Approved as to Form and Legality

OFFICE OF THE CITY CLERK

F. Faiz
City Attorney

2007 SEP 14 PM 6:48

OAKLAND CITY COUNCIL

RESOLUTION NO. 80389 C.M.S.

Introduced by Councilmember _____

A RESOLUTION ESTABLISHING A TRAFFIC IMPACT FEE (TIF) PURSUANT TO ADOPTION AND IMPLEMENTATION OF THE TRAFFIC IMPACT PROGRAM (TIP) FOR THE SOUTHEASTERN PORTION OF THE CITY OF OAKLAND, INCLUDING THE ADOPTION AND IMPOSITION OF TRAFFIC IMPACT FEES (TIF) AND DESIGNATED PROJECTS FOR FY 2007-09

WHEREAS, the purpose of this implementing resolution is to establish the amount of Traffic Impact Fee (TIF) to be imposed upon development projects within the city of Oakland, for the purpose of mitigating the impacts caused by development upon the City's traffic and transportation infrastructure and facilities; and

WHEREAS, the City is authorized to adopt and impose traffic impact fees upon development projects pursuant to article XI, section 7 of the California Constitutions; California Government Code sections 66000, *et seq* (hereinafter "Mitigation Fee Act"); and

WHEREAS, Oakland Municipal Code (OMC) Title X, Chapter 70, titled Traffic Impact Program has been adopted by the City to establish the procedures by which the City charges the traffic impact fee; and

WHEREAS, condition No. 26 and Settlement Agreement of the Leona Quarry development project, as outlined in Resolution No. 78358 C.M.S. (Resolution approving the application of the DeSilva Group to close the Leona Quarry, and reclaim it and redevelop the site for 477 residential units at 7100 Mountain Boulevard in compliance with Alameda Superior Court order [Action No. RG-03077607)] requires the establishment of a Traffic Impact Fee and Traffic Impact Fee; and

WHEREAS, pursuant to the California Environmental Quality Act (CEQA) on February 17, 2004, by Resolution 78359, the City certified an Environmental Impact Report (EIR) which adequately analyzed the impacts of the improvements contemplated by this Resolution, including the creation of fee programs to require new development in the Southeast area of Oakland to fund their proportional fair share of the cost of acquiring and improving public facilities, including traffic and transportation improvements; and

WHEREAS, Fehr & Peers Associates has prepared a transportation impact fee study dated September 2006 (Nexus Report), attached as Exhibit A, and hereby incorporated by reference, that provides the technical basis for implementation of a TIF and TIP in the Southeast Oakland area documenting the analytical approach for determining the nexus between the cost of

improvements and the local traffic impact created by anticipated development in the Southeast Oakland area along with a traffic and fair-share cost analysis conducted to equitably distribute the costs of the necessary improvements to development that causes the impacts, per the provisions of the Mitigation Fee Act; and

WHEREAS, in accordance with Government Code section 66016, at least 14 days prior to the public hearing at which the City Council first considered the adoption of this Resolution, notice of time and place of the hearing was mailed to eligible interested parties; and

WHEREAS, in accordance with Government Code section 66016, the Nexus Report was available for public review and comment for 10 days prior to the public hearing at which the City Council first considered the adoption of the this Resolution; and

WHEREAS, ten (10) days advance notice of the public hearing at which the City Council first considered the adoption of this Resolution was given by publication in accordance with Section 6062(a) of the Government Code; and

WHEREAS; the record establishes and the City Council finds as follows:

1. That the purpose of the TIF set forth in this Resolution is to mitigate the traffic impacts of new development within the study area, by developing an overall transportation system that will accommodate the expected future traffic demand.

2. That the revenues from the Southeast Oakland TIF and TIP will be used to used to fund capital improvement projects necessary to accommodate future traffic demand in the study area. These projects include such improvements as the installation and coordination of traffic signals, the provision of additional turn lanes, and/or the reconfiguration of lane geometries at nine different intersections throughout the study area.

3. There is a reasonable relationship between the fee's use and the type of development generate traffic with different characteristics and the nexus analysis presented in the technical study accounts for the differential impact on the local street system caused by different development types.

4. That there is a reasonable relationship between the need for the facilities and the type of development on which the fee is imposed by determining that implementation of the improvements would return the traffic operations at the affected intersections to within the City's standards and that there are no existing deficiencies on any of the facilities to be included in this TIF program, indicating that the need for improvements at these locations is attributable to traffic generated by new development.

5. That there is a reasonable relationship between the amount of the fee and the cost of the public facility to ensure that all reasonably anticipated cost elements have been accounted for, thus ensuring that implementation of the improvements will be supported by the fee revenues received. The projected costs are then distributed among the different development types in proportion to their respective traffic generating characteristics, resulting in the proposed fee for each land use category. now, therefore be it

RESOLVED: that the city hereby finds that the facts set forth in recitals to this implementing resolution are true and correct, and establish the factual basis for the adoption of the Traffic Impact Fee (TIF); and be it

FURTHER RESOLVED: that the City Council hereby finds that the facts and analyses described in the report titled "Southeast Oakland Traffic Improvement Fee Study" (Exhibit A), including all technical reports incorporated by reference satisfy the requirements of the Mitigation Fee Act; and be it

FURTHER RESOLVED: that the City Council hereby adopts the Traffic Impact Fee for each identified land use category identified in Exhibit A as follows:

TABLE 1
PRELIMINARY SOUTHEAST OAKLAND TIF AND TIP FEE CALCULATIONS

Land Use Category	Fee/Unit
Single-Family Residential	$3,160/Unit
Other Residential	$2,440/Unit
Retail	$5.89/Square Foot
Service	$3.12/Square Foot
Manufacturing	$1.44/Square Foot

Source: Fehr & Peers, 2006.

; and be it

FURTHER RESOLVED: that the City Council hereby adopts the following Traffic Impact Fee project and cost estimates as follows:

TABLE 2
COST ESTIMATES FOR SOUTHEAST OAKLAND TIF/TIP IMPROVEMENTS

Location	Cost Estimate
1 and 2. I-580 WB On-Ramp/Edwards Avenue and I-580 EB Off-Ramp/Edwards Avenue	$961,300
4. Greenly Drive/Edwards Avenue	$107,800
6. MacArthur Boulevard/73rd Avenue	$622,300
7 Mountain Boulevard/Keller Avenue	$823,200
8. Mountain Boulevard/I-580 WB Off-Ramp/Shone Avenue	$409,100
9. I-580 EB Off-Ramp/Keller Avenue	$411,400
16. I-580 WB Off-Ramp/Seminary Avenue/Kuhnle Avenue	$757,000
18. I-580 EB Off-Ramp/Overdale Avenue/Seminary Avenue	$417,600
A. Study of Edwards Avenue and Seminary Avenue operational improvements	$350,000
Total Cost of Improvements	**$4,859,700**

; and be it

FURTHER RESOLVED: that as funding is collected and/or allocated for each of the projects listed for the TIF, the Development Director will submit projects to the City Council for their approval through the Capital Improvement Program (CIP) budget process, under the heading of Traffic Impact Program projects; and be it

FURTHER RESOLVED: that the Development Director my move funds between individual TIF projects already approved by the City Council without the need for additional Council authorization to ensure the most effective and efficient implementation timeline for each of the traffic impact program projects; and be it

FURTHER RESOLVED: that any projects that has acquired or will acquire a vested right to develop under California law prior to the enactment of this resolution shall not be required to pay the TIF; and be it

FURTHER RESOLVED: that the fees established by this resolution shall become effective 60 days following its enactment contingent upon the adoption of the enabling ordinance Title 10 Vehicles And Traffic, Chapter 70 Southeast Oakland Area Traffic Impact Fee

IN COUNCIL, OAKLAND, CALIFORNIA, FEB 6 2007, 20____

PASSED BY THE FOLLOWING VOTE:

AYES - BROOKS, ~~BRUNNER~~, CHANG, KERNIGHAN, NADEL, ~~QUAN~~, and PRESIDENT DE LA FUENTE - 5

NOES - 0

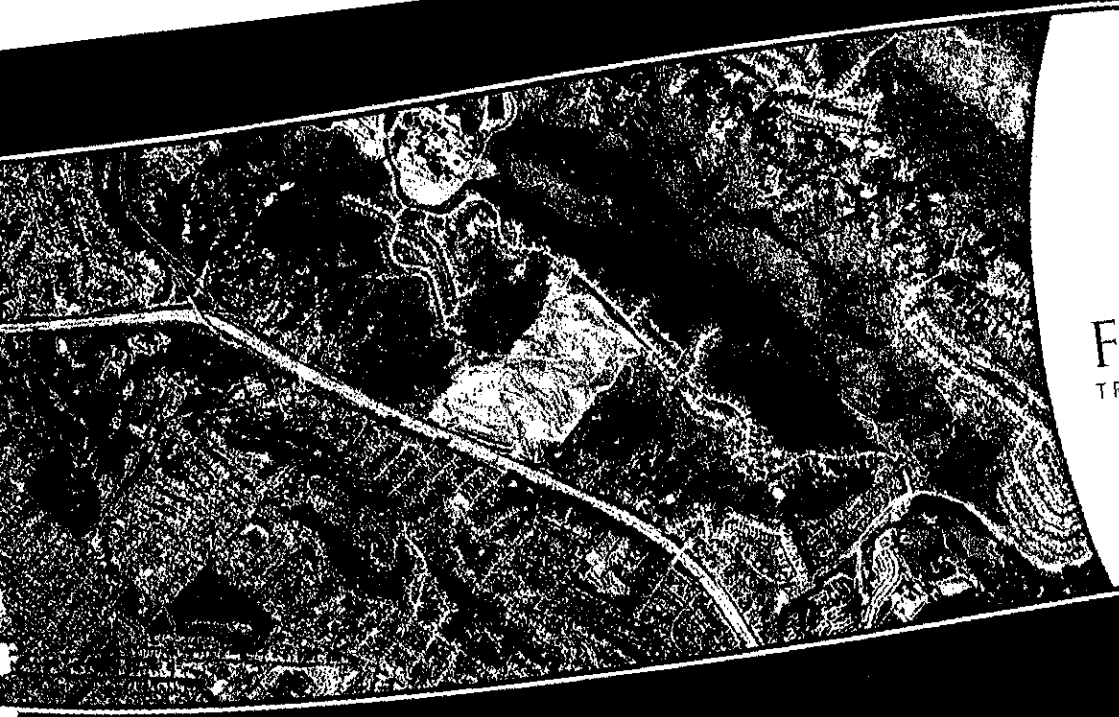
ABSENT - Brunner, Quan - 2

ABSTENTION - 0

Excused - Reid - 1

ATTEST: LaTonda Simmons

LaTonda Simmons
City Clerk and Clerk of the Council
of the City of Oakland, California



FEHR & PEERS
TRANSPORTATION CONSULTANTS

Final Draft Report

Southeast Oakland Traffic Improvement Fee Study

September 2006

Prepared for:
City of Oakland

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1. INTRODUCTION

BACKGROUND

Pursuant to the *Mitigation Fee Act*, California Government Code Section 66000, et seq. (also known as AB 1600), a local agency is authorized to charge a fee to development applicants in connection with approval of a development project for the purpose of defraying all or a portion of the costs of public facilities related to the development project. The capital improvements funded through a fee program are typically those required to mitigate the traffic impacts of new development within the study area. Specifically, the purpose of the fee is to maintain adequate level of service standards at intersections throughout the study area. The fee is not imposed to improve or correct deficiencies in baseline service levels, or to mitigate the impacts of regional (through) traffic.

Transportation impact fees are commonly collected in many jurisdictions in the Bay Area and throughout California to aid in financing transportation infrastructure required by new development. Currently, the City of Oakland does not collect transportation-related impact fees for new developments. For comparison and reference purposes, Appendix A includes a summary of impact fee programs in a selection of northern California cities.

PURPOSE

The purpose of this study is to provide the technical basis for implementation of a Traffic Improvement Fee (TIF) and Traffic Improvement Program (TIP) in the Southeast Oakland area. The TIF and TIP will constitute a funding mechanism for traffic improvements required to mitigate cumulative traffic impacts in the Southeast Oakland area, as documented in the Leona Quarry Environmental Impact Report. Development of a TIF and TIP is required as part of the Conditions of Approval (see Condition #26) for the Leona Quarry project, and is also addressed in the Leona Quarry Settlement Agreement executed in December 2003.

This report documents the analytical approach for determining the nexus between the cost of improvements and the local traffic impact created by anticipated development in the Southeast Oakland area. A traffic and fair-share cost analysis is conducted to equitably distribute the costs of the necessary improvements to development that causes the impacts, per the provisions of AB 1600.

USE OF THE TRAFFIC MITIGATION FEE

AB 1600 requires that mitigation fee programs comply with certain basic requirements, including:

- Identifying the purpose of the fee
- Identifying how the fee will be used and the facilities to be funded through the fee
- Determining a reasonable relationship between the fee's use and the type of development on which the fee is imposed

- Determining a reasonable relationship between the need for the public facility and the type of development on which the fee is imposed

- Determining a reasonable relationship between the amount of the fee and the cost of the public facility (or portion of facility) attributable to new development

These items are addressed throughout this study and are summarized in the final chapter.

STUDY AREA

The study area is located in Southeast Oakland and is shown on Figure 1. The area generally extends along both sides of the I-580 freeway corridor between the Seminary Avenue and the 98th Avenue interchanges. A more detailed map of the geographic area included in the Southeast Oakland TIF and TIP is provided in Appendix B. The goal of the study is to calculate a fee that would be collected on new development in the Southeast Oakland TIF and TIP area.

STUDY PROCESS

This study was developed under the direction of City of Oakland staff. After review and public hearing, the City Council will consider approval of the study and adoption of an ordinance specifying a fee schedule.

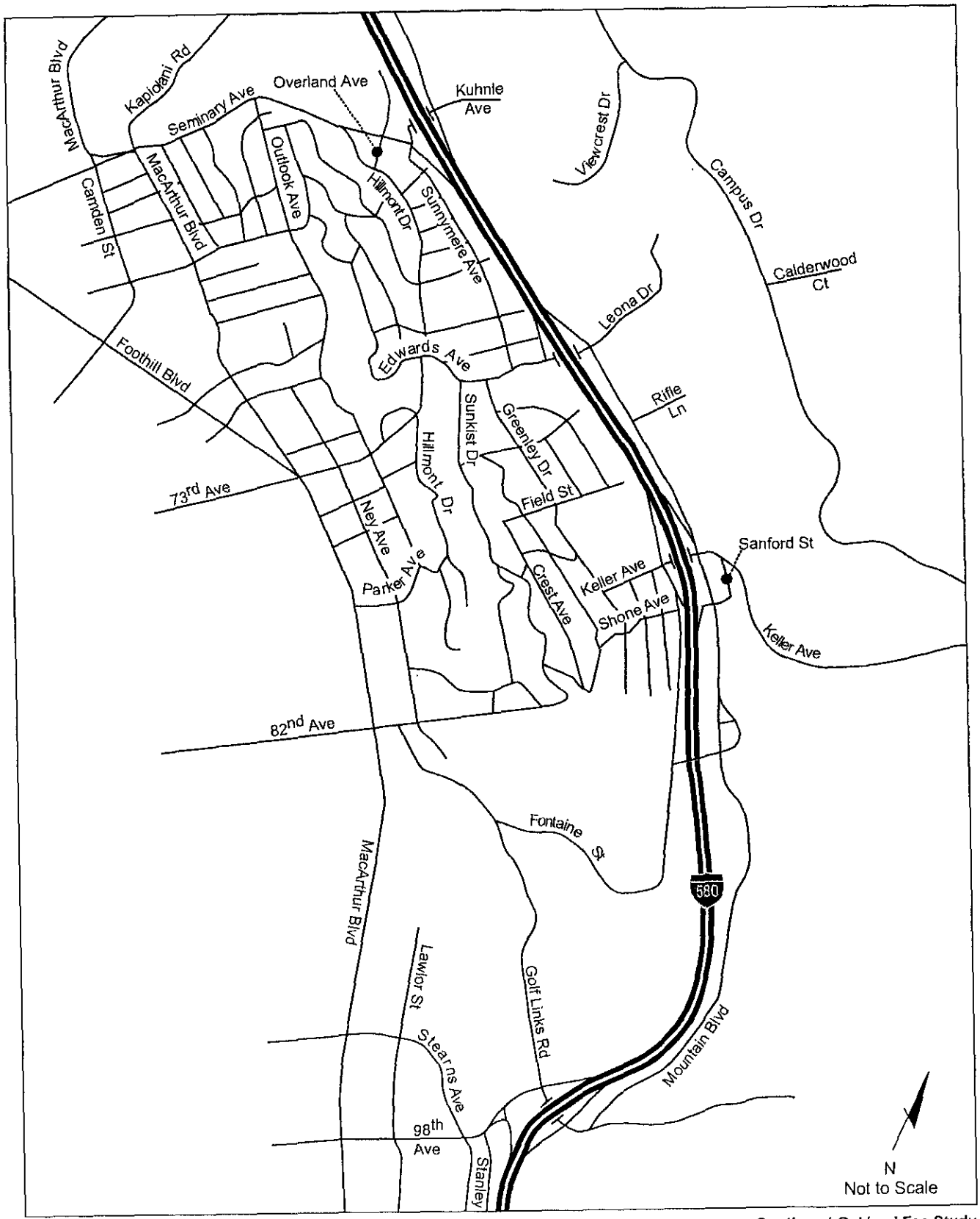
ORGANIZATION OF THE REPORT

This report contains a total of four chapters including this introductory chapter.

