenario does not include full development of vacant land where there are no pending projects.

The distribution assumptions for the cumulative traffic was also obtained from the *Preston Ranch EIR*. In addition, the cumulative traffic was adjusted so that traffic generated in the Lafayette Downtown Core and destined for the Town of Moraga was not double counted. The amount of cumulative traffic volumes at the each of the study intersections is shown in the appendix.

FUTURE INTERSECTION CAPACITY ANALYSIS

The results of the intersection capacity analysis for Existing plus Approved Projects traffic scenario are summarized in Table III. Under these conditions, 8 of the 14 study intersections would operate with a Level of Service F, indicating jammed conditions.

The results of the intersection capacity analysis for Existing plus Approved plus Moraga Cumulative traffic scenario are summarized in Table IV. Under these conditions, 9 of the 14 study intersections would operate with a Level of Service F, indicating jammed conditions.

The results of the intersection capacity analysis for the Build-Out scenario, which includes existing, approved projects, Moraga cumulative and core area build-out traffic, are summarized in Table V. Under these conditions, 10 of the 14 study intersections would operate with a Level of Service F, indicating jammed conditions.

All of the intersection capacity analysis sheets are attached in the appendix.

TABLE III

EXISTING PLUS APPROVED LEVELS OF SERVICE

	Intersection	A.M. Peak Hour	Mid-Day Peak Hour	P.M. Peak Hour
1.	Mt. Diablo Blvd./Mt. View Dr.	C	C	E
2.	Mt. Diablo Blvd./Happy Valley Rd.	*	C	*
3.	Mt. Diablo Blvd./Lafayette Cr.	C	*	E
4.	Mt. Diablo Blvd./Moraga Rd.	D	E	*
5.	Mt. Diablo Blvd./First St.	E	*	C
6.	Mt. Diablo Blvd./Second St.	B	B	B
7.	Mt. Diablo Blvd./Almanor Ln.	B	C	C
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	B	C	C
9.	Deer Hill Rd./Happy Valley Rd.	See Calculation Below		
10.	Deer Hill Rd./Oak Hill Rd.	See Calculation Below		
11.	Deer Hill Rd./SR 24 WB Off-Ramp	See Calculation Below		
12.	Deer Hill Rd./First St.	*	*	*
13.	Moraga Rd./School St.-Brook St.	C	C	*
14.	Moraga Rd./St. Marys Rd.	*	E	*

Unsignalized Intersection Capacity Analysis		Adjusted Volume	Capacity	Reserved Capacity	Approximate LOS	Signals Warranted?
9. Deer Hill Rd./ Happy Valley Rd. (Westbound Left)	A.M.	560	300	-260	F	Yes
	M.D.	309	461	152	D	No
	P.M.	290	390	99	E	No

Multi-Way Stop Control Method		Adjusted Volume	Capacity	Approximate LOS	Signals Warranted?
10. Deer Hill Rd./ Oak Hill Rd.	A.M.	1,729	2,840	C	Yes
	M.D.	1,268	2,840	C	No
	P.M.	1,680	2,840	D	Yes
11. Deer Hill Rd./ SR 24 WB Off-Ramp	A.M.	1,802	2,840	C	Yes
	M.D.	1,286	2,840	B	Borderline
	P.M.	1,750	2,840	C	Yes

* Volume-to-capacity ratio greater than 1.20, delay and level of service not meaningful

TABLE IV

EXISTING PLUS APPROVED PLUS MORAGA CUMULATIVE LEVELS OF SERVICE

	Intersection	A.M. Peak Hour	Mid-Day Peak Hour	P.M. Peak Hour
1.	Mt. Diablo Blvd./Mt. View Dr.	C	C	*
2.	Mt. Diablo Blvd./Happy Valley Rd.	*	C	*
3.	Mt. Diablo Blvd./Lafayette Cr.	C	*	E
4.	Mt. Diablo Blvd./Moraga Rd.	E	E	*
5.	Mt. Diablo Blvd./First St.	*	*	D
6.	Mt. Diablo Blvd./Second St.	B	B	B
7.	Mt. Diablo Blvd./Almanor Ln.	C	C	E
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	B	C	C
9.	Deer Hill Rd./Happy Valley Rd.	See Calculation Below		
10.	Deer Hill Rd./Oak Hill Rd.	See Calculation Below		
11.	Deer Hill Rd./SR 24 WB Off-Ramp	See Calculation Below		
12.	Deer Hill Rd./First St.	*	*	*
13.	Moraga Rd./School St.-Brook St.	C	C	*
14.	Moraga Rd./St. Marys Rd.	*	*	*

Unsignalized Intersection Capacity Analysis		Adjusted Volume	Capacity	Reserved Capacity	Approximate LOS	Signals Warranted?
9. Deer Hill Rd./ Happy Valley Rd. (Westbound Left)	A.M.	560	300	-260	F	Yes
	M.D.	309	461	-152	D	Yes
	P.M.	290	390	99	E	Yes

Multi-Way Stop Control Method		Adjusted Volume	Capacity	Approximate LOS	Signals Warranted?
10. Deer Hill Rd./ Oak Hill Rd.	A.M.	1,729	2,840	C	Yes
	M.D.	1,268	2,840	B	No
	P.M.	1,680	2,840	C	Yes
11. Deer Hill Rd./ SR 24 WB Off-Ramp	A.M.	1,819	2,840	C	Yes
	M.D.	1,289	2,840	B	Yes
	P.M.	1,760	2,840	C	Yes

* Volume-to-capacity ratio greater than 1.20, delay and level of service not meaningful