Chapter 2 – Fee Program Background provides an overview of fee programs and the factors considered in this analysis. A description of the projects proposed to be included in this TIF program is also included.

Chapter 3 – Analysis Methods and Results describes the technical analysis conducted to establish the nexus between local development and the costs of improvements, and presents the results of the fee calculations.

Chapter 4 – Findings reviews the study procedures and results in the context of the requirements of AB 1600.



Southeast Oakland Fee Study

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STUDY AREA

Figure 1

2. THE PROPOSED FEE PROGRAM

This chapter describes the impetus behind this proposed fee program and identifies the project locations covered by the Southeast Oakland TIF and TIP.

The Southeast Oakland TIF and TIP developed here is intended to assess the cost-sharing responsibilities for capital roadway improvements identified in the Leona Quarry EIR and in the Conditions of Approval for the Leona Quarry project. As specified in these documents and in the Leona Quarry Settlement Agreement, the following improvements will be included in the Southeast Oakland TIF and TIP[1]:

1. I-580 Westbound On-Ramp/Edwards Avenue/Mountain Boulevard: Install traffic signal and associated geometric changes.

2. I-580 Eastbound Off-Ramp/Edwards Avenue: Install traffic signal and associated geometric changes (including improvements to the Burckhalter Park driveway).

4. Greenly Drive/Edwards Avenue: Restripe Edwards Avenue to provide a separate westbound left-turn lane.

6. MacArthur Boulevard/Foothill Boulevard/73rd Avenue: Modify west leg to add a second eastbound left-turn lane.

7. Mountain Boulevard/Keller Avenue: Install traffic signal.

8. I-580 Westbound Off-Ramp/Mountain Boulevard/Shone Avenue: Install traffic signal.

9. I-580 Eastbound Off-Ramp/Keller Avenue: Install traffic signal.

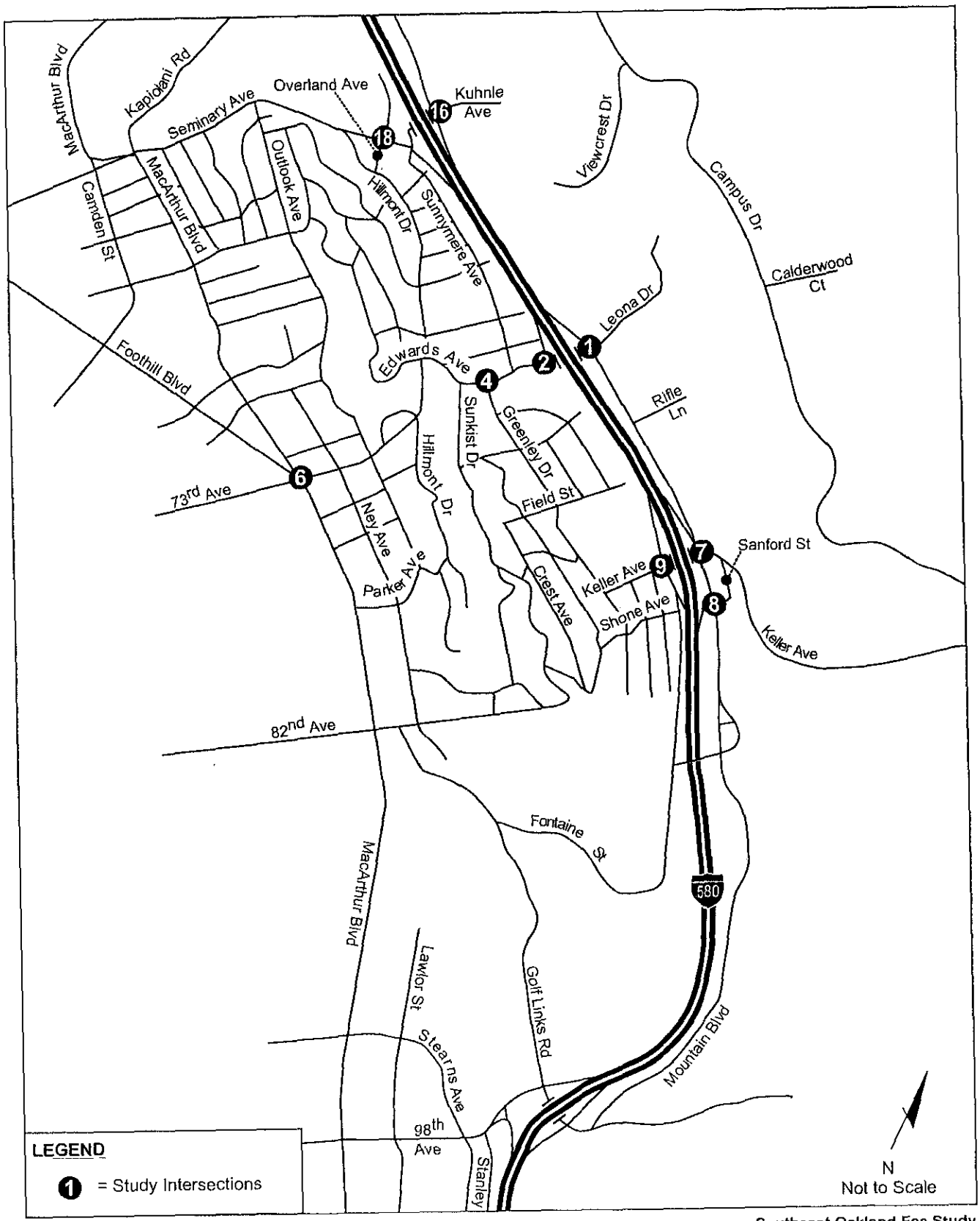
16. I-580 Westbound Off-Ramp/Seminary Avenue/Kuhnle Avenue: Install traffic signal and add second eastbound left-turn lane.

18. I-580 Eastbound Off-ramp/Seminary Avenue/Overdale Avenue: Install traffic signal.

In addition, Conditions of Approval #26g and #26h call for the TIF and TIP to include a study of other potential long-term operational improvements along the Edwards Avenue, 82nd Avenue, and Seminary Avenue routes, including any further intersection improvements in the Edwards Avenue corridor area beyond those identified in the Leona Quarry EIR. A more detailed description of this study is included in Appendix C.

The locations of these TIF and TIP projects are shown on Figure 2. The nexus analysis presented in the subsequent chapters calculates fees that can be collected to support improvements at these locations.

[1] Intersection numbering is consistent with that used in the Leona Quarry EIR.



Southeast Oakland Fee Study

FEHR & PEERS
TRANSPORTATION CONSULTANTS

SOUTHEAST OAKLAND TRAFFIC IMPROVEMENT FEE PROJECTS

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Figure 2

3. ANALYSIS METHODS AND RESULTS

The analysis methods used to determine the nexus between traffic impacts from new developments and the associated improvement measures are outlined in this chapter, along with the results of the fee calculations.

Step 1 – Review and Update Prior Traffic Analysis

The capital improvements to be included in this fee study were initially identified as mitigation measures in the Leona Quarry EIR. The analysis presented in the EIR was based on traffic forecasts derived from 2020 land use projections used in the Alameda County Congestion Management Agency (ACCMA) model. More recently, year 2025 ACCMA model land use projections have become available. For this study, an updated analysis using the most recent land use projections currently available was conducted to verify the applicability of the mitigation measures. The process of reviewing and updating the traffic analysis is described below. Appendix B provides further detail about the land use projections.

Existing Traffic Conditions

Existing peak hour operating conditions at the relevant study intersections from the Leona Quarry EIR are presented in Table 1. As shown in Table 1, the EIR analysis found that all intersections currently operate acceptably at LOS D or better during the morning and evening peak hours.

Future Traffic Conditions

As described above and in Appendix B, an updated future conditions analysis was conducted to ensure that the improvements called for in the Leona Quarry EIR would remain adequate to address future traffic demands. In this analysis, peak hour trips from new development in the study area were generated using rates from the Institute of Transportation Engineers (ITE) *Trip Generation*, 7th Edition and were added to the existing traffic volumes (a figure showing the resulting traffic volumes is included in Appendix D). The purpose of this analysis was to confirm that traffic from the new developments in the local study area would cause the need for improvements at the study intersections; to achieve this, no growth in traffic from outside the study area was assumed. In addition, we wanted to confirm that the mitigation measures proposed in the Leona Quarry EIR would be adequate to mitigate the projected deficiencies. A summary of these mitigation measures, which are the improvements included in this TIF and TIP, is provided in Table 2.

The resulting future peak hour traffic volumes were analyzed at each of the study locations, both with and without the specified mitigation measures, and the results are shown in Table 3. The results indicate that, with the addition of traffic from the new local developments ("Future Conditions"), all of the intersections would operate poorly, with levels of service at LOS E or F or with excessive queuing that would obstruct traffic flow. When the mitigation measures were applied ("Future With Mitigation"), all intersections would operate at LOS D or better, which is consistent with the City's standards. Thus, the capital improvements

identified for inclusion in the Southeast Oakland TIP/TIF will mitigate the traffic effects of new development in the area. Appendix D contains the detailed LOS analysis worksheets.

TABLE 1
EXISTING CONDITIONS
PEAK HOUR INTERSECTION LEVELS OF SERVICE

Intersection	AM Peak Hour		PM Peak Hour	
	Delay	LOS[1]	Delay	LOS[1]
Side-Street Stop-Controlled				
1. I-580 WB On-Ramp/Mountain Boulevard/Edwards Avenue	9.1	A	5.7	B
2. I-580 EB Off-Ramp/Edwards Avenue	3.9	A	3.6	A
8. Mountain Boulevard/I-580 WB Off-Ramp/Shone Avenue	4.4	A	6.3	B
16. I-580 WB Off-Ramp/Seminary Avenue/Kuhnle Avenue	8.6	B	8.2	B
18. I-580 EB Off-Ramp/Overdale Avenue/Seminary Avenue	4.2	A	9.1	B
All-Way Stop-Controlled				
7. Mountain Boulevard/Keller Avenue	13.6	C	12.8	C
9. I-580 EB Off-Ramp/Keller Avenue	7.9	B	14.7	C
Signalized				
4. Greenly Drive/Edwards Avenue	9.1	B	13.5	B
6. MacArthur Boulevard/73rd Avenue	28.6	D	27.2	D

Notes: LOS = Level of Service; WB = westbound; EB = eastbound

1. Based on *Highway Capacity Manual* (HCM) 1994 method for unsignalized and signalized intersection service levels.

Source: *Revised Draft Traffic Study for the Proposed Residential Development at Leona Quarry Site in the City of Oakland*, TJKM Transportation Consultants, June 7, 2002.

TABLE 2
SOUTHEAST OAKLAND TIF AND TIP PROJECT LIST

ID	Project	Description
1 (MM K.2a)	I-580 WB On-Ramp/ Mountain Boulevard/ Edwards Avenue	• Signalize intersection and coordinate with I-580 EB Off-Ramp/Edwards Avenue
2 (MM K.2b)	I-580 EB Off-Ramp/ Edwards Avenue	• Signalize intersection and coordinate with I-580 WB Off-Ramp/Edwards Avenue
4 (MM K.2c)	Greenly Drive/ Edwards Avenue	• Add westbound left-turn lane
6 (MM K.2d)	MacArthur Boulevard/ 73rd Avenue	• Add second eastbound left-turn lane
7 (MM K.2e)	Mountain Boulevard/ Keller Avenue	• Signalize intersection and coordinate with I-580 EB Off-Ramp/Keller Avenue • Re-stripe eastbound approach from one shared left/through/right lane to one shared left-turn/through lane and one shared through/right-turn lane • Re-stripe west leg of Keller Avenue from two lanes to one lane
8 (MM K.2f)	Mountain Boulevard/ I-580 WB Off-Ramp/ Shone Avenue	• Signalize intersection • Re-stripe existing right-turn only lane on I-580 WB off-ramp to shared left-turn/right-turn lane
9 (MM K.2g)	I-580 EB Off-Ramp/ Keller Avenue	• Signalize intersection and coordinate with Mountain Boulevard/Keller Avenue
16 (MM K.2h)	I-580 WB Off-Ramp/ Seminary Avenue/ Kuhnle Avenue	• Signalize intersection and coordinate with I-580 EB Off-Ramp/Overdale Avenue/Seminary Avenue and I-580 EB On-Ramp/Seminary Avenue/Kuhnle Avenue • Re-stripe eastbound Kuhnle Avenue to include two exclusive left-turn lanes and one through lane • Widen the north leg of Mountain Boulevard to one southbound lane and two northbound lanes
18 (MM K.2i)	I-580 EB Off-Ramp/ Overdale Avenue/ Seminary Avenue	• Signalize intersection and coordinate with I-580 WB Off-Ramp/Seminary Avenue/Kuhnle Avenue and I-580 EB On-Ramp/Seminary Avenue/Kuhnle Avenue
A (COA 26g/h)	Study of Edwards Avenue and Seminary Avenue operational improvements	• A study of other long-term operational traffic improvements along the Edwards Avenue, 82nd Avenue segment and Seminary Avenue routes, particularly the Foothill-82nd Avenue segment and the MacArthur-Seminary segment, including any further intersection improvements in the Edwards Avenue corridor area beyond those identified in the Leona Quarry EIR

Source: Leona Quarry EIR and Conditions of Approval (including Mitigation Measure (MM) identification numbers).

TABLE 3
FUTURE PEAK HOUR INTERSECTION LEVELS OF SERVICE
WITHOUT AND WITH MITIGATION

Intersection	Traffic Control[1]	AM Peak Hour				PM Peak Hour			
		Future		Future With Mitigation		Future		Future With Mitigation	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. I-580 WB On-Ramp/ Mountain Boulevard/ Edwards Avenue	Side Street Stop[2] (Signal[3])	>50 (NB)	F	15	B	>50 (NB)	F	11	B
2. I-580 EB Off-Ramp/ Edwards Avenue	Side Street Stop[2] (Signal[3])	41 (SB)	E	20	B	47 (SB)	E	19	B
4. Greenly Drive/ Edwards Avenue	Signal[3]	10	B	11	B	9	A[5]	13	B
6. MacArthur Boulevard/ 73rd Avenue	Signal[3]	>80	F	49	D	>80	F	55	D
7. Mountain Boulevard/ Keller Avenue	All-Way Stop[4] (Signal[3])	>50	F	12	B	>50	F	9	A
8. Mountain Boulevard/ I-580 WB Off-Ramp/ Shone Avenue	Side Street Stop[2] (Signal[3])	33 (EB)	D	8	A	>50 (EB)	F	9	A
9. I-580 EB Off-Ramp/ Keller Avenue	All-Way Stop[4] (Signal[3])	20	C	18	B	>50	F	20	B
16. I-580 WB Off-Ramp/ Seminary Avenue/ Kuhnle Avenue	Side Street Stop[2] (Signal[3]))	>50 (NB)	F	20	C	>50 (NB)	F	19	B
18. I-580 EB Off-Ramp/ Overdale Avenue/ Seminary Avenue	Side Street Stop[2] (Signal[3])	27 (NB)	C	7	A	>50 (NB)	F	11	B

Notes: LOS = Level of Service; NB = northbound; SB = southbound; WB = westbound; EB = eastbound.

1. Traffic control with mitigation shown in parenthesis.
2. Side-street stop-controlled intersection level of service based on worst approach delay per vehicle (in seconds), according to the *Highway Capacity Manual* (HCM) – *Special Report 209* (Transportation Research Board, 2000). The worst approach is indicated in parenthesis.
3. Signalized intersection level of service is based on average control delay per vehicle (in seconds), according to HCM 2000.
4. All-way stop-controlled intersection level of service is based on average delay per vehicle (in seconds), according to HCM 2000.
5. Westbound 95th percentile queue greater than 1,000 feet without mitigation.

Source: Fehr & Peers, 2006.

Step 2 – Summarize Capital Improvements and Estimate Costs

During preparation of the EIR and the Conditions of Approval, cost estimates were developed for the improvements identified in Chapter 2. The cost estimates have been reviewed and updated for the purposes of this TIF and TIP study, and are based on actual construction and design engineering costs (where available), current City fees, and local construction cost trends. Table 4 lists the proposed TIF/TIP improvements and their associated costs. The detailed cost estimate worksheets for each project are included in Appendix E.

TABLE 4
COST ESTIMATES FOR SOUTHEAST OAKLAND TIF/TIP IMPROVEMENTS

Location	Cost Estimate
1 and 2. I-580 WB On-Ramp/Edwards Avenue and I-580 EB Off-Ramp/Edwards Avenue	$961,300
4. Greenly Drive/Edwards Avenue	$107,800
6. MacArthur Boulevard/73rd Avenue	$622,300
7. Mountain Boulevard/Keller Avenue	$823,200
8. Mountain Boulevard/I-580 WB Off-Ramp/Shone Avenue	$409,100
9. I-580 EB Off-Ramp/Keller Avenue	$411,400
16. I-580 WB Off-Ramp/Seminary Avenue/Kuhnle Avenue	$757,000
18. I-580 EB Off-Ramp/Overdale Avenue/Seminary Avenue	$417,600
A. Study of Edwards Avenue and Seminary Avenue operational improvements	$350,000
Total Cost of Improvements	**$4,859,700**

Source: HQE, Incorporated, 2006; City of Oakland, 2006.

Step 3 – Summarize the Amount of New Development

For purposes of a fee calculation, it is important to identify the amount of future growth expected in the fee program area, in order to produce a reasonably accurate estimate of the new development that will be subject to the fee. Existing and future land use projections from the ACCMA model were used to determine the amount of new development expected in the TIF and TIP area.

The most recent available set of Oakland land use data from the Alameda County CMA model was used to estimate the total amount of new development expected in the TIF and TIP area. The ACCMA model projections were provided in four basic land use categories: residential dwelling units, retail jobs, service jobs, and manufacturing jobs. Because there are different traffic-generating characteristics from different housing types, the City requested that the residential land use projections be broken down into two

categories: traditional single-family dwelling units and other residential types. Many of the residential development projects being proposed in this area of the City involve duet homes, townhomes, or other attached residential types that may have somewhat different traffic characteristics from traditional single-family development. For the Leona Quarry development, it is known that the project includes 404 townhomes and 19 single-family dwellings. For all other areas in the Southeast Oakland TIF/TIP area, it was assumed that the future residential development would be 40% single-family and 60% other types, which is generally consistent with the current development plans for the Oak Knoll site. The resulting development projections are shown in Table 5. The program area is expected to grow by approximately 1,400 residential units over the next 20 years; most of those new units are expected to be in the Leona Quarry and the Oak Knoll development areas. Employment is expected to grow by about 850 jobs, with most of the additional employment expected in the southernmost part of the TIF and TIP area, west of I-580 and south of 98th Avenue.

The concept of Dwelling Unit Equivalents (DUEs) is commonly used in fee studies to account for the fact that different development types generate traffic with different characteristics and with different levels of impact on the city's transportation system. DUE conversion factors typically account for differences in peak hour trip rates for each development type, as well as the effects of pass-by trips that are often associated with commercial uses. For example, retail uses tend to generate more trips per square foot than office uses, but those retail trips tend to be shorter in length because people often visit several retail establishments during the course of a single trip, or stop by a retail business on their way to their final destination. The DUE conversion process accounts for these differences in impact on the transportation system.

The DUE factors developed for the Southeast Oakland TIF/TIP are shown in Table 6, and reflect the PM peak hour trip rates published in the Institute of Transportation Engineer's (ITE's) *Trip Generation* Manual, 7th Edition and the percentage of new trips (i.e., excluding pass-by trips) published in the San Diego Association of Governments (SANDAG) *Brief Guide of Vehicular Traffic Generation Rates*, July 1998. The results were normalized to the single-family dwelling unit rate to produce a DUE per unit rate for each land use category.

The projected growth in each land use category shown in Table 5 was multiplied by the DUE conversion factors shown in Table 6, and the resulting total number of DUEs by category is shown in Table 7. Appendix B provides detailed land use and DUE results for each traffic analysis zone in the Southeast Oakland TIF/TIP area.

TABLE 5
SOUTHEAST OAKLAND TIF AND TIP AREA HOUSING AND EMPLOYMENT PROJECTIONS

Land Use Category	Projected Growth
Single-Family Residential Units	422
Other Residential Units	1,008
Retail Jobs	481
Service Jobs	387
Manufacturing Jobs	0

Source: Hausrath Economics Group, 2005.

TABLE 6
DUE CONVERSION FACTORS

Land Use Category	Unit	PM Peak Hour Trip Rate[1]	% New Trips[2]	DUE per Unit
Single-Family Residences	Dwelling Unit	1.01	100%	1.00
Other Residences	Dwelling Unit	0.78	100%	0.77
Retail	Job	1.13	50%	0.56
Service	Job	0.46	65%	0.30
Manufacturing	Job	0.42	80%	0.33

Notes:

1. PM peak hour trip rates from ITE Trip Generation, 7th Edition, using the following categories:
   ITE #210: Single-Family Detached Housing used for Single-Family Residential category
   ITE #231: Low-Rise Residential Condo/Townhouse used for Other Residential category
   ITE #820: Shopping Center used for Retail Jobs category
   ITE #710: General Office Building used for Service Jobs category
   ITE #110: General Light Industrial used for Manufacturing Jobs category
2. SANDAG Brief Guide of Vehicular Traffic Generation Rates, July 1998.

Source: Fehr & Peers, 2006.

TABLE 7
GROWTH CONVERTED TO DUES

Land Use Category	Total Growth	DUE Per Unit	Growth Converted to DUEs
Single-Family Residential Units	422	1.00	422
Other Residential Units	1,008	0.77	777
Retail Jobs	481	0.56	270
Service Jobs	387	0.30	115
Manufacturing Jobs	0	0.33	0
TOTAL DUEs			***1,584***

Source: Fehr & Peers, 2006.

Step 4 – Determine Fee Amounts

To determine the appropriate fee amounts assessed to individual developments, the total cost of the capital improvements (Step 2) was divided by the total number of new DUEs (Step 3). Table 8 displays the calculated impact fees by land use category. The total cost of the TIF and TIP improvement projects as shown in Table 4 ($4,859,700) was divided by the total number of DUEs expected in the program area as shown in Table 7 (1,584) to calculate the resulting fee per DUE ($3,068). An administration fee of 3% was added, to bring the final total fee to $3,160 per DUE. These figures do not reflect any reductions or subsidies that the City may choose to implement.

TABLE 8
PRELIMINARY SOUTHEAST OAKLAND TIF AND TIP FEE CALCULATIONS

Land Use Category	Fee/Unit
Single-Family Residential	$3,160/Unit
Other Residential	$2,440/Unit
Retail	$5.89/Square Foot
Service	$3.12/Square Foot
Manufacturing	$1 44/Square Foot

Source: Fehr & Peers, 2006.

4. FINDINGS

This report provides a detailed discussion of the elements of the proposed Southeast Oakland TIF and TIP and explains the analytical techniques used to develop this nexus study. The report addresses all the fee program elements required by AB 1600, as described below:

Identifying the purpose of the fee

The purpose of the Southeast Oakland TIF and TIP is to mitigate the traffic impacts of new development within the study area, by developing an overall transportation system that will accommodate the expected future traffic demand. Specifically, there are a number of intersections where traffic operations are expected to deteriorate with the addition of traffic from new development in the study area. Table 3 provides the traffic operations analysis results for these intersections and identifies the operations problems that are expected to occur if mitigation measures are not implemented. This TIF program is designed to fund the necessary mitigation measures and ensure that the traffic operations at the affected intersections remain within the City's standards.

Identifying how the fee will be used and the facilities to be funded through the fee

Revenues from the Southeast Oakland TIF and TIP will be used to fund capital improvement projects necessary to accommodate future traffic demand in the study area. These projects include such improvements as the installation and coordination of traffic signals, the provision of additional turn lanes, and/or the reconfiguration of lane geometries at nine different intersections throughout the study area. Table 2 describes all of the capital improvement projects to be funded through the fee program, and Table 4 summarizes the costs of those improvements. The TIF and TIP will be administered by the City of Oakland Public Works Agency.

Determining a reasonable relationship between the fee's use and the type of development on which the fee is imposed

Different types of development generate traffic with different characteristics and the nexus analysis presented in this report accounts for the differential impact on the local street system caused by different development types. Tables 5, 6 and 7 and the accompanying text describe the amount of new development of different types expected in the Southeast Oakland area over the next 20 years, including residential, retail, and professional/service types of uses. The traffic generated by these new uses will have effects on the nine intersections described above; the proposed fee levels are set such that each development type pays a fee that reflects its share of traffic contributions to the local transportation system.

Determining a reasonable relationship between the need for the public facility and the type of development on which the fee is imposed

The need for the capital improvements listed in Table 2 was established in the Leona Quarry EIR. This report confirms that the mitigation measures identified in that EIR would adequately address the expected traffic operations issues (through the analysis described in Chapter 3, Step 1) by determining that implementation of the improvements would return the traffic operations at the nine affected intersections to within the City's standards. Table 1 shows there are no existing deficiencies on any of the facilities to be included in this TIF program, indicating that the need for

improvements at these locations is attributable to traffic generated by new development. As described above, the proposed fee levels are set such that each development type pays a fee that reflects its share of traffic contributions to the local transportation system.

Determining a reasonable relationship between the amount of the fee and the cost of the public facility (or portion of facility) attributable to new development

The nine intersections included in this study currently operate within the City's standards, indicating that there are no existing deficiencies at the improvement locations included in the TIF program. Further, the analysis presented in Table 3 shows that traffic generated by the new development expected in the Southeast Oakland TIF program area will cause operational deficiencies at the study locations; those deficiencies are mitigated by the identified capital improvement projects. Thus, the TIF program is targeted toward the public improvements necessary to accommodate the traffic generated by new development within the program area.

The cost estimates for the capital improvement projects have been carefully developed and reviewed to ensure that all reasonably anticipated cost elements have been accounted for, thus ensuring that implementation of the improvements will be supported by the fee revenues received. The projected costs are then distributed among the different development types in proportion to their respective traffic generating characteristics, resulting in the proposed fee for each land use category.

APPENDIX A:
SUMMARY OF FEE PROGRAMS IN OTHER JURISDICTIONS

Appendix A

Currently, the City of Oakland does not collect transportation related impact fees for new development, although the city does charge fees for other purposes, such as affordable housing. For purposes of information and comparison, Tables A-1 and A-2 summarize citywide development fees and transportation related development fees in other Northern California jurisdictions.

TABLE A-1

TOTAL IMPACT FEES[1]

City	Single Family Dwelling Unit	Multi-Family Dwelling Unit	General Office[2] (per ksf)	Restaurant[2] (per ksf)	Retail[2] (per ksf)
Alameda	$3,229	$2,644	$3,378	$3,485	$3,485
Berkeley	$4,695	$1,947	$12,253	$48,910	$63,541
Concord	$27,323	$26,823	$6,754	$8,234	$8,234
Emeryville	$7,239	$2,643	$5,370	$8,624	$6,923
Fremont	$25,049	$16,938	$5,975	$7,732	$5,903
Sacramento	$6,505	$4,934	$3,148	$1,033	$1,033
San Francisco	$23,270	$23,270	$22,000	$10,000	$12,000
San Jose	$26,716	$24,090	$14,246	$3,806	$3,806
Average	$15,503	$12,911	$9,140	$11,478	$13,116
Minimum	$3,229	$1,947	$3,148	$1,033	$1,033
Maximum	$27,323	$26,823	$22,000	$48,910	$63,541

Notes:

1. Total impact fee includes transportation impact fee and other development fees for parks, affordable housing, child care, sewer, drainage, fire, public facilities, etc. (building permit and plan check fees are excluded, as are fees collected by school districts or other outside agencies).
2. Calculation based on gross floor area.

Source: Fehr & Peers and HQE, Inc, March 2006.

TABLE A-2

TRANSPORTATION IMPACT FEES

City	Single Family Dwelling Unit	Multi-Family Dwelling Unit	General Office[1] (per ksf)	Restaurant[1] (per ksf)	Retail[1] (per ksf)
Alameda[2]	$1,128	$866	$3,040	$3,140	$3,140
Berkeley	$4,695	$1,947	$7,253	$43,910	$58,541
Concord	$2,588	$2,088	$5,920	$7,400	$7,400
Emeryville	$1,976	$1,384	$1,970	$5,224	$3,523
Fremont	$2,513	$1,949	$5,000	$6,360	$5,000
Sacramento	$380	$316	$318	$600	$600
San Francisco	-	-	$10,000	$10,000	$10,000
San Jose	$6,994	$5,596	$10,440	-	-
Average	$2,534	$1,768	$5,493	$9,579	$11,026
Minimum	$380	$316	$318	$600	$600
Maximum	$6,994	$5,596	$10,440	$43,910	$58,541

Notes:

1. Calculation based on gross floor area.
2. City of Alameda Transportation Fee estimated based on discussion with city staff.

Source: Fehr & Peers and HQE, Inc, March 2006.

APPENDIX B:
TIF AND TIP AREA AND LAND USE PROJECTIONS

TIF and TIP Area

Figure B-1 presents a detailed view of the TIF and TIP area, including the numbers of the TAZs from the Alameda County CMA model that are within the program area.

Review of Land Use Projections

We compared the land use forecasts used in the Leona Quarry EIR with the most recent set available from the City's economic consultant (referred to as the Kaiser EIR dataset). The Leona Quarry EIR dataset projected to the year 2020, while the Kaiser EIR projected to 2025. Comparisons of household and employment totals for the study area from each dataset's respective horizon year showed very small differences of about 1% for households and 1.4% for employment. A summary of these comparisons is provided in Table B-1.