TABLE V

BUILD-OUT LEVELS OF SERVICE

	Intersection	A.M. Peak Hour	Mid-Day Peak Hour	P.M. Peak Hour
1.	Mt. Diablo Blvd./Mt. View Dr.	D	D	*
2.	Mt. Diablo Blvd./Happy Valley Rd.	*	*	*
3.	Mt. Diablo Blvd./Lafayette Cr.	C	*	*
4.	Mt. Diablo Blvd./Moraga Rd.	E	*	*
5.	Mt. Diablo Blvd./First St.	*	*	*
6.	Mt. Diablo Blvd./Second St.	B	C	C
7.	Mt. Diablo Blvd./Almanor Ln.	C	E	*
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	C	C	C
9.	Deer Hill Rd./Happy Valley Rd.	See Calculation Below		
10.	Deer Hill Rd./Oak Hill Rd.	See Calculation Below		
11.	Deer Hill Rd./SR 24 WB Off-Ramp	See Calculation Below		
12.	Deer Hill Rd./First St.	*	*	*
13.	Moraga Rd./School St.-Brook St.	D	C	*
14.	Moraga Rd./St. Marys Rd.	*	*	*

Unsignalized Intersection Capacity Analysis		Adjusted Volume	Capacity	Reserved Capacity	Approximate LOS	Signals Warranted?
9. Deer Hill Rd./ Happy Valley Rd. (Westbound Left)	A.M.	783	280	-503	F	Yes
	M.D.	383	363	-20	F	Yes
	P.M.	367	291	-77	F	Yes

Multi-Way Stop Control Method		Adjusted Volume	Capacity	Approximate LOS	Signals Warranted?
10. Deer Hill Rd./ Oak Hill Rd.	A.M.	2,018	2,840	D	Yes
	M.D.	1,520	2,840	C	Yes
	P.M.	1,943	2,840	D	Yes
11. Deer Hill Rd./ SR 24 WB Off-Ramp	A.M.	2,080	2,840	C	Yes
	M.D.	1,460	2,840	B	Yes
	P.M.	1,939	2,840	C	Yes

* Volume-to-capacity ratio greater than 1.20, delay and level of service not meaningful

Existing Plus Approved Plus Moraga Cumulative

Under the Existing plus Approved plus Moraga Cumulative traffic scenario, the mitigation measures described below would be required to ensure acceptable operations at the study intersections. The calculation sheets are attached and the level of service results are summarized in Table VI.

For these cases, all reasonable lane modifications and signal optimization techniques were included. It should be noted that the operating conditions of these three intersections with mitigation were calculated using the TJKM Intersection Capacity Analysis. This analysis indicates that under the Existing plus Project plus Moraga Cumulative traffic scenario, the mitigations would achieve a Level of Service D or better during all peak hours.

Mitigation measures are as follows:

Intersection No. 1 Mt. Diablo Boulevard/Mt. View Drive

Modify traffic signal controller to add a northbound/southbound vehicle phase and a northbound/southbound pedestrian phase, and optimize signal timing.

Intersection No. 2 Mt. Diablo Boulevard/Happy Valley Road

Add an additional eastbound left-turn lane and optimize signal timing.

Happy Valley Road would consist of five lanes (three southbound and two northbound for a distance of approximately 200 feet north of Mt. Diablo Boulevard. It would consist of 2 lanes north of this point.

Intersection No. 3 Mt. Diablo Boulevard/Lafayette Circle

Add an exclusive northbound right-turn lane and an exclusive southbound through lane. Also, optimize signal timing.

Intersection No. 4 Mt. Diablo Boulevard/Moraga Road

Add an additional eastbound through lane, an exclusive northbound through lane, and an exclusive southbound right-turn and left-turn lane. Add pedestrian phasing for west leg of Mt. Diablo Boulevard as requested by the Traffic Commission, and optimize signal timing.

TABLE VI

EXISTING PLUS APPROVED PLUS MORAGA CUMULATIVE LEVELS OF SERVICE (Mitigated)

	Intersection	A.M. Peak Hour	Mid-Day Peak Hour	P.M. Peak Hour
1.	Mt. Diablo Blvd./Mt. View Dr.	C	C	D
2.	Mt. Diablo Blvd./Happy Valley Rd.	B	B	C
3.	Mt. Diablo Blvd./Lafayette Cr.	B	C	D
4.	Mt. Diablo Blvd./Moraga Rd.	D	D	D
5.	Mt. Diablo Blvd./First St.	D	D	D
6.	Mt. Diablo Blvd./Second St.	B	B	B
7.	Mt. Diablo Blvd./Almanor Ln.	B	B	B
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	B	C	C
9.	Deer Hill Rd./Happy Valley Rd.	B	A	A
10.	Deer Hill Rd./Oak Hill Rd.	A	A	B
11.	Deer Hill Rd./SR 24 WB Off-Ramp	D	B	C
12.	Deer Hill Rd./First St.	C	B	B
13.	Moraga Rd./School St.-Brook St.	B	B	B
14.	Moraga Rd./St. Marys Rd.	C	B	C

* Volume-to-capacity ratio greater than 1.20, delay and level of service not meaningful

Intersection No. 5 Mt. Diablo Boulevard/First Street

Add an exclusive right-turn lane in the westbound direction. Split the northbound and southbound phases, and optimize signal timing.

Intersection No. 7 Mt. Diablo Boulevard/Almanor Lane

Optimize signal timing.

Intersection No. 9 Deer Hill Road/Happy Valley Road

Install a traffic signal and add a southbound left-turn lane

It should be noted that multi-way STOP control can be added as an interim measure. Traffic volumes at the intersection could then be monitored to determine when signals are warranted.

Intersection No. 10 Deer Hill Road/Oak Hill Road

Install a traffic signal at the existing multi-way STOP controlled intersection.

It should be noted that the existing three-way STOP control would operated sufficiently with the approved project traffic. This intersection could then be monitored to determine when signals are warranted.

Intersection No. 11 Deer Hill Road/State Route 24 Westbound Off-Ramp

Install a traffic signal.

Intersection No. 12 Deer Hill Road/First Street

Add an additional eastbound right-turn lane. Add a left-turn phase in the eastbound/westbound direction and optimize signal timing.

Intersection No. 13 Moraga Road/School Street - Brook Street

Add exclusive left-turn lanes in the northbound, southbound and eastbound directions. Re-phase timing to include a northbound/southbound left-turn phase, a northbound/southbound through phase, and a eastbound/westbound phase. Eliminate the all-pedestrian phase and optimize the signal timing.

Intersection No. 14 Moraga Road/St. Marys Road

Add an additional left-turn lane in the southbound direction. The eastbound exit lane of St. Marys Road would need widening to accommodate traffic from the dual left-turn lane. Re-phase timing to include a northbound/southbound left-turn phase, a northbound/southbound through phase, an eastbound approach phase and a westbound approach phase. The signal timing should also be optimized.

Build-Out

Under the Build-Out traffic scenario, the mitigation measures described below would be required to ensure acceptable operations at the study intersections. The calculation sheets are attached and the level of service results are summarized in Table VII.

For these cases, all reasonable lane modifications and signal optimization techniques were included. It should be noted that the operating conditions of these three intersections with mitigation were calculated using the TJKM Intersection Capacity Analysis. This analysis indicates that under the Build-Out traffic scenario, the mitigations would achieve a Level of Service D or better during all peak hours. In some cases, a Level of Service E was the optimum condition achievable.

The cost of the mitigation measures were estimated using order-of-magnitude techniques. It should be noted that more detailed cost estimating procedures would result in a more accurate estimate. The cost estimating worksheets for the required roadway widening at each intersection are included in the appendix.

Mitigation measures and the cost estimates are as follows:

Intersection No. 1 Mt. Diablo Boulevard/Mt. View Drive

Modify traffic signal controller to add a northbound/southbound vehicle phase and a northbound/southbound pedestrian phase, and optimize signal timing.

Cost Estimate: minimal.

Intersection No. 2 Mt. Diablo Boulevard/Happy Valley Road

Add an additional eastbound left-turn lane, an exclusive southbound left-turn lane, an exclusive northbound right-turn lane. Also, split the northbound/southbound phasing, and optimize signal timing.

Happy Valley Road would consist of five lanes (three southbound and two northbound for a distance of approximately 200 feet north of Mt. Diablo Boulevard. It would consist of two lanes north of this point.

Cost Estimate: $570,000.

Intersection No. 3 Mt. Diablo Boulevard/Lafayette Circle

Add an additional eastbound through lane, an exclusive eastbound right-turn lane, an exclusive northbound right-turn lane, and an exclusive southbound through lane. Also, optimize signal timing.

Cost Estimate: $480,000.

TABLE VII

BUILD-OUT LEVELS OF SERVICE
(Mitigated)

	Intersection	A.M. Peak Hour	Mid-Day Peak Hour	P.M. Peak Hour
1.	Mt. Diablo Blvd./Mt. View Dr.	C	C	D
2.	Mt. Diablo Blvd./Happy Valley Rd.	B	C	C
3.	Mt. Diablo Blvd./Lafayette Cr.	C	C	D
4.	Mt. Diablo Blvd./Moraga Rd.	E	D	E
5.	Mt. Diablo Blvd./First St.	D	D	D
6.	Mt. Diablo Blvd./Second St.	B	C	C
7.	Mt. Diablo Blvd./Almanor Ln.	B	C	C
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	C	C	C
9.	Deer Hill Rd./Happy Valley Rd.	C	A	A
10.	Deer Hill Rd./Oak Hill Rd.	A	A	C
11.	Deer Hill Rd./SR 24 WB Off-Ramp	C	A	C
12.	Deer Hill Rd./First St.	C	B	B
13.	Moraga Rd./School St.-Brook St.	B	B	C
13.	Moraga Rd./School St.-Brook St. (With all-pedestrian phase)	D	C	E
14.	Moraga Rd./St. Marys Rd.	D	B	D

Intersection No. 4 Mt. Diablo Boulevard/Moraga Road

Add an additional eastbound through lane, an exclusive northbound through lane, and an exclusive southbound right-turn and left-turn lane. Add pedestrian phasing for west leg of Mt. Diablo Boulevard as requested by the Traffic Commission, and optimize signal timing.

Cost Estimate: $997,000.

Intersection No. 5 Mt. Diablo Boulevard/First Street

Add an additional eastbound through lane, an exclusive right-turn lane in the westbound and northbound directions. Split the northbound and southbound phases, and optimize signal timing. Although it appears that the northbound right-turn lane is not needed, the additional lanes will aid in reducing the overall delay at the intersection.

Cost Estimate: $714,000.

Intersection No. 7 Mt. Diablo Boulevard/Almanor Lane

Optimize signal timing.

Cost Estimate: minimal.

Intersection No. 9 Deer Hill Road/Happy Valley Road

Install a traffic signal and add a southbound left-turn lane

Cost Estimate: $200,000.

It should be noted that multi-way STOP control can be added as an interim measure. Traffic volumes at the intersection could then be monitored to determine when signals are warranted.

Intersection No. 10 Deer Hill Road/Oak Hill Road

Install a traffic signal at the existing multi-way STOP controlled intersection.

Cost Estimate: $150,000.