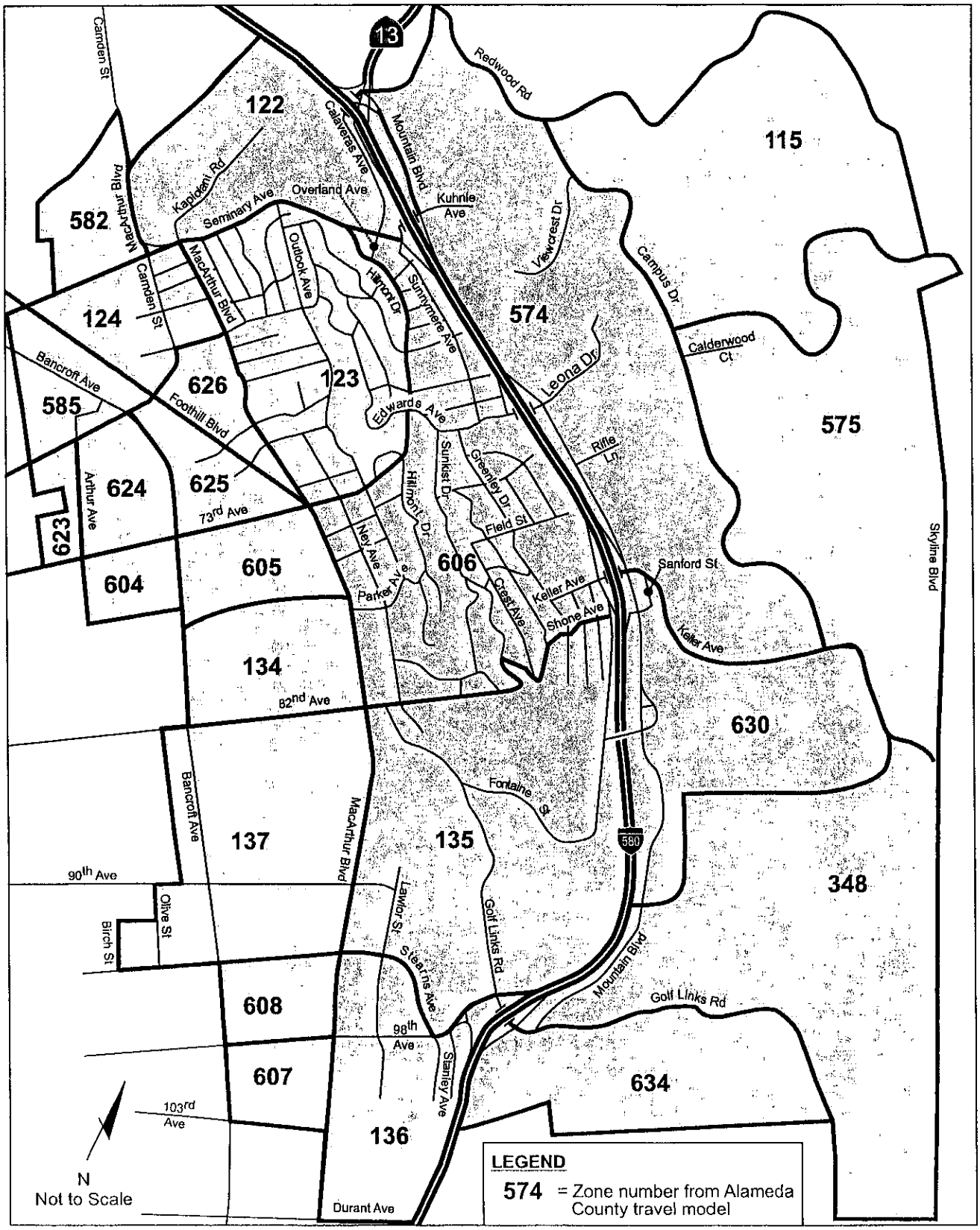
In a zone-by-zone comparison, the larger differences between the two datasets occur primarily in zones 135 and 136, which are in the far southern part of the study area and are unlikely to have much impact on travel through the intersections included in this traffic impact fee. Zone 123, located just south of Seminary Avenue near the Seminary interchange, also shows some increase in households, but that appears to be simply a recalibration of existing conditions; no growth in households is projected between the base year and the horizon year in either of the two datasets.

Based on this review, it was reasonable to conclude that the most recent set of land use projections are not substantially different from the projections used in the Leona Quarry EIR and thus would not substantially change the traffic forecasts in the study area.

Estimate of New Development in TIF Program Area

Existing and future land use projections from the CMA model were used to determine the amount of new development expected in the TIF program area. For each of the traffic analysis zones (TAZs) in the study area, the change in land use from the 2005 to the 2025 CMA model represents the expected amount of new development. Non-residential conversions were made in accordance with the Memorandum on *Revisions to Estuary Plan for Traffic Modeling* from Barry Miller, March 15, 1999 which consolidated non-residential land use projections into the following categories: manufacturing jobs, retail jobs and service jobs. Table B-2 presents the change in land use projected for each TAZ in the TIF program area.

Table B-3 presents more specific land use category conversion factors based on the Barry Miller memorandum that may prove useful in applying the fee to specific development applications.



Southeast Oakland Fee Study

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TRANSPORTATION CONSULTANTS

SOUTHEAST OAKLAND TIF PROGRAM AREA

September 2006
2176-B1

Figure B-1

TABLE B-1

COMPARISON OF LEONA QUARRY EIR AND KAISER EIR LAND USE PROJECTIONS

TAZ	Leona Quarry EIR				Kaiser EIR				Difference (Kaiser - Leona)			
	Total Households		Total Employment		Total Households		Total Employment		Total Households		Total Employment	
	2005	2020	2005	2020	2005	2025	2005	2025	2005	2020 or 2025	2005	2020 or 2025
115	485	485	647	677	481	502	647	677	-4	17	0	0
122	47	47	878	958	43	43	878	958	-4	-4	0	0
123	871	871	648	696	976	976	548	596	105	105	-100	-100
124	546	546	254	254	514	514	294	294	-32	-32	40	40
134	626	626	63	73	646	665	63	63	20	39	0	-10
135	779	865	296	170	606	606	96	86	-173	-259	-200	-84
136	255	255	540	765	196	364	561	1,058	-59	109	21	293
137	253	253	4	4	319	319	4	4	66	66	0	0
348	1,257	1,257	211	214	1,168	1,168	211	214	-89	-89	0	0
574	1,357	1,754	67	96	1,178	1,667	67	72	-179	-87	0	-24
575	631	631	0	0	707	707	0	0	76	76	0	0
582	494	494	42	42	496	496	42	42	2	2	0	0
585	655	655	37	43	746	777	37	43	91	122	0	0
604	212	212	0	0	222	222	0	0	10	10	0	0
605	563	563	56	76	545	545	56	76	-18	-18	0	0
606	1,134	1,134	30	41	1,090	1,090	30	37	-44	-44	0	-4
607	301	339	51	42	343	350	51	42	42	11	0	0
608	312	312	4	14	352	386	4	7	40	74	0	-7
623	354	354	13	13	317	317	14	14	-37	-37	1	1
624	434	434	99	99	436	436	99	99	2	2	0	0
625	105	162	1,395	1,471	70	128	1,395	1,471	-35	-34	0	0
626	170	170	109	115	182	231	100	100	12	61	-9	-15
630	170	718	188	253	212	766	188	253	42	48	0	0
634	0	0	319	347	1	1	319	347	1	1	0	0
Total	**12,011**	**13,137**	**5,951**	**6,463**	**11,846**	**13,276**	**5,704**	**6,553**	**-165**	**139**	**-247**	**90**

Source: Hausrath Economics Group, 2005.

TABLE B-2

FORECASTED GROWTH IN STUDY AREA

TAZ	Estimated Growth (2005-2025) [1]				Estimated Growth in DUEs (2005-2025) [4]				
	Total Residential Units[2]	Employment[3]			Single-Family Residential	Other Residential	Employment		Total
		Manufacturing	Retail	Service			Retail	Service	
115	21	0	0	30	8	10	0	9	27
122	0	0	0	80	0	0	0	24	24
123	0	0	5	43	0	0	3	13	16
124	0	0	0	0	0	0	0	0	0
134	19	0	0	0	8	8	0	0	16
135	0	0	0	0	0	0	0	0	0
136	168	0	376	121	67	78	210	36	391
137	0	0	0	0	0	0	0	0	0
348	0	0	0	3	0	0	0	1	1
574	489	0	0	5	45	343	0	1	389
575	0	0	0	0	0	0	0	0	0
582	0	0	0	0	0	0	0	0	0
585	31	0	0	6	12	15	0	2	29
604	0	0	0	0	0	0	0	0	0
605	0	0	10	10	0	0	6	3	9
606	0	0	0	7	0	0	0	2	2
607	7	0	0	0	3	3	0	0	6
608	34	0	0	3	14	15	0	1	30
623	0	0	0	0	0	0	0	0	0
624	0	0	0	0	0	0	0	0	0
625	58	0	48	28	23	27	27	8	85
626	49	0	0	0	20	22	0	0	42
630	554	0	30	35	222	256	17	10	505
634	0	0	12	16	0	0	7	5	12
Grand Total	***1,430***	***0***	***481***	***387***	***422***	***777***	***270***	***115***	***1,584***

Notes:

1. Growth calculated as the difference between year 2005 and 2025 land use projections from the Kaiser EIR, as shown in Table B-1.
2. Total Residential Units were divided into Single-Family and Other Residential as follows: For Leona Quarry development, assumed 19 single-family and 404 other. For all other development areas, assumed 40% single-family and 60% other.
3. The CMA model land use category "Other" was divided into the fee program Retail and Service land use categories (50% Retail and 50% Service).
4. Growth was converted to DUEs based on the factors provided in Table 6 of the report, then rounded to the nearest whole DUE.

Source: Fehr & Peers, 2006.

TABLE B-3
LAND USE CONVERSION FACTORS

Land Use Category	Unit	Size/Employee	DUE Category Employment /Employee[1]		
			Manufacturing	Retail	Service
Office	sf	300	0.5	0.25	0.25
Retail	sf	300	0	0.5	0.5
Dining	sf	300	0	0.5	0.5
Entertainment	sf	300	0	0.5	0.5
Wholesale	sf	750	0	0.75	0.25
Off-price Retail	sf	750	0	0.75	0.25
Warehousing	sf	1500	0	0.5	0.5
Light Industry	sf	750	1	0	0
Heavy Industry	sf	1000	1	0	0
Public Use	sf	1000	0	0.5	0.5

Notes:

1. The consolidated CMA model land use category "Other" was divided into the fee program Retail and Service land use categories (50% Retail and 50% Service).

Source: Barry Miller, *Revisions to Estuary Plan for Traffic Modeling Memorandum*, March 15, 1999.

APPENDIX C:
DESCRIPTION OF EDWARDS/SEMINARY CORRIDOR STUDY

DESCRIPTION OF EDWARDS/SEMINARY CORRIDOR STUDY

Leona Quarry COA & MMRP 26g and 26h - Preliminary Study Scope

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The Leona Quarry COA & MMRP 26g and 26h call for a study of other long-term operational improvements along the Edwards Avenue, 82nd Avenue segment and Seminary Avenue routes, particularly the Foothill Boulevard-82nd Avenue segment and the MacArthur Boulevard-Seminary Avenue segment and including any further intersections improvements in the Edwards Avenue corridor area beyond those identified in the Leona Quarry EIR. The preliminary scope is listed below. Note that a more detailed study scope will need to be developed in the future.

Study Purpose
The purpose of the study is to identify, package and prioritize traffic capacity, safety and calming improvements for the above-referenced roadways and potential cross-connectors under existing and 2025 conditions. The study is needed because several intersections and roadways, including arterial, collector and local streets, are projected to operate at unacceptable levels of service under 2025 conditions. The study must answer the concerns of the community regarding congestion and safety on the area roadways due to through traffic and traffic diversion onto local residential streets between I-580 and the Airport/Coliseum area as well as growth from nearby cumulative development. The recommended improvements will be presented to the City Council to request authorization to incorporate them into a previously approved Traffic Improvement Fee/Traffic Improvement Program, if any.

Study Breadth/Influence Area
The study area includes a local roadway network bounded by I-580 to the north, Foothill Boulevard and MacArthur Boulevard to the south, Seminary Avenue to the west and Golf Links Road/82nd Avenue to the east, and includes potential cross-connectors, such as Sunnymere Avenue, because these are routes that provide access between I-580 and the Coliseum/Airport Area, similar to Edwards Avenue. Study intersections and roadway segments include both signalized and unsignalized intersections as well as local, collector, and arterial roadways as follows:

<u>Edwards Avenue at and between</u>
Sunnymere Avenue
Greenly Drive
Sunkist Drive
Hillmont Drive
Outlook Avenue
Lacey/Ney Avenue

<u>Seminary Avenue at and between</u>
Outlook Avenue
MacArthur Boulevard
Camden Street
Foothill Boulevard

<u>Golf Links Road/82nd Ave at and between</u>
Fontaine Street
82nd Avenue
MacArthur Boulevard

<u>Sunnymere Avenue at and between</u>
Seminary Avenue and Edwards Avenue

<u>Hillmont Drive at and between</u>
Seminary Avenue and 75th Avenue

<u>Outlook Avenue at and between</u>
Seminary Avenue and Parker Avenue

<u>Greenly Drive at and between</u>
Edwards Avenue and Keller Avenue

Sunkist Drive at and between
Edwards Avenue and 82nd Avenue

Ney Avenue at and between
Edwards Avenue and 82nd Avenue

Keller Avenue at and between
Fontaine Street and Greenly Drive

Fontaine Street at and between
Keller Avenue
Crest Avenue
Golf Links Road

MacArthur Boulevard at and between
Seminary Avenue
64th Avenue
68th Avenue
73rd Avenue
75th Avenue
Parker Avenue
Ritchie Street
82nd Avenue

Foothill Boulevard at and between
Seminary Avenue
Camden Street
68th Avenue

Camden St at and between
Seminary Avenue
64th Avenue
Foothill Boulevard

68th Avenue at and between
Outlook Avenue
MacArthur Boulevard
Foothill Boulevard

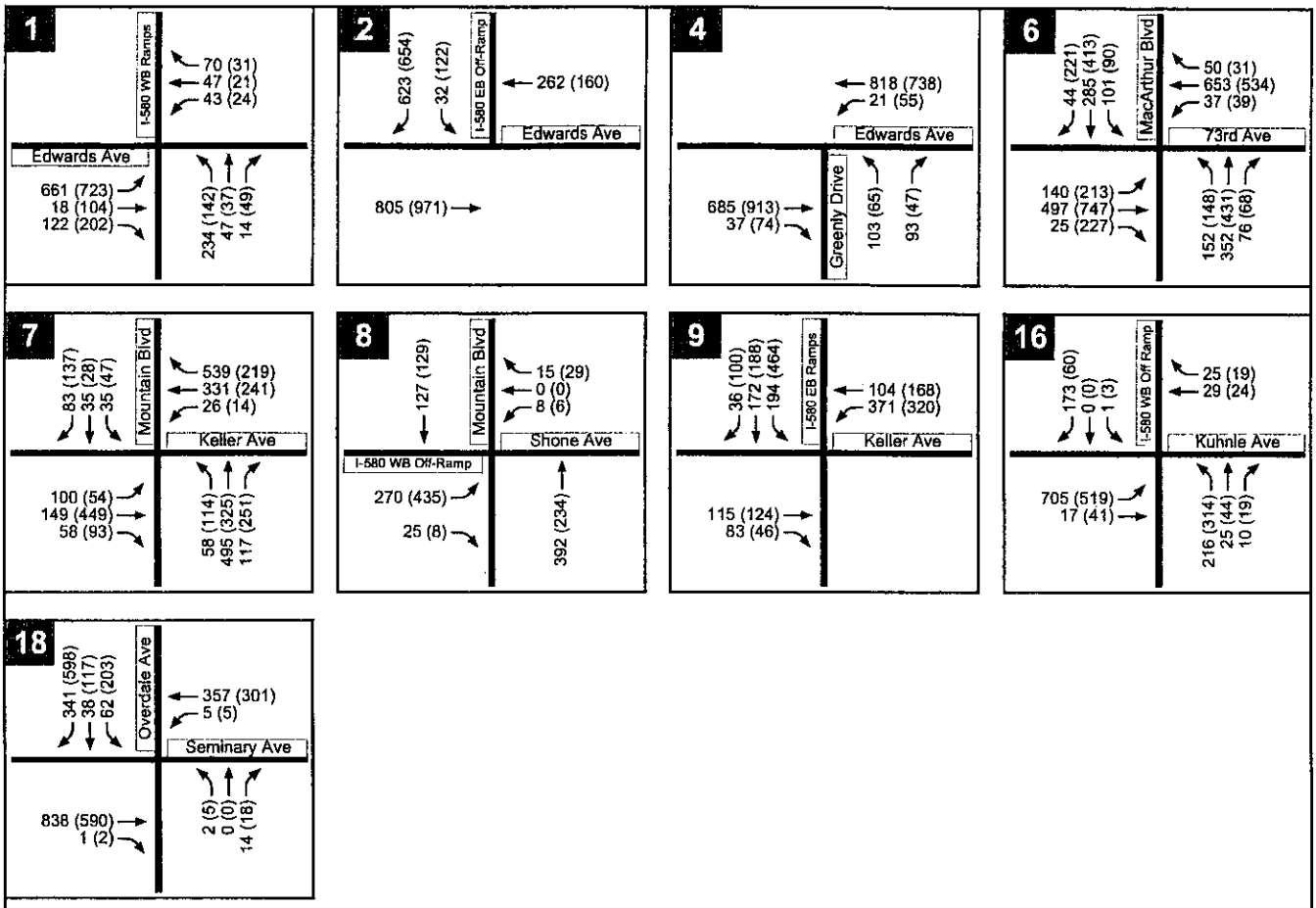
64th Avenue at and between
Outlook Avenue
MacArthur Boulevard
Camden Boulevard
Foothill Boulevard

The alternatives to be analyzed include existing and 2025 conditions with and without improvements, including two alternative improvement scenarios, during the a.m. and p.m. peak periods. The measures of effectiveness include level of service, speed, travel time, travel distance, traffic volumes, volume-to-capacity ratio, delay, queue lengths, number of stops, collisions, and benefit/cost ratio.