It should be noted that the existing three-way STOP control would operated sufficiently with the approved project traffic. This intersection could then be monitored to determine when signals are warranted.

Intersection No. 11 Deer Hill Road/State Route 24 Westbound Off-Ramp

Install a traffic signal and restripe northbound approach to include an exclusive left-turn lane, a shared through/left-turn lane and a right-turn lane. This may require

widening of the off-ramp to assure that there is enough storage length so that queuing vehicles would not intrude into the free right-turn lane.

Cost Estimate: $603,000.

Intersection No. 12 Deer Hill Road/First Street

Add an additional eastbound right-turn lane. Add a left-turn phase in the eastbound/westbound direction and optimize signal timing.

Cost Estimate: $79,000.

Intersection No. 13 Moraga Road/School Street - Brook Street

Add exclusive left-turn lanes in the northbound, southbound and eastbound directions. Re-phase timing to include a northbound/southbound left-turn phase, a northbound/southbound through phase, and a eastbound/westbound phase. Eliminate the all-pedestrian phase and optimize the signal timing.

Cost Estimate: $318,000.

In order to maintain the existing all-pedestrian phase, the operating conditions during the p.m. peak hour would experience a Level of Service E, indicating intolerable delay. A comparison of operating conditions with and without the all-pedestrian phase is shown in Table V.

Intersection No. 14 Moraga Road/St. Marys Road

Add an additional left-turn lane in the southbound direction. The eastbound exit lane of St. Marys Road would need widening to accommodate traffic from the dual left-turn lane. Re-phase timing to include a northbound/southbound left-turn phase, a northbound/southbound through phase, an eastbound approach phase and a westbound approach phase. The signal timing should also be optimized.

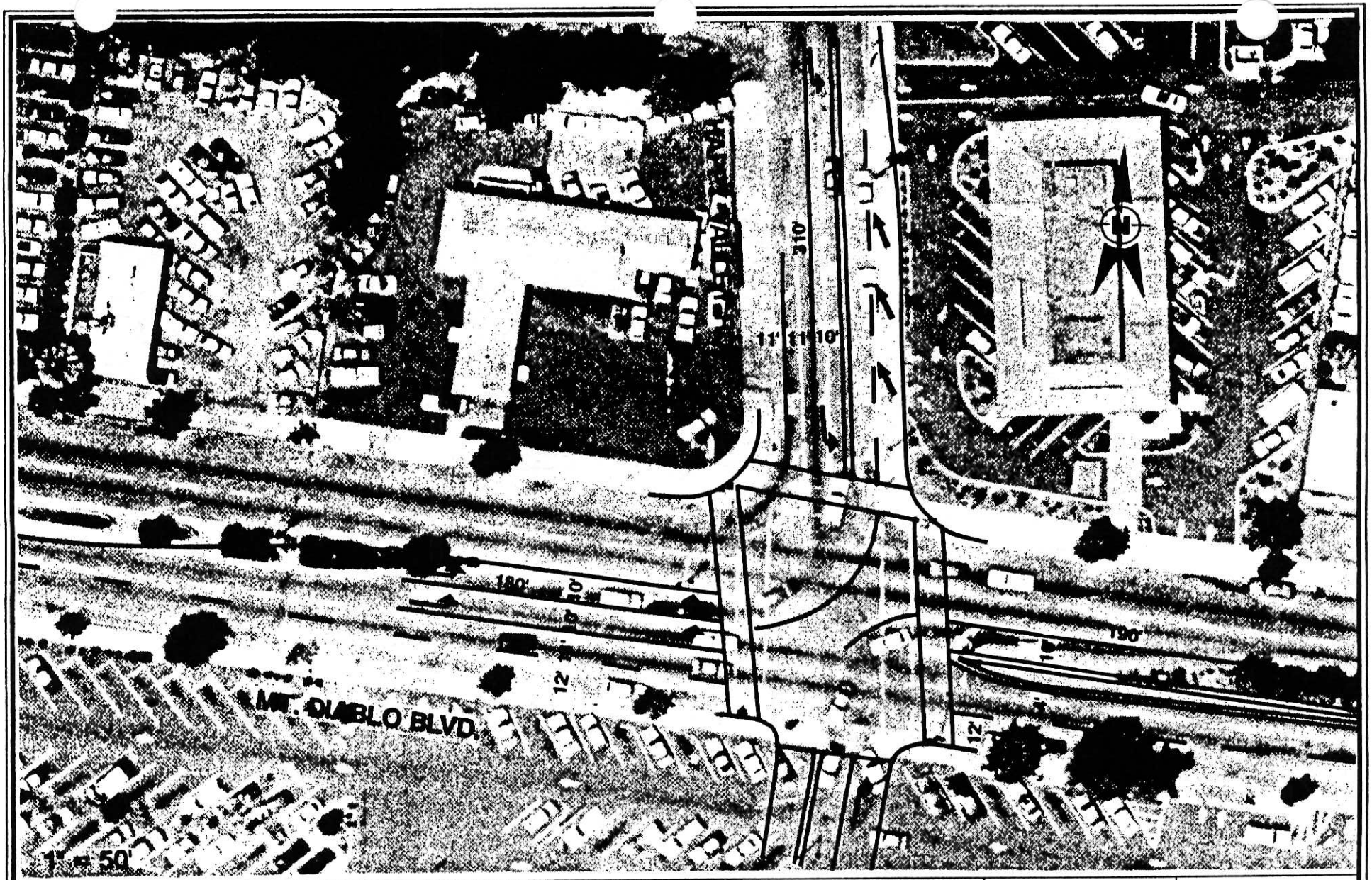
Cost Estimate: $143,000.

Mt. Diablo Boulevard Signal System

Additional funding should be added for the cost of interconnect conduit installation, timing plan preparation, controller replacement software or hardware purchases, and other items needed to allow progressive signal operation.

Cost Estimate: $200,000.

The improvements for Intersections 2, 3, 4, 5, 12, 13, and 14 are shown graphically on Figures 1 through 7.



CITY OF LAFAYETTE **CORE AREA TRAFFIC** **CAPACITY STUDY**	**INTERSECTION IMPROVEMENTS** **MT. DIABLO BLVD./HAPPY VALLEY ROAD**	**JKM**	**FIGURE** **1**

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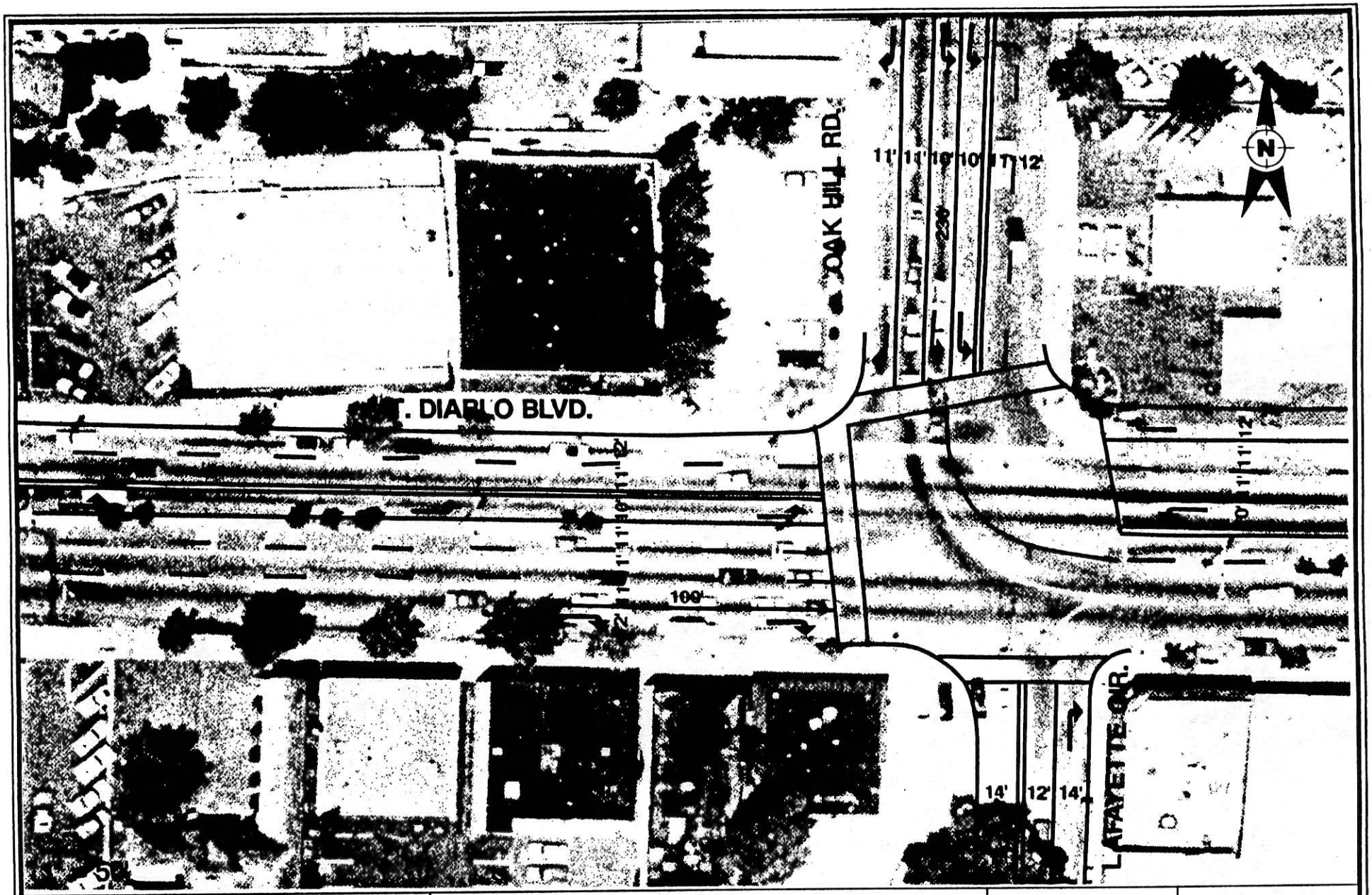
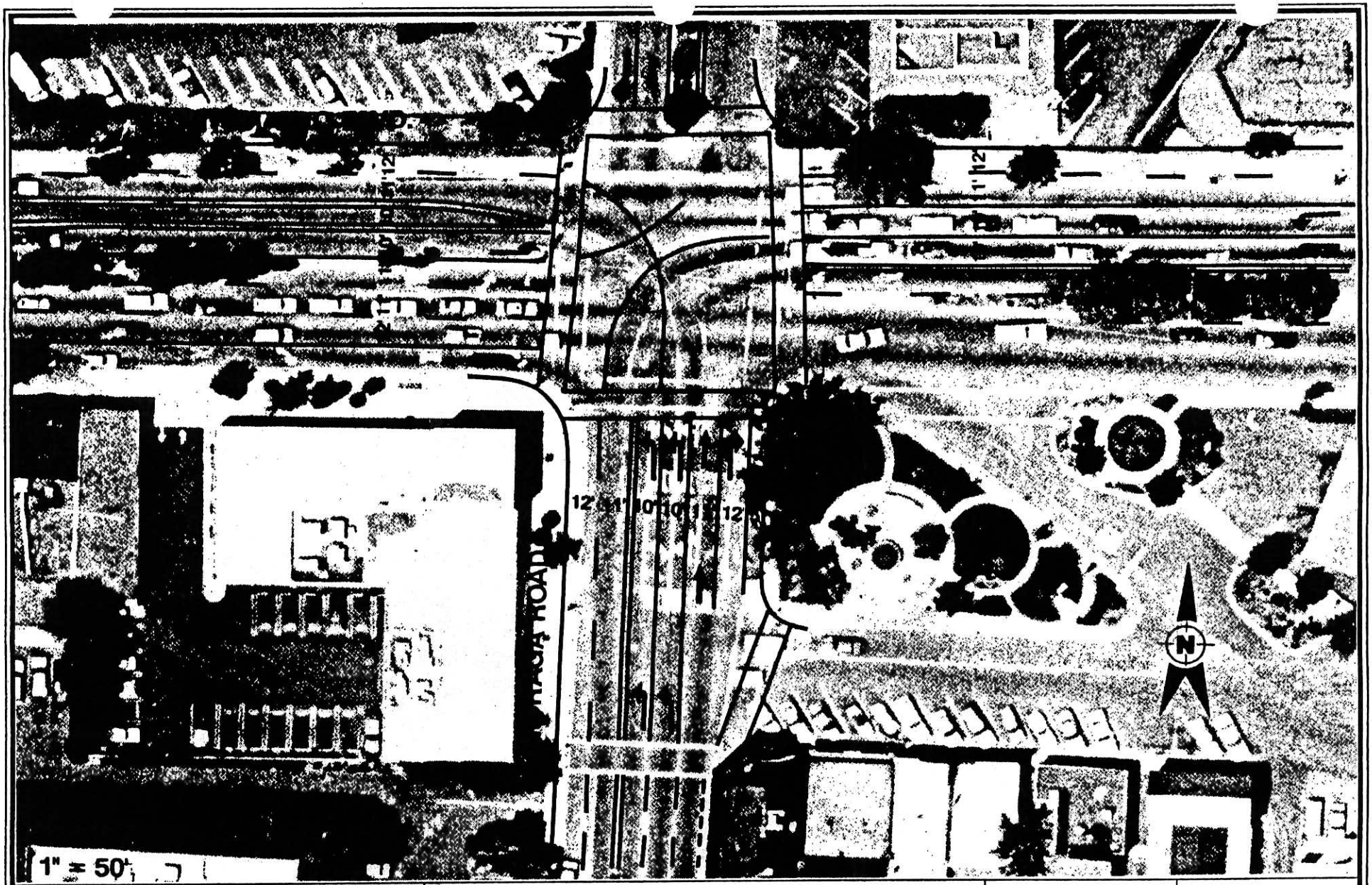