Study Approach/Model

The community is concerned about through traffic and traffic diversion to local residential streets between I-580 and the Airport/Coliseum area as well as growth from nearby cumulative development. A regional travel demand model would probably not be adequate to estimate traffic diversion on potential cut-through routes on a series of local residential streets because it would not be able to model the various types of traffic control and calming devices along these streets. Analytical Highway Capacity Manual (HCM) methods could estimate the capacity measures of effectiveness; however, they cannot estimate the effect queuing and traffic diversion. A study that uses both HCM analytical techniques and microsimulation techniques would probably best suit the needs of this study. The recommended software that incorporates both techniques is Snychro/SimTraffic.

APPENDIX D:
DETAILED TRAFFIC LEVEL OF SERVICE ANALYSIS WORKSHEETS



KEY:

XX (YY) = AM (PM) Peak Hour Traffic Volumes

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September 2006
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Southeast Oakland Fee Study

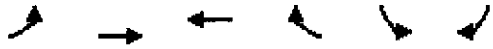
FUTURE PEAK HOUR TRAFFIC VOLUMES AT STUDY INTERSECTIONS

Figure D-1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	661	18	122	43	47	70	234	47	14	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	734	20	136	48	52	78	260	52	16	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1252										
pX, platoon unblocked												
vC, conflicting volume	130			156			1704	1782	88	1678	1772	52
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	130			156			1704	1782	88	1678	1772	52
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	50			97			0	0	98	0	100	100
cM capacity (veh/h)	1455			1425			43	39	971	0	40	1015

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	734	156	100	78	260	68
Volume Left	734	0	48	0	260	0
Volume Right	0	136	0	78	0	16
cSH	1455	1700	1425	1700	43	50
Volume to Capacity	0.50	0.09	0.03	0.05	6.12	1.35
Queue Length 95th (ft)	74	0	3	0	Err	156
Control Delay (s)	10.0	0.0	3.8	0.0	Err	377.8
Lane LOS	A		A		F	F
Approach Delay (s)	8.2		2.1		8009.5	
Approach LOS					F	

Intersection Summary			
Average Delay	1886.7		
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↰	↱
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	805	262	0	32	623
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	894	291	0	36	692
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		936				
pX, platoon unblocked					0.75	
vC, conflicting volume	291				1186	291
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	291				1247	291
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				75	7
cM capacity (veh/h)	1271				144	748

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	894	291	36	692
Volume Left	0	0	36	0
Volume Right	0	0	0	692
cSH	1700	1700	144	748
Volume to Capacity	0.53	0.17	0.25	0.93
Queue Length 95th (ft)	0	0	23	325
Control Delay (s)	0.0	0.0	38.1	40.8
Lane LOS			E	E
Approach Delay (s)	0.0	0.0	40.7	
Approach LOS			E	

Intersection Summary			
Average Delay	15.5		
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1850			1860	1699	
Flt Permitted	1.00			0.98	0.97	
Satd. Flow (perm)	1850			1818	1699	
Volume (vph)	685	37	21	818	103	93
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	761	41	23	909	114	103
RTOR Reduction (vph)	2	0	0	0	49	0
Lane Group Flow (vph)	800	0	0	932	168	0
Turn Type			pm+pt			
Protected Phases	4		3	8	2	
Permitted Phases			8			
Actuated Green, G (s)	45.1			45.1	11.0	
Effective Green, g (s)	46.1			46.1	12.0	
Actuated g/C Ratio	0.70			0.70	0.18	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1290			1268	308	
v/s Ratio Prot	0.43				c0.10	
v/s Ratio Perm				c0.51		
v/c Ratio	0.62			0.74	0.55	
Uniform Delay, d1	5.3			6.2	24.6	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	2.2			2.2	2.0	
Delay (s)	7.6			8.5	26.5	
Level of Service	A			A	C	
Approach Delay (s)	7.6			8.5	26.5	
Approach LOS	A			A	C	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			0.95			0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99			0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1843			3425			3494	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1843			3425			3494	1583
Volume (vph)	140	497	25	37	653	50	152	352	76	101	285	44
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	156	552	28	41	726	56	169	391	84	112	317	49
RTOR Reduction (vph)	0	0	18	0	2	0	0	9	0	0	0	0
Lane Group Flow (vph)	156	552	10	41	780	0	0	635	0	0	429	49
Turn Type	Prot		Perm	Prot			Split			Split		Free
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4									Free
Actuated Green, G (s)	5.0	45.5	45.5	32.5	73.0			18.0			15.0	131.0
Effective Green, g (s)	6.0	46.5	46.5	33.5	74.0			19.0			16.0	131.0
Actuated g/C Ratio	0.05	0.35	0.35	0.26	0.56			0.15			0.12	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	81	661	562	453	1041			497			427	1583
v/s Ratio Prot	c0.09	c0.30		0.02	c0.42			c0.19			c0.12	
v/s Ratio Perm			0.01									0.03
v/c Ratio	1.93	0.84	0.02	0.09	0.75			1.28			1.00	0.03
Uniform Delay, d1	62.5	38.7	27.4	37.1	21.5			56.0			57.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	458.7	9.0	0.0	0.1	4.9			139.5			44.7	0.0
Delay (s)	521.2	47.7	27.4	37.2	26.4			195.5			102.2	0.0
Level of Service	F	D	C	D	C			F			F	A
Approach Delay (s)		147.3			27.0			195.5			91.7	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	112.0	HCM Level of Service	F
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	131.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	100	149	58	26	331	539	58	495	117	35	35	83
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	111	166	64	29	368	599	64	550	130	39	39	92

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	341	397	599	339	405	78	92
Volume Left (vph)	111	29	0	64	0	39	0
Volume Right (vph)	64	0	599	0	130	0	92
Hadj (s)	-0.01	0.07	-0.67	0.13	-0.19	0.28	-0.67
Departure Headway (s)	8.2	8.2	7.5	8.3	8.0	9.7	8.7
Degree Utilization, x	0.78	0.91	1.25	0.78	0.90	0.21	0.22
Capacity (veh/h)	430	431	487	428	439	352	388
Control Delay (s)	34.9	51.0	150.0	33.9	47.8	14.0	13.1
Approach Delay (s)	34.9	110.6		41.5		13.5	
Approach LOS	D	F		E		B	

Intersection Summary			
Delay	68.9		
HCM Level of Service	F		
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	270	0	25	8	0	15	0	392	0	0	127	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	300	0	28	9	0	17	0	436	0	0	141	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	593	577	141	604	577	436	141			436		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	593	577	141	604	577	436	141			436		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	26	100	97	98	100	97	100			100		
cM capacity (veh/h)	406	428	907	397	428	621	1442			1124		

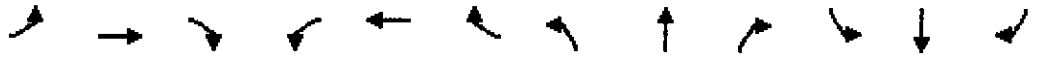
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	300	28	26	436	141
Volume Left	300	0	9	0	0
Volume Right	0	28	17	0	0
cSH	406	907	519	1700	1700
Volume to Capacity	0.74	0.03	0.05	0.26	0.08
Queue Length 95th (ft)	147	2	4	0	0
Control Delay (s)	35.1	9.1	12.3	0.0	0.0
Lane LOS	E	A	B		
Approach Delay (s)	32.9		12.3	0.0	0.0
Approach LOS	D		B		

Intersection Summary			
Average Delay	11.9		
Intersection Capacity Utilization	48.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	115	83	371	104	0	0	0	0	194	172	36
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	128	92	412	116	0	0	0	0	216	191	40

Direction, Lane #	EB 1	WB 1	WB 2	SB 1	SB 2
Volume Total (vph)	220	412	116	311	136
Volume Left (vph)	0	412	0	216	0
Volume Right (vph)	92	0	0	0	40
Hadj (s)	-0.22	0.53	0.03	0.38	-0.17
Departure Headway (s)	6.6	6.9	6.4	7.1	6.5
Degree Utilization, x	0.40	0.79	0.21	0.61	0.25
Capacity (veh/h)	521	513	544	486	527
Control Delay (s)	13.9	30.0	9.8	19.5	10.5
Approach Delay (s)	13.9	25.6		16.7	
Approach LOS	B	D		C	

Intersection Summary			
Delay	20.1		
HCM Level of Service	C		
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	705	17	0	0	29	25	216	25	10	1	0	173
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	783	19	0	0	32	28	240	28	11	1	0	192
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	60			19			1824	1646	19	1657	1632	46
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			19			1824	1646	19	1657	1632	46
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	49			100			0	43	99	96	100	81
cM capacity (veh/h)	1544			1598			29	49	1059	27	50	1023

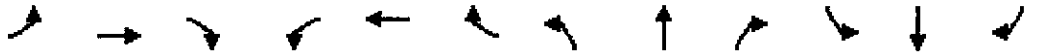
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	783	19	60	240	39	193
Volume Left	783	0	0	240	0	1
Volume Right	0	0	28	0	11	192
cSH	1544	1700	1700	29	67	844
Volume to Capacity	0.51	0.01	0.04	8.28	0.58	0.23
Queue Length 95th (ft)	75	0	0	Err	61	22
Control Delay (s)	9.7	0.0	0.0	Err	115.0	10.5
Lane LOS	A			F	F	B
Approach Delay (s)	9.5		0.0	8620.7		10.5
Approach LOS				F		B

Intersection Summary			
Average Delay	1808.9		
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	838	1	5	357	0	2	0	14	62	38	341
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	931	1	6	397	0	2	0	16	69	42	379
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	397			932			1541	1339	466	889	1340	198
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	397			932			1541	1339	466	889	1340	198
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			93	100	97	70	72	53
cM capacity (veh/h)	1158			730			33	150	543	230	150	810

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	466	467	204	198	18	111	379
Volume Left	0	0	6	0	2	69	0
Volume Right	0	1	0	0	16	0	379
cSH	1158	1700	730	1700	183	191	810
Volume to Capacity	0.00	0.27	0.01	0.12	0.10	0.58	0.47
Queue Length 95th (ft)	0	0	1	0	8	79	63
Control Delay (s)	0.0	0.0	0.4	0.0	26.7	47.1	13.3
Lane LOS			A		D	E	B
Approach Delay (s)	0.0		0.2		26.7	21.0	
Approach LOS					D	C	

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	723	104	202	24	21	31	142	37	49	0	0	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	803	116	224	27	23	34	158	41	54	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)		1252										
pX, platoon unblocked												
vC, conflicting volume	58			340			1911	1946	228	1874	2023	23
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	58			340			1911	1946	228	1874	2023	23
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	48			98			0	0	93	0	100	100
cM capacity (veh/h)	1546			1219			30	30	812	0	27	1053

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	803	340	50	34	158	96
Volume Left	803	0	27	0	158	0
Volume Right	0	224	0	34	0	54
cSH	1546	1700	1219	1700	30	67
Volume to Capacity	0.52	0.20	0.02	0.02	5.26	1.42
Queue Length 95th (ft)	78	0	2	0	Err	200
Control Delay (s)	9.8	0.0	4.4	0.0	Err	359.5
Lane LOS	A		A		F	F
Approach Delay (s)	6.9		2.6		6363.1	
Approach LOS					F	

Intersection Summary			
Average Delay	1093.8		
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↰	↱
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	971	160	0	122	654
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	1079	178	0	136	727
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)		936				
pX, platoon unblocked					0.77	
vC, conflicting volume	178				1257	178
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	178				1335	178
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				0	16
cM capacity (veh/h)	1398				130	865

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	1079	178	136	727
Volume Left	0	0	136	0
Volume Right	0	0	0	727
cSH	1700	1700	130	865
Volume to Capacity	0.63	0.10	1.05	0.84
Queue Length 95th (ft)	0	0	188	250
Control Delay (s)	0.0	0.0	157.8	26.7
Lane LOS			F	D
Approach Delay (s)	0.0	0.0	47.3	
Approach LOS			E	

Intersection Summary			
Average Delay	19.3		
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	1844			1856	1708	
Flt Permitted	1.00			0.80	0.97	
Satd. Flow (perm)	1844			1496	1708	
Volume (vph)	913	74	55	738	65	47
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1014	82	61	820	72	52
RTOR Reduction (vph)	2	0	0	0	22	0
Lane Group Flow (vph)	1094	0	0	881	102	0
Turn Type			pm+pt			
Protected Phases	4		3	8	2	
Permitted Phases			8			
Actuated Green, G (s)	94.1			94.1	11.7	
Effective Green, g (s)	95.1			95.1	12.7	
Actuated g/C Ratio	0.82			0.82	0.11	
Clearance Time (s)	5.0			5.0	5.0	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	1514			1229	187	
v/s Ratio Prot	c0.59				c0.06	
v/s Ratio Perm				0.59		
v/c Ratio	0.72			0.72	0.54	
Uniform Delay, d1	4.6			4.5	48.8	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	1.7			2.0	3.2	
Delay (s)	6.3			6.5	52.0	
Level of Service	A			A	D	
Approach Delay (s)	6.3			6.5	52.0	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	115.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			0.95			0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99			0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1848			3444			3508	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1848			3444			3508	1583
Volume (vph)	213	747	227	39	534	31	148	431	68	90	413	221
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	237	830	252	43	593	34	164	479	76	100	459	246
RTOR Reduction (vph)	0	0	89	0	2	0	0	6	0	0	0	0
Lane Group Flow (vph)	237	830	163	43	625	0	0	713	0	0	559	246
Turn Type	Prot		Perm	Prot			Split			Split		Free
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4									Free
Actuated Green, G (s)	14.0	69.7	69.7	7.3	63.0			26.0			18.0	141.0
Effective Green, g (s)	15.0	70.7	70.7	8.3	64.0			27.0			19.0	141.0
Actuated g/C Ratio	0.11	0.50	0.50	0.06	0.45			0.19			0.13	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	188	934	794	104	839			659			473	1583
v/s Ratio Prot	c0.13	c0.45		0.02	c0.34			c0.21			c0.16	
v/s Ratio Perm			0.10									0.16
v/c Ratio	1.26	0.89	0.20	0.41	0.75			1.08			1.18	0.16
Uniform Delay, d1	63.0	31.6	19.5	64.0	31.8			57.0			61.0	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	152.8	10.3	0.1	2.7	6.0			59.1			101.7	0.2
Delay (s)	215.8	41.9	19.7	66.7	37.7			116.1			162.7	0.2
Level of Service	F	D	B	E	D			F			F	A
Approach Delay (s)		68.9			39.6			116.1			113.1	
Approach LOS		E			D			F			F	

Intersection Summary			
HCM Average Control Delay	83.1	HCM Level of Service	F
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	141.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	54	449	93	14	241	219	114	325	251	47	28	137
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	499	103	16	268	243	127	361	279	52	31	152

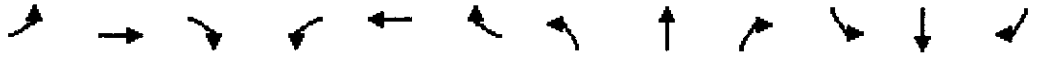
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	662	283	243	307	459	83	152
Volume Left (vph)	60	16	0	127	0	52	0
Volume Right (vph)	103	0	243	0	279	0	152
Hadj (s)	-0.04	0.06	-0.67	0.24	-0.39	0.35	-0.67
Departure Headway (s)	8.2	8.7	8.0	8.5	7.9	9.6	8.7
Degree Utilization, x	1.51	0.68	0.54	0.73	1.01	0.22	0.37
Capacity (veh/h)	441	405	437	415	459	365	407
Control Delay (s)	264.8	27.3	18.7	29.9	71.6	14.2	15.4
Approach Delay (s)	264.8	23.3		54.9		14.9	
Approach LOS	F	C		F		B	

Intersection Summary			
Delay	106.4		
HCM Level of Service	F		
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	435	0	8	6	0	29	0	234	0	0	129	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	483	0	9	7	0	32	0	260	0	0	143	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	436	403	143	412	403	260	143			260		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	436	403	143	412	403	260	143			260		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	5	100	99	99	100	96	100			100		
cM capacity (veh/h)	509	536	904	545	536	779	1439			1304		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	483	9	39	260	143
Volume Left	483	0	7	0	0
Volume Right	0	9	32	0	0
cSH	509	904	725	1700	1700
Volume to Capacity	0.95	0.01	0.05	0.15	0.08
Queue Length 95th (ft)	299	1	4	0	0
Control Delay (s)	56.9	9.0	10.2	0.0	0.0
Lane LOS	F	A	B		
Approach Delay (s)	56.0		10.2	0.0	0.0
Approach LOS	F		B		

Intersection Summary			
Average Delay	29.9		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	124	46	320	168	0	0	0	0	464	188	100
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	138	51	356	187	0	0	0	0	516	209	111

Direction, Lane #	EB 1	WB 1	WB 2	SB 1	SB 2
Volume Total (vph)	189	356	187	620	216
Volume Left (vph)	0	356	0	516	0
Volume Right (vph)	51	0	0	0	111
Hadj (s)	-0.13	0.53	0.03	0.45	-0.33
Departure Headway (s)	7.2	7.6	7.1	7.2	6.4
Degree Utilization, x	0.38	0.75	0.37	1.24	0.39
Capacity (veh/h)	492	472	503	507	550
Control Delay (s)	14.5	28.4	12.9	147.3	12.2
Approach Delay (s)	14.5	23.1		112.4	
Approach LOS	B	C		F	

Intersection Summary			
Delay	69.7		
HCM Level of Service	F		
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	519	41	0	0	24	19	314	44	19	3	0	60
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	577	46	0	0	27	21	349	49	21	3	0	67
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	48			46			1303	1247	46	1282	1236	37
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	48			46			1303	1247	46	1282	1236	37
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	63			100			0	55	98	95	100	94
cM capacity (veh/h)	1559			1562			92	109	1024	66	111	1035

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1
Volume Total	577	46	48	349	70	70
Volume Left	577	0	0	349	0	3
Volume Right	0	0	21	0	21	67
cSH	1559	1700	1700	92	150	611
Volume to Capacity	0.37	0.03	0.03	3.81	0.47	0.11
Queue Length 95th (ft)	43	0	0	Err	54	10
Control Delay (s)	8.7	0.0	0.0	Err	48.6	11.7
Lane LOS	A			F	E	B
Approach Delay (s)	8.0		0.0	8336.2		11.7
Approach LOS				F		B

Intersection Summary				
Average Delay	3018.2			
Intersection Capacity Utilization	66.1%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑↱			↱			↰	↱
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	0	590	2	5	301	0	5	0	18	203	117	598
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	656	2	6	334	0	6	0	20	226	130	664
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	334			658			1564	1002	329	693	1003	167
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	334			658			1564	1002	329	693	1003	167
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			40	100	97	29	46	22
cM capacity (veh/h)	1222			926			9	240	667	318	239	848

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	328	330	173	167	26	356	664
Volume Left	0	0	6	0	6	226	0
Volume Right	0	2	0	0	20	0	664
cSH	1222	1700	926	1700	41	284	848
Volume to Capacity	0.00	0.19	0.01	0.10	0.63	1.25	0.78
Queue Length 95th (ft)	0	0	0	0	57	422	201
Control Delay (s)	0.0	0.0	0.3	0.0	189.9	176.3	22.8
Lane LOS			A		F	F	C
Approach Delay (s)	0.0		0.2		189.9	76.3	
Approach LOS					F	F	

Intersection Summary			
Average Delay	40.5		
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	1.00			1.00	1.00	1.00	1.00	1.00			
Frt	1.00	0.87			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			0.98	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	3433	1619			1819	1583	1770	1863	1583			
Flt Permitted	0.95	1.00			0.98	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	3433	1619			1819	1583	1770	1863	1583			
Volume (vph)	661	18	122	43	47	70	234	47	14	0	0	0
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	734	20	136	48	52	78	260	52	16	0	0	0
RTOR Reduction (vph)	0	62	0	0	0	70	0	0	13	0	0	0
Lane Group Flow (vph)	734	94	0	0	100	8	260	52	3	0	0	0
Turn Type	Split			Split		Perm	Split		Perm			
Protected Phases	2	2		6	6		4	4				
Permitted Phases						6			4			
Actuated Green, G (s)	42.5	42.5			8.3	8.3	16.2	16.2	16.2			
Effective Green, g (s)	43.5	43.5			8.3	8.3	16.2	16.2	16.2			
Actuated g/C Ratio	0.54	0.54			0.10	0.10	0.20	0.20	0.20			
Clearance Time (s)	5.0	5.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	1867	880			189	164	358	377	321			
v/s Ratio Prot	c0.21	0.06			c0.05		c0.15	0.03				
v/s Ratio Perm						0.01			0.00			
v/c Ratio	0.39	0.11			0.53	0.05	0.73	0.14	0.01			
Uniform Delay, d1	10.6	8.8			34.0	32.3	29.8	26.2	25.5			
Progression Factor	0.39	0.37			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	0.5	0.2			2.7	0.1	7.2	0.2	0.0			
Delay (s)	4.6	3.4			36.7	32.4	37.0	26.3	25.5			
Level of Service	A	A			D	C	D	C	C			
Approach Delay (s)		4.4			34.8			34.7			0.0	
Approach LOS		A			C			C			A	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1863	1863		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1863	1863		1770	1583
Volume (vph)	0	805	262	0	32	623
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	894	291	0	36	692
RTOR Reduction (vph)	0	0	0	0	0	457
Lane Group Flow (vph)	0	894	291	0	36	235
Turn Type						Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		56.2	56.2		15.8	15.8
Effective Green, g (s)		56.2	56.2		15.8	15.8
Actuated g/C Ratio		0.70	0.70		0.20	0.20
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1309	1309		350	313
v/s Ratio Prot		c0.48	0.16		0.02	
v/s Ratio Perm						c0.15
v/c Ratio		0.68	0.22		0.10	0.75
Uniform Delay, d1		6.8	4.2		26.3	30.2
Progression Factor		1.00	0.26		1.00	1.00
Incremental Delay, d2		2.9	0.3		0.1	9.5
Delay (s)		9.7	1.4		26.4	39.7
Level of Service		A	A		C	D
Approach Delay (s)		9.7	1.4		39.0	
Approach LOS		A	A		D	

Intersection Summary			
HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.94	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1850		1770	1863	1699	
Flt Permitted	1.00		0.95	1.00	0.97	
Satd. Flow (perm)	1850		1770	1863	1699	
Volume (vph)	685	37	21	818	103	93
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	761	41	23	909	114	103
RTOR Reduction (vph)	2	0	0	0	49	0
Lane Group Flow (vph)	800	0	23	909	168	0
Turn Type			Prot			
Protected Phases	4		3	8	2	
Permitted Phases						
Actuated Green, G (s)	34.6		2.0	40.6	10.4	
Effective Green, g (s)	34.6		2.0	40.6	10.4	
Actuated g/C Ratio	0.59		0.03	0.69	0.18	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1085		60	1282	299	
v/s Ratio Prot	0.43		0.01	c0.49	c0.10	
v/s Ratio Perm						
v/c Ratio	0.74		0.38	0.71	0.56	
Uniform Delay, d1	8.9		27.9	5.6	22.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.6		4.0	1.8	2.4	
Delay (s)	11.5		31.9	7.4	24.6	
Level of Service	B		C	A	C	
Approach Delay (s)	11.5			8.0	24.6	
Approach LOS	B			A	C	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00			0.95			0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99			0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1843			3425			3494	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1843			3425			3494	1583
Volume (vph)	140	497	25	37	653	50	152	352	76	101	285	44
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	156	552	28	41	726	56	169	391	84	112	317	49
RTOR Reduction (vph)	0	0	15	0	2	0	0	11	0	0	0	0
Lane Group Flow (vph)	156	552	13	41	780	0	0	633	0	0	429	49
Turn Type	Prot		Perm	Prot			Split			Split		Free
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4									Free
Actuated Green, G (s)	7.9	52.9	52.9	3.6	48.6			21.6			14.8	110.9
Effective Green, g (s)	7.9	52.9	52.9	3.6	48.6			22.6			15.8	110.9
Actuated g/C Ratio	0.07	0.48	0.48	0.03	0.44			0.20			0.14	1.00
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	245	889	755	57	808			698			498	1583
v/s Ratio Prot	c0.05	0.30		0.02	c0.42			c0.18			c0.12	
v/s Ratio Perm			0.01									0.03
v/c Ratio	0.64	0.62	0.02	0.72	0.97			0.91			0.86	0.03
Uniform Delay, d1	50.1	21.5	15.3	53.1	30.3			43.1			46.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	5.3	1.4	0.0	35.1	23.2			15.4			14.2	0.0
Delay (s)	55.4	22.9	15.3	88.2	53.6			58.5			60.7	0.0
Level of Service	E	C	B	F	D			E			E	A
Approach Delay (s)		29.5			55.3			58.5			54.5	
Approach LOS		C			E			E			D	

Intersection Summary			
HCM Average Control Delay	48.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	110.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↰	↱		↕			↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Util. Factor		0.95			1.00	1.00		0.95			1.00	1.00
Frt		0.97			1.00	0.85		0.97			1.00	0.85
Flt Protected		0.98			1.00	1.00		1.00			0.98	1.00
Satd. Flow (prot)		3384			1856	1583		3432			1817	1583
Flt Permitted		0.75			0.96	1.00		0.92			0.67	1.00
Satd. Flow (perm)		2594			1792	1583		3187			1243	1583
Volume (vph)	100	149	58	26	331	539	58	495	117	35	35	83
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	111	166	64	29	368	599	64	550	130	39	39	92
RTOR Reduction (vph)	0	27	0	0	0	72	0	19	0	0	0	58
Lane Group Flow (vph)	0	314	0	0	397	527	0	725	0	0	78	34
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)		21.8			21.8	21.8		17.5			17.5	17.5
Effective Green, g (s)		21.8			21.8	21.8		17.5			17.5	17.5
Actuated g/C Ratio		0.46			0.46	0.46		0.37			0.37	0.37
Clearance Time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		1196			826	730		1179			460	586
v/s Ratio Prot												
v/s Ratio Perm		0.12			0.22	c0.33		c0.23			0.06	0.02
v/c Ratio		0.26			0.48	0.72		0.62			0.17	0.06
Uniform Delay, d1		7.8			8.8	10.3		12.2			10.0	9.6
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		0.1			0.4	3.5		1.0			0.2	0.0
Delay (s)		7.9			9.3	13.8		13.1			10.2	9.6
Level of Service		A			A	B		B			B	A
Approach Delay (s)		7.9			12.0			13.1			9.9	
Approach LOS		A			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	47.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	0.95	0.95			1.00			1.00			1.00	
Frt	1.00	0.98			0.91			1.00			1.00	
Flt Protected	0.95	0.96			0.98			1.00			1.00	
Satd. Flow (prot)	1681	1658			1669			1863			1863	
Flt Permitted	0.74	0.74			0.89			1.00			1.00	
Satd. Flow (perm)	1310	1281			1508			1863			1863	
Volume (vph)	270	0	25	8	0	15	0	392	0	0	127	0
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	300	0	28	9	0	17	0	436	0	0	141	0
RTOR Reduction (vph)	0	15	0	0	13	0	0	0	0	0	0	0
Lane Group Flow (vph)	151	162	0	0	13	0	0	436	0	0	141	0
Turn Type	Perm			Perm								
Protected Phases		4			8			2			6	
Permitted Phases	4			8								
Actuated Green, G (s)	9.7	9.7			9.7			21.0			21.0	
Effective Green, g (s)	9.7	9.7			9.7			21.0			21.0	
Actuated g/C Ratio	0.25	0.25			0.25			0.54			0.54	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	328	321			378			1011			1011	
v/s Ratio Prot								c0.23			0.08	
v/s Ratio Perm	0.12	c0.13			0.01							
v/c Ratio	0.46	0.50			0.04			0.43			0.14	
Uniform Delay, d1	12.3	12.4			11.0			5.3			4.4	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	1.0	1.3			0.0			0.3			0.1	
Delay (s)	13.3	13.7			11.0			5.6			4.4	
Level of Service	B	B			B			A			A	
Approach Delay (s)		13.5			11.0			5.6			4.4	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	38.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						0.95	
Frt		0.94		1.00	1.00						0.99	
Flt Protected		1.00		0.95	1.00						0.98	
Satd. Flow (prot)		1758		1770	1863						3409	
Flt Permitted		1.00		0.95	1.00						0.98	
Satd. Flow (perm)		1758		1770	1863						3409	
Volume (vph)	0	115	83	371	104	0	0	0	0	194	172	36
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	128	92	412	116	0	0	0	0	216	191	40
RTOR Reduction (vph)	0	33	0	0	0	0	0	0	0	0	9	0
Lane Group Flow (vph)	0	187	0	412	116	0	0	0	0	0	438	0
Turn Type				Prot						Split		
Protected Phases		2		1	6					4	4	
Permitted Phases												
Actuated Green, G (s)		11.2		17.3	32.5						12.2	
Effective Green, g (s)		11.2		17.3	32.5						12.2	
Actuated g/C Ratio		0.21		0.33	0.62						0.23	
Clearance Time (s)		4.0		4.0	4.0						4.0	
Vehicle Extension (s)		3.0		3.0	3.0						3.0	
Lane Grp Cap (vph)		374		581	1149						789	
v/s Ratio Prot		c0.11		c0.23	0.06						c0.13	
v/s Ratio Perm												
v/c Ratio		0.50		0.71	0.10						0.55	
Uniform Delay, d1		18.3		15.5	4.1						17.9	
Progression Factor		1.00		1.00	1.00						1.00	
Incremental Delay, d2		1.1		4.0	0.0						0.8	
Delay (s)		19.3		19.5	4.2						18.7	
Level of Service		B		B	A						B	
Approach Delay (s)		19.3			16.1			0.0			18.7	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	52.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor	0.97	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.94		1.00	0.96			0.87	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	3433	1863			1745		1770	1784			1612	
Flt Permitted	0.95	1.00			1.00		0.59	1.00			1.00	
Satd. Flow (perm)	3433	1863			1745		1108	1784			1611	
Volume (vph)	705	17	0	0	29	25	216	25	10	1	0	173
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	783	19	0	0	32	28	240	28	11	1	0	192
RTOR Reduction (vph)	0	0	0	0	23	0	0	8	0	0	142	0
Lane Group Flow (vph)	783	19	0	0	37	0	240	31	0	0	51	0
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	18.3	32.0			9.7		14.2	14.2			14.2	
Effective Green, g (s)	18.3	32.0			9.7		14.2	14.2			14.2	
Actuated g/C Ratio	0.34	0.59			0.18		0.26	0.26			0.26	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	1159	1100			312		290	467			422	
v/s Ratio Prot	c0.23	0.01			c0.02			0.02				
v/s Ratio Perm							c0.22				0.03	
v/c Ratio	0.68	0.02			0.12		0.83	0.07			0.12	
Uniform Delay, d1	15.4	4.6			18.7		18.8	15.0			15.2	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	1.6	0.0			0.2		17.3	0.1			0.1	
Delay (s)	17.0	4.6			18.8		36.2	15.1			15.4	
Level of Service	B	A			B		D	B			B	
Approach Delay (s)		16.7			18.8			33.2			15.4	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		0.95			0.95			1.00			1.00	1.00
Frt		1.00			1.00			0.88			1.00	0.85
Flt Protected		1.00			1.00			0.99			0.97	1.00
Satd. Flow (prot)		3539			3537			1630			1807	1583
Flt Permitted		1.00			0.94			0.97			0.82	1.00
Satd. Flow (perm)		3539			3336			1592			1521	1583
Volume (vph)	0	838	1	5	357	0	2	0	14	62	38	341
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	931	1	6	397	0	2	0	16	69	42	379
RTOR Reduction (vph)	0	0	0	0	0	0	0	12	0	0	0	244
Lane Group Flow (vph)	0	932	0	0	403	0	0	6	0	0	111	135
Turn Type				Perm			Perm			Perm		Perm
Protected Phases		2			6			8			4	
Permitted Phases				6			8			4		4
Actuated Green, G (s)		17.1			17.1			9.2			9.2	9.2
Effective Green, g (s)		17.1			17.1			9.2			9.2	9.2
Actuated g/C Ratio		0.50			0.50			0.27			0.27	0.27
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		1764			1663			427			408	425
v/s Ratio Prot		c0.26										
v/s Ratio Perm					0.12			0.00			0.07	c0.09
v/c Ratio		0.53			0.24			0.01			0.27	0.32
Uniform Delay, d1		5.9			4.9			9.2			9.9	10.0
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		0.3			0.1			0.0			0.4	0.4
Delay (s)		6.1			5.0			9.2			10.3	10.5
Level of Service		A			A			A			B	B
Approach Delay (s)		6.1			5.0			9.2			10.4	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	34.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	0.97	1.00			1.00	1.00	1.00	1.00	1.00			
Frt	1.00	0.90			1.00	0.85	1.00	1.00	0.85			
Flt Protected	0.95	1.00			0.97	1.00	0.95	1.00	1.00			
Satd. Flow (prot)	3433	1679			1814	1583	1770	1863	1583			
Flt Permitted	0.95	1.00			0.97	1.00	0.95	1.00	1.00			
Satd. Flow (perm)	3433	1679			1814	1583	1770	1863	1583			
Volume (vph)	723	104	202	24	21	31	142	37	49	0	0	0
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	803	116	224	27	23	34	158	41	54	0	0	0
RTOR Reduction (vph)	0	55	0	0	0	31	0	0	45	0	0	0
Lane Group Flow (vph)	803	285	0	0	50	3	158	41	9	0	0	0
Turn Type	Split			Split		Perm	Split		Perm			
Protected Phases	2	2		6	6		4	4				
Permitted Phases						6			4			
Actuated Green, G (s)	47.8	47.8			6.5	6.5	12.7	12.7	12.7			
Effective Green, g (s)	48.8	48.8			6.5	6.5	12.7	12.7	12.7			
Actuated g/C Ratio	0.61	0.61			0.08	0.08	0.16	0.16	0.16			
Clearance Time (s)	5.0	5.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)	2094	1024			147	129	281	296	251			
v/s Ratio Prot	c0.23	0.17			c0.03		c0.09	0.02				
v/s Ratio Perm						0.00			0.01			
v/c Ratio	0.38	0.28			0.34	0.02	0.56	0.14	0.03			
Uniform Delay, d1	7.9	7.3			34.7	33.8	31.1	28.9	28.5			
Progression Factor	0.56	0.40			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	0.3	0.4			1.4	0.1	2.6	0.2	0.1			
Delay (s)	4.8	3.4			36.1	33.9	33.6	29.2	28.5			
Level of Service	A	A			D	C	C	C	C			
Approach Delay (s)		4.4			35.2			31.8			0.0	
Approach LOS		A			D			C			A	