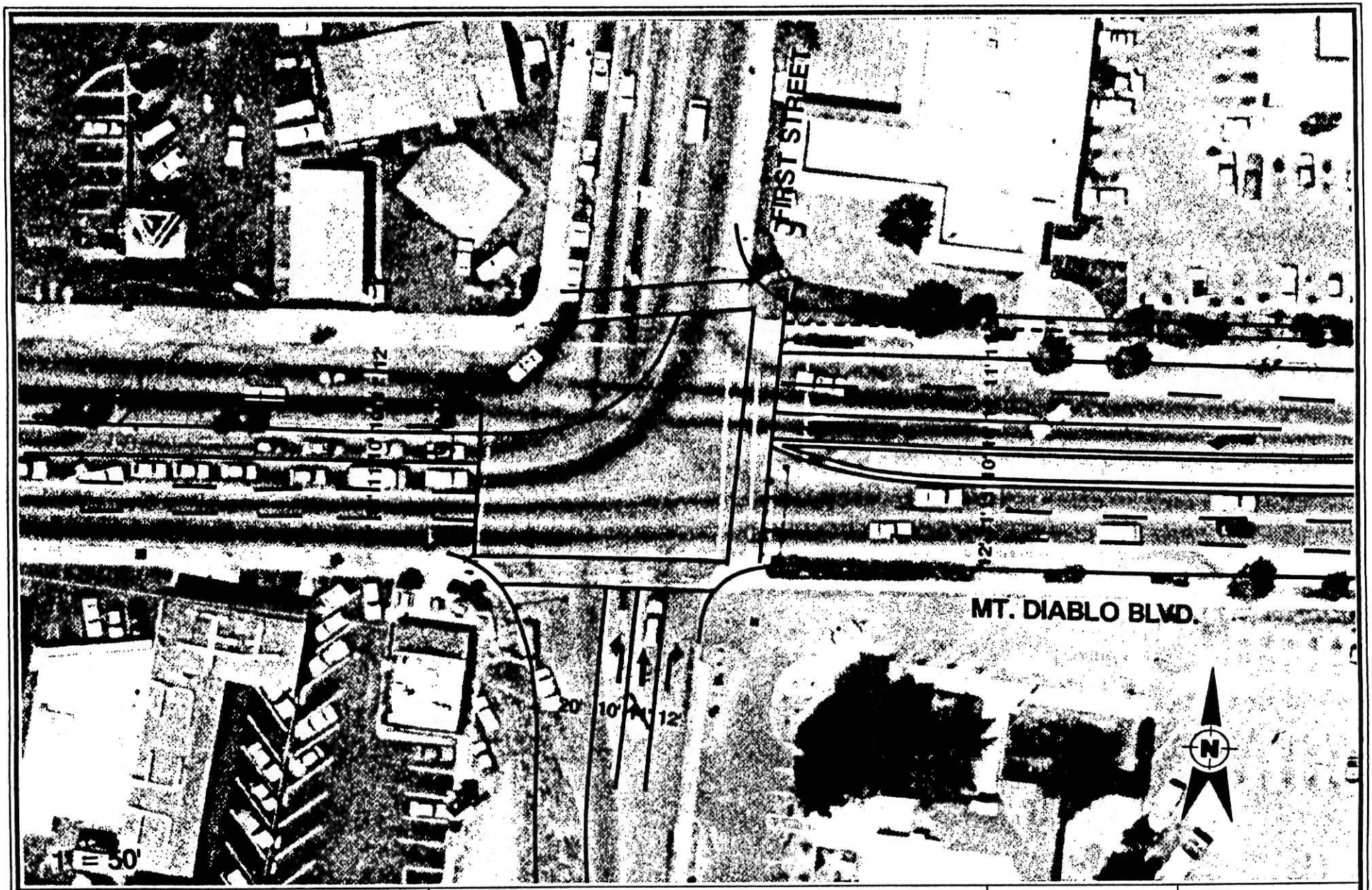
CITY OF LAFAYETTE CORE AREA TRAFFIC CAPACITY STUDY	INTERSECTION IMPROVEMENTS MT. DIABLO BLVD./OAKHILL ROAD/ LAFAYETTE CIRCLE	TJKM	FIGURE 2