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		1863	1863		1770	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		1863	1863		1770	1583
Volume (vph)	0	971	160	0	122	654
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	1079	178	0	136	727
RTOR Reduction (vph)	0	0	0	0	0	605
Lane Group Flow (vph)	0	1079	178	0	136	122
Turn Type						Perm
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		58.6	58.6		13.4	13.4
Effective Green, g (s)		58.6	58.6		13.4	13.4
Actuated g/C Ratio		0.73	0.73		0.17	0.17
Clearance Time (s)		4.0	4.0		4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1365	1365		296	265
v/s Ratio Prot		c0.58	0.10		0.08	
v/s Ratio Perm						c0.08
v/c Ratio		0.79	0.13		0.46	0.46
Uniform Delay, d1		6.8	3.2		30.0	30.0
Progression Factor		1.00	0.14		1.00	1.00
Incremental Delay, d2		4.7	0.2		1.1	1.3
Delay (s)		11.5	0.6		31.2	31.3
Level of Service		B	A		C	C
Approach Delay (s)		11.5	0.6		31.3	
Approach LOS		B	A		C	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.99		1.00	1.00	0.94	
Flt Protected	1.00		0.95	1.00	0.97	
Satd. Flow (prot)	1844		1770	1863	1708	
Flt Permitted	1.00		0.95	1.00	0.97	
Satd. Flow (perm)	1844		1770	1863	1708	
Volume (vph)	913	74	55	738	65	47
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1014	82	61	820	72	52
RTOR Reduction (vph)	2	0	0	0	25	0
Lane Group Flow (vph)	1094	0	61	820	99	0
Turn Type			Prot			
Protected Phases	4		3	8	2	
Permitted Phases						
Actuated Green, G (s)	69.7		5.5	79.2	10.9	
Effective Green, g (s)	69.7		5.5	79.2	10.9	
Actuated g/C Ratio	0.71		0.06	0.81	0.11	
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1310		99	1504	190	
v/s Ratio Prot	c0.59		0.03	c0.44	c0.06	
v/s Ratio Perm						
v/c Ratio	0.84		0.62	0.55	0.52	
Uniform Delay, d1	10.1		45.3	3.3	41.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	4.8		10.9	0.4	2.6	
Delay (s)	14.9		56.1	3.7	43.7	
Level of Service	B		E	A	D	
Approach Delay (s)	14.9			7.3	43.7	
Approach LOS	B			A	D	

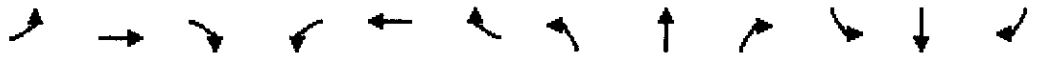
Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	98.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0			4.0			4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00			0.95			0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99			0.98			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (prot)	3433	1863	1583	1770	1848			3444			3508	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.99			0.99	1.00
Satd. Flow (perm)	3433	1863	1583	1770	1848			3444			3508	1583
Volume (vph)	213	747	227	39	534	31	148	431	68	90	413	221
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	237	830	252	43	593	34	164	479	76	100	459	246
RTOR Reduction (vph)	0	0	101	0	2	0	0	8	0	0	0	0
Lane Group Flow (vph)	237	830	151	43	625	0	0	711	0	0	559	246
Turn Type	Prot		Perm	Prot			Split			Split		Free
Protected Phases	7	4		3	8		2	2		6	6	
Permitted Phases			4									Free
Actuated Green, G (s)	10.6	53.1	53.1	3.1	45.6			24.1			19.1	117.4
Effective Green, g (s)	10.6	53.1	53.1	3.1	45.6			25.1			20.1	117.4
Actuated g/C Ratio	0.09	0.45	0.45	0.03	0.39			0.21			0.17	1.00
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	310	843	716	47	718			736			601	1583
v/s Ratio Prot	c0.07	c0.45		0.02	0.34			c0.21			c0.16	
v/s Ratio Perm			0.10									0.16
v/c Ratio	0.76	0.98	0.21	0.91	0.87			0.97			0.93	0.16
Uniform Delay, d1	52.2	31.7	19.5	57.0	33.2			45.7			48.0	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	10.7	27.0	0.1	98.6	11.2			24.9			21.2	0.2
Delay (s)	62.9	58.7	19.6	155.6	44.4			70.6			69.1	0.2
Level of Service	E	E	B	F	D			E			E	A
Approach Delay (s)		52.0			51.5			70.6			48.1	
Approach LOS		D			D			E			D	

Intersection Summary			
HCM Average Control Delay	54.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	117.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰	↱		↰↑↱			↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0		4.0			4.0	4.0
Lane Util. Factor		0.95			1.00	1.00		0.95			1.00	1.00
Frt		0.98			1.00	0.85		0.95			1.00	0.85
Flt Protected		1.00			1.00	1.00		0.99			0.97	1.00
Satd. Flow (prot)		3441			1858	1583		3319			1806	1583
Flt Permitted		0.90			0.95	1.00		0.89			0.58	1.00
Satd. Flow (perm)		3115			1766	1583		2966			1080	1583
Volume (vph)	54	449	93	14	241	219	114	325	251	47	28	137
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	60	499	103	16	268	243	127	361	279	52	31	152
RTOR Reduction (vph)	0	19	0	0	0	149	0	97	0	0	0	90
Lane Group Flow (vph)	0	643	0	0	284	94	0	670	0	0	83	62
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		6
Actuated Green, G (s)		13.8			13.8	13.8		14.6			14.6	14.6
Effective Green, g (s)		14.8			14.8	14.8		15.6			15.6	15.6
Actuated g/C Ratio		0.39			0.39	0.39		0.41			0.41	0.41
Clearance Time (s)		5.0			5.0	5.0		5.0			5.0	5.0
Vehicle Extension (s)		3.0			3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)		1201			681	610		1205			439	643
v/s Ratio Prot												
v/s Ratio Perm		c0.21			0.16	0.06		c0.23			0.08	0.04
v/c Ratio		0.54			0.42	0.15		0.56			0.19	0.10
Uniform Delay, d1		9.1			8.6	7.7		8.7			7.3	7.0
Progression Factor		1.00			1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2		0.5			0.4	0.1		0.6			0.2	0.1
Delay (s)		9.6			9.1	7.8		9.3			7.5	7.1
Level of Service		A			A	A		A			A	A
Approach Delay (s)		9.6			8.5			9.3			7.3	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	38.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	0.95	0.95			1.00			1.00			1.00	
Frt	1.00	0.99			0.89			1.00			1.00	
Flt Protected	0.95	0.95			0.99			1.00			1.00	
Satd. Flow (prot)	1681	1679			1642			1863			1863	
Flt Permitted	0.73	0.71			0.93			1.00			1.00	
Satd. Flow (perm)	1295	1241			1544			1863			1863	
Volume (vph)	435	0	8	6	0	29	0	234	0	0	129	0
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	483	0	9	7	0	32	0	260	0	0	143	0
RTOR Reduction (vph)	0	3	0	0	22	0	0	0	0	0	0	0
Lane Group Flow (vph)	242	247	0	0	17	0	0	260	0	0	143	0
Turn Type	Perm			Perm								
Protected Phases		4			8			2			6	
Permitted Phases	4			8								
Actuated Green, G (s)	10.2	10.2			10.2			13.7			13.7	
Effective Green, g (s)	10.2	10.2			10.2			13.7			13.7	
Actuated g/C Ratio	0.32	0.32			0.32			0.43			0.43	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	414	397			494			800			800	
v/s Ratio Prot								c0.14			0.08	
v/s Ratio Perm	0.19	c0.20			0.01							
v/c Ratio	0.58	0.62			0.03			0.32			0.18	
Uniform Delay, d1	9.1	9.2			7.5			6.0			5.6	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	2.1	3.0			0.0			0.2			0.1	
Delay (s)	11.2	12.2			7.5			6.3			5.7	
Level of Service	B	B			A			A			A	
Approach Delay (s)		11.7			7.5			6.3			5.7	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	31.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0						4.0	
Lane Util. Factor		1.00		1.00	1.00						0.95	
Frt		0.96		1.00	1.00						0.98	
Flt Protected		1.00		0.95	1.00						0.97	
Satd. Flow (prot)		1795		1770	1863						3365	
Flt Permitted		1.00		0.95	1.00						0.97	
Satd. Flow (perm)		1795		1770	1863						3365	
Volume (vph)	0	124	46	320	168	0	0	0	0	464	188	100
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	138	51	356	187	0	0	0	0	516	209	111
RTOR Reduction (vph)	0	17	0	0	0	0	0	0	0	0	15	0
Lane Group Flow (vph)	0	172	0	356	187	0	0	0	0	0	821	0
Turn Type				Prot						Split		
Protected Phases		2		1	6					4	4	
Permitted Phases												
Actuated Green, G (s)		11.2		16.7	31.9						19.5	
Effective Green, g (s)		11.2		16.7	31.9						19.5	
Actuated g/C Ratio		0.19		0.28	0.54						0.33	
Clearance Time (s)		4.0		4.0	4.0						4.0	
Vehicle Extension (s)		3.0		3.0	3.0						3.0	
Lane Grp Cap (vph)		338		498	1001						1105	
v/s Ratio Prot		c0.10		c0.20	0.10						c0.24	
v/s Ratio Perm												
v/c Ratio		0.51		0.71	0.19						0.88dl	
Uniform Delay, d1		21.6		19.2	7.1						17.7	
Progression Factor		1.00		1.00	1.00						1.00	
Incremental Delay, d2		1.2		4.8	0.1						2.7	
Delay (s)		22.8		24.0	7.2						20.5	
Level of Service		C		C	A						C	
Approach Delay (s)		22.8			18.2			0.0			20.5	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	59.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor	0.97	1.00			1.00		1.00	1.00			1.00	
Frt	1.00	1.00			0.94		1.00	0.96			0.87	
Flt Protected	0.95	1.00			1.00		0.95	1.00			1.00	
Satd. Flow (prot)	3433	1863			1753		1770	1779			1619	
Flt Permitted	0.95	1.00			1.00		0.71	1.00			0.99	
Satd. Flow (perm)	3433	1863			1753		1325	1779			1611	
Volume (vph)	519	41	0	0	24	19	314	44	19	3	0	60
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	577	46	0	0	27	21	349	49	21	3	0	67
RTOR Reduction (vph)	0	0	0	0	18	0	0	14	0	0	45	0
Lane Group Flow (vph)	577	46	0	0	30	0	349	56	0	0	25	0
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	13.8	26.0			8.2		17.1	17.1			17.1	
Effective Green, g (s)	13.8	26.0			8.2		17.1	17.1			17.1	
Actuated g/C Ratio	0.27	0.51			0.16		0.33	0.33			0.33	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	927	948			281		443	595			539	
v/s Ratio Prot	c0.17	0.02			c0.02			0.03				
v/s Ratio Perm							c0.26				0.02	
v/c Ratio	0.62	0.05			0.11		0.79	0.09			0.05	
Uniform Delay, d1	16.4	6.3			18.3		15.4	11.7			11.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	
Incremental Delay, d2	1.3	0.0			0.2		9.0	0.1			0.0	
Delay (s)	17.7	6.3			18.5		24.4	11.7			11.5	
Level of Service	B	A			B		C	B			B	
Approach Delay (s)		16.8			18.5			22.2			11.5	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	51.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	4.0
Lane Util. Factor		0.95			0.95			1.00			1.00	1.00
Frt		1.00			1.00			0.90			1.00	0.85
Flt Protected		1.00			1.00			0.99			0.97	1.00
Satd. Flow (prot)		3538			3536			1650			1805	1583
Flt Permitted		1.00			0.94			0.93			0.79	1.00
Satd. Flow (perm)		3538			3336			1560			1478	1583
Volume (vph)	0	590	2	5	301	0	5	0	18	203	117	598
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	656	2	6	334	0	6	0	20	226	130	664
RTOR Reduction (vph)	0	0	0	0	0	0	0	10	0	0	0	109
Lane Group Flow (vph)	0	658	0	0	340	0	0	16	0	0	356	555
Turn Type				Perm			Perm			Perm		Perm
Protected Phases		2			6			8			4	
Permitted Phases				6			8			4		4
Actuated Green, G (s)		12.7			12.7			19.4			19.4	19.4
Effective Green, g (s)		12.7			12.7			19.4			19.4	19.4
Actuated g/C Ratio		0.32			0.32			0.48			0.48	0.48
Clearance Time (s)		4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)		3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)		1121			1057			755			715	766
v/s Ratio Prot		c0.19										
v/s Ratio Perm					0.10			0.01			0.24	c0.35
v/c Ratio		0.59			0.32			0.02			0.50	0.72
Uniform Delay, d1		11.5			10.4			5.4			7.0	8.2
Progression Factor		1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2		0.8			0.2			0.0			0.5	3.4
Delay (s)		12.3			10.6			5.4			7.6	11.6
Level of Service		B			B			A			A	B
Approach Delay (s)		12.3			10.6			5.4			10.2	
Approach LOS		B			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	40.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX E:
PROJECT COST ESTIMATES