7.009 - 9/89 - SW



CITY OF LAFAYETTE CORE AREA TRAFFIC CAPACITY STUDY	INTERSECTION IMPROVEMENTS MT. DIABLO BLVD./MORAGA ROAD	TJKM	FIGURE 3

7-009 - 9/89 - SW



CITY OF LAFAYETTE CORE AREA TRAFFIC CAPACITY STUDY	**INTERSECTION IMPROVEMENTS MT. DIABLO BLVD./FIRST STREET**	**JKM**	**FIGURE 4**

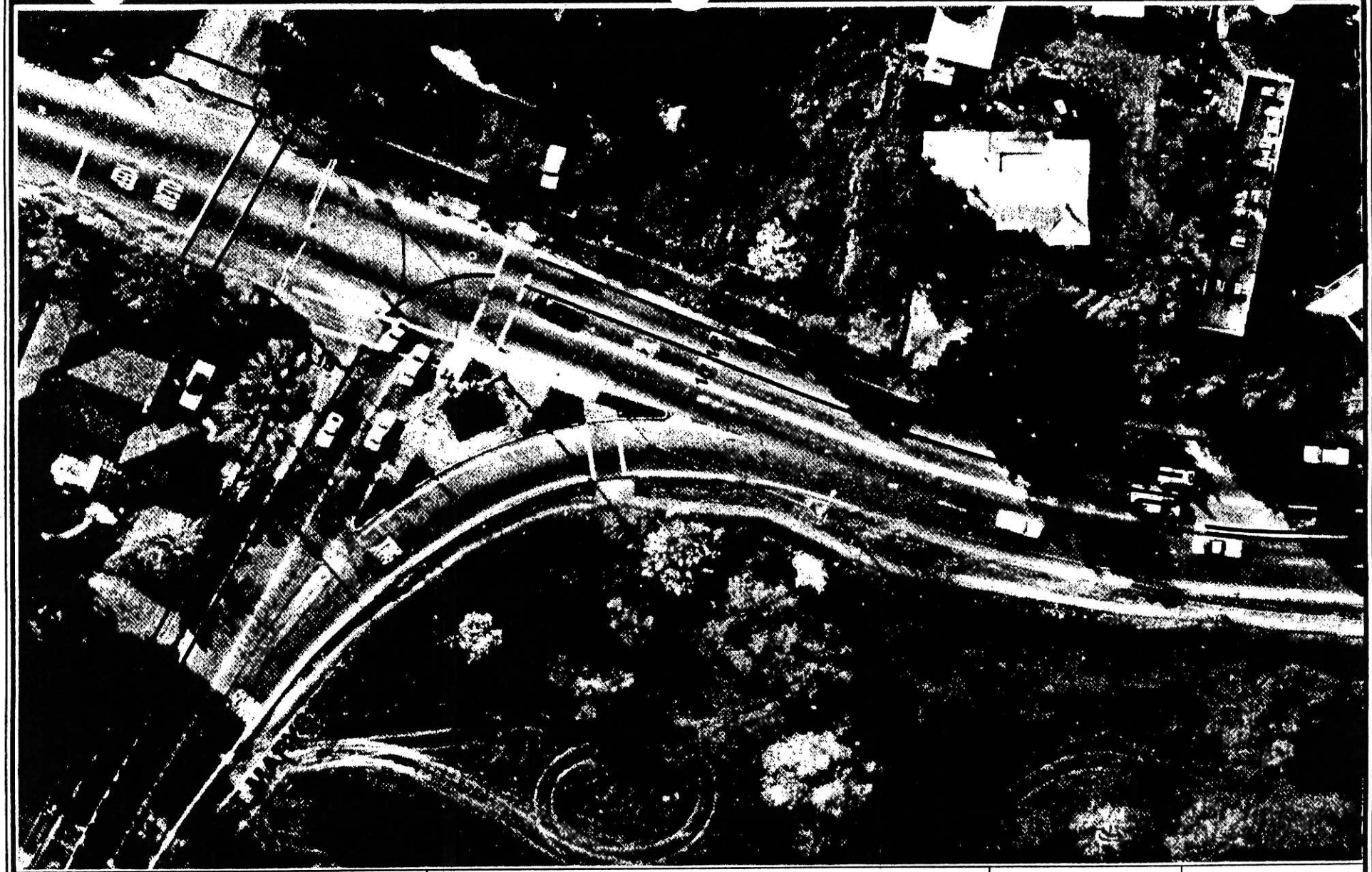
7-009 - 9/89 - SW

CITY OF LAFAYETTE CORE AREA TRAFFIC CAPACITY STUDY	**INTERSECTION IMPROVEMENTS DEER HILL ROAD/FIRST STREET**	JKM	**FIGURE 5**

7-009 - 9/89 - SW

CITY OF LAFAYETTE CORE AREA TRAFFIC CAPACITY STUDY	INTERSECTION IMPROVEMENTS MORAGA ROAD/SCHOOL STREET- BROOK STREET	JKM	FIGURE 6

7-009 - 9/89 - SW



CITY OF LAFAYETTE
CORE AREA TRAFFIC
CAPACITY STUDY

INTERSECTION IMPROVEMENTS
MORAGA ROAD/ST. MARY ROAD

TJKM

FIGURE
7

7-009 - 9/89 - SW

COST ESTIMATES AND FUNDING

The cost estimates for traffic improvements totals $4,304,000. As noted above, these are order-of-magnitude estimates. In order to fund the traffic improvements, the City may wish to consider imposing a traffic mitigation fee to all future development in the downtown core.

The total development not currently approved in the downtown core is estimated at 808,000 square feet. This includes all office, retail, and commercial space. Based on the cost estimates completed as part of this analysis, a traffic mitigation fee of $5.33 per square foot would be indicated. In comparison with traffic mitigation fees of other local jurisdictions, this rate is moderately higher. Traffic mitigation fees generally vary from $2.50 per square foot for office development to $4.30 per square foot for retail development.

However, the traffic generated by development from cumulative projects in the Town of Moraga also contributes to the need for improvements at the study intersections. The percentage contribution of the Approved Projects, Moraga Cumulative and Core Build-Out to the new traffic volumes during the p.m. peak hour at the study intersections are shown in Table VIII.

Again, it should be noted that the Signalized Intersection Operations Method from the *1985 Highway Capacity Manual* could result in levels of service which are worse than those projected by methods which are intended for planning purposes. Therefore, if a planning method had been used to obtain the future intersection levels of service, the mitigation measures would be less extensive. Likewise, the total cost estimates for the improvements and the corresponding mitigation fee would also be less.

Based on the TJKM Intersection Analysis Method the following mitigation measures would be required at the study intersections under Build-Out conditions in order to obtain a Level of Service D, indicating tolerable delay.

Intersection No. 3 Mt. Diablo Boulevard/Lafayette Circle

Add an exclusive northbound right-turn lane.

Intersection No. 4 Mt. Diablo Boulevard/Moraga Road

Add an additional eastbound through lane, an exclusive northbound right-turn lane, and an exclusive southbound left-turn lane.

Intersection No. 5 Mt. Diablo Boulevard/First Street

Add an exclusive right-turn lane in the westbound direction.

Intersection No. 9 Deer Hill Road/Happy Valley Road

Install a traffic signal and add a southbound left-turn lane

TABLE VIII

NEW TRAFFIC PERCENTAGES
(P.M. Peak Hour)

	Intersection	Total New Traffic	Approved Projects No.	Approved Projects %	Core Area No.	Core Area %	Moraga Cumulative No.	Moraga Cumulative %
1.	Mt. Diablo Blvd./Mt. View Dr.	488	176	36	300	61	12	3
2.	Mt. Diablo Blvd./Happy Valley Rd.	842	185	22	645	77	12	1
3.	Mt. Diablo Blvd./Lafayette Cr.	944	133	14	763	81	48	5
4.	Mt. Diablo Blvd./Moraga Rd.	1,286	167	13	888	69	231	18
5.	Mt. Diablo Blvd./First St.	1,118	144	13	791	71	183	16
6.	Mt. Diablo Blvd./Second St.	631	92	15	476	75	63	10
7.	Mt. Diablo Blvd./Almanor Ln.	541	102	19	376	69	63	12
8.	Mt. Diablo Blvd./Pleasant Hill Rd.	496	34	7	160	32	302	61
9.	Deer Hill Rd./Happy Valley Rd.	353	58	16	295	84	0	0
10.	Deer Hill Rd./Oak Hill Rd.	370	53	14	307	83	10	3
11.	Deer Hill Rd./SR 24 WB Off-Ramp	492	53	11	355	72	84	17
12.	Deer Hill Rd./First St.	199	9	5	116	58	74	37
13.	Moraga Rd./School St.-Brook St.	600	60	10	309	51.5	231	38.5
14.	Moraga Rd./St. Marys Rd.	581	58	10	292	50	231	40

Intersection No. 10 Deer Hill Road/Oak Hill Road

Install a traffic signal at the existing multi-way STOP controlled intersection.

Intersection No. 11 Deer Hill Road/State Route 24 Westbound Off-Ramp

Install a traffic signal and restripe northbound approach to include an exclusive left-turn lane, a shared through/left-turn lane and a right-turn lane. This may require widening of the off-ramp to assure that there is enough storage length so that queuing vehicles would not intrude into the free right-turn lane.

Intersection No. 14 Moraga Road/St. Marys Road

Add an additional left-turn lane in the southbound direction. The eastbound exit lane of St. Marys Road would need widening to accommodate traffic from the dual left-turn lane. Re-phase timing to include a northbound/southbound left-turn phase, a northbound/southbound through phase, an eastbound approach phase and a westbound approach phase. The signal timing should also be optimized.

Mount Diablo Boulevard Signal System

Additional funding should be added for the cost of interconnect conduit installation, timing plan preparation, controller replacement software or hardware purchases, and other items needed to allow progressive signal operation.