City of Oakland

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTIONS 1, 2
LEONA QUARRY
OAKLAND, CALIFORNIA

13-Jul-06

Item	Description	Quantity	Unit	Unit Price	Amount
	I-580 WESTBOUND ON-RAMP/ EDWARDS AVE, I-580 EASTBOUND OFF RAMP/ EDWARDS AVE				
	IMPROVEMENTS				
	Improvements				
1	Burckhalter Park driveway construction	1	LS	$55,638	$55,638
2	Interchange modification construction	1	LS	$747,928	$747,928
	TOTAL				**$803,566**
	DESIGN ENGINEERING				**$110,900**
	FEES PAID TO CITY				**$46,841**
	TOTAL *(rounded to nearest $100)*				**$961,300**

Note:

1. *Actual construction cost and design engineering cost provided by David Chapman, DeSilva Group.*
2. *Actual fees paid for inspection, permits, plan review, etc. provided by Marcel Uzegbu, City of Oakland.*

City of Oakland

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 4
LEONA QUARRY
OAKLAND, CALIFORNIA

13-Jul-06

Item	Description	Quantity	Unit	Unit Price	Amount
	EDWARDS AVE./GREENLY DR.				
	IMPROVEMENTS				
	Improvements				
1	Construction	1	LS	$77,605	$77,605
	TOTAL				**$77,605**
	DESIGN ENGINEERING				**$14,100**
	FEES PAID TO CITY				**$16,127**
	TOTAL *(rounded to nearest $100)*				**$107,800**

Note:

1. *Actual construction cost and design engineering cost provided by David Chapman, DeSilva Group.*
2. *Actual fees for inspection, permits, plan review, etc. provided by Marcel Uzegbu, City of Oakland.*

City of Oakland

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 6
LEONA QUARRY
OAKLAND, CALIFORNIA

16-Feb-06

Item	Description	Quantity	Unit	Unit Price	Amount
	73rd AVE./MacARTHUR BLVD./FOOTHILL BLVD.				
	IMPROVEMENTS				
	Street Work				
1	Saw Cut	250	LF	$5	$1,250
2	AC/AB Pavement (6" AC/30" AB)	2,200	SF	$35	$77,000
3	Median Curb	220	LF	$25	$5,500
4	Miscellaneous Improvements/Utility Relocation	1	LS	$11,300	$11,300
5	Landscaping	1	LS	$25,000	$25,000
6	Water Meter (relocate)	1	EA	$11,300	$11,300
7	HC Ramps	3	EA	$2,900	$8,700
8	Signing/Striping	1	LS	$25,000	$25,000
9	Remove curb and gutter	220	LF	$20	$4,400
10	Remove tree	6	EA	$900	$5,400
	Subtotal				$174,850
	Signalization				
11	Modify Traffic Signal	1	LS	$135,600	$135,600
12	Interconnect	600	LF	$25	$15,000
	Subtotal				$150,600
	TOTAL				**$325,450**

CITY OF OAKLAND PUBLIC WORKS AGENCY / ENGINEERING DESIGN AND RIGHT-OF-WAY MANAGEMENT
PRELIMINARY PROJECT ESTIMATE

Project: 73rd/MacArthur Blvd/Foothill Blvd #6 — **Estimate by:** M. Uzegbu

Date Estimated 5/4/2006

Project No.: P27710 — **Checked by:**

CONSTRUCTION COSTS	ESTIMATED CONSTRUCTION COST		$	325,450
	Contingency	25.0%	$	81,363
	Inspection	9.0%	$	29,291
	Construction Services (Survey and Testing)	2.0%	$	6,509
	TOTAL CONSTRUCTION COSTS	36.0%	$	442,613
DSG	**DESIGN COST**			
	Engineering studies(traffic studies)	3.0%	$	13,278
	Environmental studies	3.0%	$	13,278
	Design/Engineering	15.0%	$	66,392
	Constructibility Plan Review Cost	5.0%	$	22,131
	TOTAL DESIGN COST	26.0%	$	115,079
ADMINISTRATIVE COSTS	**ADMINISTRATION**			
	Project Management (Administration, bidding etc)	8.0%	$	35,409
	Printing/Duplication/Advertising/Postage	0.5%	$	2,213
	Other Agencies Permit (PGE power)	0.5%	$	2,213
	Contract Compliance	3.0%	$	13,278
	TOTAL ADMINISTRATIVE COSTS	12.0%	$	53,113
TOTALS	***SUB TOTAL PROJECT COST***		$	610,805
	Project Contingency	10.0%	$	11,508
	TOTAL PROJECT COST:		***$***	***622,312***

City of Oakland

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 7
LEONA QUARRY
OAKLAND, CALIFORNIA

06-Jan-06

Item	Description		Quantity	Unit	Unit Price	Amount
	MOUNTAIN BLVD./KELLER AVE.					
	IMPROVEMENTS					
	Improvements					
1	Miscellaneous Improvements/Utility Relocation		1	LS	$11,300	$11,300
2	Signing/Striping		1	LS	$21,000	$21,000
3	HC Ramps		4	EA	$2,900	$11,600
		Subtotal				$43,900
	Signalization					
4	Traffic Signal		2	LS	$180,800	$361,600
5	Interconnect		1,000	LF	$25	$25,000
		Subtotal				$386,600
		TOTAL				**$430,500**

CITY OF OAKLAND PUBLIC WORKS AGENCY / ENGINEERING DESIGN AND RIGHT-OF-WAY MANAGEMENT
PRELIMINARY PROJECT ESTIMATE

Project:	Mountain Blvd/Keller Avenue # 7	**Estimate by:**	M. Uzegbu
		Date Estimated	5/4/2006
Project No.:	P27710	**Checked by:**	

CONSTRUCTION COSTS	ESTIMATED CONSTRUCTION COST		$	430,500
	Contingency	25.0%	$	107,625
	Inspection	9.0%	$	38,745
	Construction Services (Survey and Testing)	2.0%	$	8,610
	TOTAL CONSTRUCTION COSTS	36.0%	$	585,480
	DESIGN COST			
	Engineering studies(traffic studies)	3.0%	$	17,564
	Environmental studies	3.0%	$	17,564
DSG	Design/Engineering	15.0%	$	87,822
	Constructibility Plan Review Cost	5.0%	$	29,274
	TOTAL DESIGN COST	26.0%	$	152,225
	ADMINISTRATION			
ADMINISTRATIVE COSTS	Project Management (Administration, bidding etc)	8.0%	$	46,838
	Printing/Duplication/Advertising/Postage	0.5%	$	2,927
	Other Agencies Permit9eg. PGE power)	0.5%	$	2,927
	Contract Compliance	3.0%	$	17,564
	TOTAL ADMINISTRATIVE COSTS	12.0%	$	70,256
	SUB TOTAL PROJECT COST		$	807,962
	Project Contingency	10.0%	$	15,222
	TOTAL PROJECT COST:		***$***	***823,185***

City of Oakland

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 8
LEONA QUARRY
OAKLAND, CALIFORNIA

16-Feb-06

Item	Description	Quantity	Unit	Unit Price	Amount
	I-580 WESTBOUND OFF-RAMP/MOUNTAIN BLVD.				
	IMPROVEMENTS				
	Improvements				
1	Construction	1	LS	$212,385	$212,385
	TOTAL				**$212,385**

Note:

1. *Actual construction cost (based on bids received) provided by David Chapman, DeSilva Group.*

CITY OF OAKLAND PUBLIC WORKS AGENCY / ENGINEERING DESIGN AND RIGHT-OF-WAY MANAGEMENT
PRELIMINARY PROJECT ESTIMATE

Project: I-580 Westbound off-ramp/Mountain Blvd/Shone # 8

Estimate by: M. Uzegbu

Date Estimated 5/4/2006

Project No.: P27710

Checked by:

CONSTRUCTION COSTS	ESTIMATED CONSTRUCTION COST		$ 212,385
	Contingency	25.0%	$ 53,096
	Inspection	9.0%	$ 19,115
	Construction Services (Survey and Testing)	3.0%	$ 6,372
	TOTAL CONSTRUCTION COSTS	37.0%	$ 290,967
	DESIGN COST		
	Engineering studies(traffic studies)	3.0%	$ 8,729
	Environmental studies	3.0%	$ 8,729
DSG	Design/Engineering	15.0%	$ 43,645
	Constructibility Plan Review Cost	5.0%	$ 14,548
	TOTAL DESIGN COST	26.0%	$ 75,652
	ADMINISTRATION		
ADMINISTRATIVE COSTS	Project Management (Administration, bidding etc)	8.0%	$ 23,277
	Printing/Duplication/Advertising/Postage	0.5%	$ 1,455
	Other Agencies Permit eg. PGE Power)	0.5%	$ 1,455
	Contract Compliance	3.0%	$ 8,729
	TOTAL ADMINISTRATIVE COSTS	12.0%	$ 34,916
	SUB TOTAL PROJECT COST		$ 401,535
	Project Contingency	10.0%	$ 7,565
	TOTAL PROJECT COST:		***$ 409,100***

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 9
LEONA QUARRY
OAKLAND, CALIFORNIA

16-Feb-06

Item	Description		Quantity	Unit	Unit Price	Amount
	I-580 EASTBOUND OFF-RAMP/KELLER AVE.					
	IMPROVEMENTS					
	Improvements					
1	Miscellaneous Improvements/Utility Relocation		1	LS	$11,300	$11,300
2	HC Ramps		4	EA	$2,900	$11,600
3	Signing/Striping		1	LS	$13,000	$13,000
		Subtotal				$35,900
	Signalization					
4	Traffic Signal		1	LS	$180,800	$180,800
		Subtotal				$180,800
		TOTAL				**$216,700**

CITY OF OAKLAND PUBLIC WORKS AGENCY / ENGINEERING DESIGN AND RIGHT-OF-WAY MANAGEMENT
PRELIMINARY PROJECT ESTIMATE

Project:	Eastbound Off-Ramp/Keller Avenue # 9	**Estimate by:**	M. Uzegbu
		Date Estimated	5/4/2006
Project No.:	P27710	**Checked by:**	

CONSTRUCTION COSTS	ESTIMATED CONSTRUCTION COST		$	216,700
	Contingency	25.0%	$	54,175
	Inspection	9.0%	$	19,503
	Construction Services (Survey and Testing)	2.0%	$	4,334
	TOTAL CONSTRUCTION COSTS	36.0%	$	294,712
	DESIGN COST			
	Engineering studies(traffic studies)	3.0%	$	8,841
	Environmental studies	3.0%	$	8,841
DSG	Design/Engineering	15.0%	$	44,207
	Constructibility Plan Review Cost	5.0%	$	14,736
	TOTAL DESIGN COST	26.0%	$	76,625
ADMINISTRATIVE COSTS	**ADMINISTRATION**			
	Project Management (Administration, bidding etc)	7.0%	$	20,630
	Printing/Duplication/Advertising/Postage	0.5%	$	1,474
	Other Agencies Permit(PGE power etc)	0.5%	$	1,474
	Contract Compliance	3.0%	$	8,841
	TOTAL ADMINISTRATIVE COSTS	11.0%	$	32,419
TOTALS	***SUB TOTAL PROJECT COST***		$	403,755
	Project Contingency	10.0%	$	7,663
	TOTAL PROJECT COST:		***$***	***411,418***

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 16
LEONA QUARRY
OAKLAND, CALIFORNIA

17-Jan-06

Item	Description	Quantity	Unit	Unit Price	Amount
	I-580 WESTBOUND OFF-RAMP/KUHNLE AVE./MOUNTAIN BLVD.				
	IMPROVEMENTS				
	Street Work				
1	Saw Cut	300	LF	$5	$1,500
2	AC/AB (6" AC/30" AB)	1,200	SF	$35	$42,000
3	Curb and Gutter	300	LF	$21	$6,300
4	Miscellaneous Improvements/Utility Relocation	1	LS	$116,700	$116,700
5	HC Ramps	4	EA	$2,900	$11,600
8	Signing/Striping	1	LS	$22,000	$22,000
	Subtotal				$200,100
	Signalization				
7	Traffic Signal	1	LS	$180,800	$180,800
8	Interconnect	600	LF	$25	$15,000
	Subtotal				$195,800
	TOTAL				**$395,900**

CITY OF OAKLAND PUBLIC WORKS AGENCY / ENGINEERING DESIGN AND RIGHT-OF-WAY MANAGEMENT
PRELIMINARY PROJECT ESTIMATE

Project:	I.580 Westbound off.ramp/Kunle Avenue/Mountain Blvd #16	**Estimate by:**	M. Uzegbu
		Date Estimated	5/4/2006
Project No.:	P27710	**Checked by:**	

CONSTRUCTION COSTS	ESTIMATED CONSTRUCTION COST		$	395,900
	Contingency	25.0%	$	98,975
	Inspection	9.0%	$	35,631
	Construction Services (Survey and Testing)	2.0%	$	7,918
	TOTAL CONSTRUCTION COSTS	36.0%	$	542,424
	DESIGN COST			
	Engineering studies(traffic studies)	3.0%	$	16,153
	Environmental studies	3.0%	$	16,153
DSG	Design/Engineering	15.0%	$	80,764
	Constructibility Plan Review Cost	5.0%	$	26,921
	TOTAL DESIGN COST	26.0%	$	139,990
ADMINISTRATIVE COSTS	**ADMINISTRATION**			
	Project Management (Administration, bidding etc)	8.0%	$	43,074
	Printing/Duplication/Advertising/Postage	0.5%	$	2,692
	Other Agencies Permit	0.5%	$	2,692
	Contract Compliance	3.0%	$	16,153
	TOTAL ADMINISTRATIVE COSTS	12.0%	$	64,611
	SUB TOTAL PROJECT COST		$	743,025
	Project Contingency	10.0%	$	13,999
	TOTAL PROJECT COST:		***$***	***757,024***

City of Oakland

PRELIMINARY ENGINEER'S ESTIMATE
TRAFFIC INTERSECTION IMPROVEMENTS - INTERSECTION 18
LEONA QUARRY
OAKLAND, CALIFORNIA

06-Jan-06

Item	Description	Quantity	Unit	Unit Price	Amount
	I-580 EASTBOUND OFF-RAMP/SEMINARY AVE./OVERDALE AVE.				
	IMPROVEMENTS				
	Street Work				
1	Miscellaneous Improvements/Utility Relocation	1	LS	$11,300	$11,300
2	Signing/Striping	1	LS	$15,000	$15,000
	Subtotal				$26,300
	Signalization				
3	Traffic Signal	1	LS	$180,800	$180,800
4	Interconnect	1	LS	$11,300	$11,300
	Subtotal				$192,100
	TOTAL				**$218,400**

CITY OF OAKLAND PUBLIC WORKS AGENCY / ENGINEERING DESIGN AND RIGHT-OF-WAY MANAGEMENT
PRELIMINARY PROJECT ESTIMATE

Project: I.580 eastbound off.ramp/Seminary Avenue/Overdale Ave #18 | **Estimate by:** M. Uzegbu | **Date Estimated** 5/4/2006

Project No.: P27710 | **Checked by:**

CONSTRUCTION COSTS	ESTIMATED CONSTRUCTION COST		$	218,400
	Contingency	25.0%	$	54,600
	Inspection	9.0%	$	19,656
	Construction Services (Survey and Testing)	2.0%	$	4,368
	TOTAL CONSTRUCTION COSTS	36.0%	$	78,624
	DESIGN COST			
	Engineering studies(traffic studies)	3.0%	$	8,911
	Environmental studies	3.0%	$	8,911
DSG	Design/Engineering	15.0%	$	44,554
	Constructibility Plan Review Cost	5.0%	$	14,851
	TOTAL DESIGN COST	26.0%	$	77,226
ADMINISTRATION COSTS	**ADMINISTRATION**			
	Project Management (administration, bidding etc)	8.0%	$	23,762
	Printing/Duplication/Advertising/Postage	0.5%	$	1,485
	Other Agencies Permit (PGE power)	0.5%	$	1,485
	Contract Compliance	3.0%	$	8,911
	TOTAL ADMINISTRATIVE COSTS	12.0%	$	35,643
	SUB TOTAL PROJECT COST		$	409,893
	Project Contingency	10.0%	$	7,723
	TOTAL PROJECT COST:		$	***417,616***