Initial Study -
Attachment 2

Memorandum

To: Marc Stout, P.E.

From: Joe Cryer
Matt Weir, P.E., T.E., PTOE

Re: *Eureka Road Medical Office Building (PL16-0169)*
Traffic Evaluation
Roseville, California

Date: December 16, 2016

Per your request and authorization, we have prepared this traffic evaluation for the above referenced project.

Project Understanding

Kimley-Horn understands that the project proposes to construct a 75,000 square foot (maximum size) medical office building on the vacant site located in the southeast corner of the Eureka Road intersection with Rocky Ridge Drive in Roseville (see **Exhibit 1**). The purpose of this analysis is to evaluate the proposed project's access points, and a primary adjacent intersection, to determine the amount of storage and/or driveway treatments that are necessary to ensure safe and efficient operations.

Study Facilities and Evaluation Parameters

The following four intersections (see **Exhibit 2**) are included in this access evaluation. **Exhibit 3** details the study intersections' geometries while **Exhibit 4** details the volumes for Intersections #1-#3 (Existing (2016)) and Intersection #4 (Cumulative (2035)). Traffic counts are provided in **Attachment A**. For each location, traffic/access control and the primary evaluation parameter(s) are described below:

1. Eureka Road @ Southern Site Access Driveway
    - Right-in/right-out
    - Primary considerations are the need for a right-turn deceleration lane and the minimum required throat depth (MRTD)
2. Eureka Road @ Northern Site Access Driveway/Existing Retail Driveway
    - Right-in/right-out
    - Primary considerations are the need for a right-turn deceleration lane, the MRTD, and interaction with the existing retail uses
3. Rocky Ridge Drive @ Site Access Driveway/Existing Retail Driveway
    - Full access, side-street stop control
    - Primary considerations are the need for a right-turn deceleration lane, the MRTD, and interaction with the existing retail uses
4. Eureka Road @ Rocky Ridge Drive
    - Existing traffic signal
    - Primary consideration is build-out (year 2035) volume mix with project volumes, with a focus on the left and U-turn movements

The access evaluation was conducted for the weekday AM and PM peak- hours for the following conditions:

A. Existing (2016) plus Full, Proposed Project (75-ksf) Conditions with direct internal connectivity from Rocky Ridge Drive[+]
B. Existing (2016) plus Full, Proposed Project (75-ksf) Conditions with no direct internal connectivity from Rocky Ridge Drive[+]
C. Cumulative (2035) plus Full, Proposed Project (75-ksf) Conditions with direct internal connectivity from Rocky Ridge Drive[++]
D. Cumulative (2035) plus Full, Proposed Project (75-ksf) Conditions with no direct internal connectivity from Rocky Ridge Drive[++]

[+] Study intersections #1-#3 only
[++] Study intersection #4 only

The access evaluation was performed for the time periods and analysis scenarios listed above. Kimley-Horn applied methods defined in the *Highway Capacity Manual (HCM),* using Synchro 9 traffic analysis software.

Assessment of Proposed Project

Trip Generation
The number of trips anticipated to be generated by the proposed project were approximated using *Trip Generation Manual, 9th Edition* published by the Institute of Transportation Engineers (ITE). **Table 1** presents the trip generation data for the proposed project.

Table 1 – Proposed Project Trip Generation

Land Use (ITE Code)	Size (ksf)	Daily Trips	AM Peak-Hour					PM Peak-Hour				
			Total Trips	IN		OUT		Total Trips	IN		OUT	
				%	Trips	%	Trips		%	Trips	%	Trips
Medical-Dental Office Building (720)	75.0	2,710	179	79%	141	21%	38	268	28%	75	72%	193
Total Trips:		*2,710*	*179*		*141*		*38*	*268*		*75*		*193*

Source: *Trip Generation Manual, 9th Edition*, ITE.

As reflected in **Table 1**, the proposed project is anticipated to generate 179 AM peak-hour and 268 PM peak-hour trips.

Trip Distribution
The distribution of project traffic was developed based on existing project area roadway volumes, general knowledge of project area traffic patterns, the proposed project layout, guidance from *Transportation and Land Development, 2nd Edition* published by ITE, and engineering judgment. Project trips were assigned to the study intersections and the surrounding roadway network according to these patterns. The assignment of project trips to the site driveways accounts for the anticipated building orientation (front of building better served by Driveway #2) and the two internal access points to the adjacent commercial properties. Furthermore, under conditions without full access at Intersection #3, a small portion of the site trips are assumed to "cut through" the adjacent property to enter and exit the site.

Project only volumes for Existing (2016) and Cumulative (2035) plus Proposed Project Conditions with full access at Intersection #3, and Existing (2016) and Cumulative (2035) plus Proposed Project Conditions

with no direct access at Intersection #3 are reflected in **Exhibit 5** and **Exhibit 6,** respectively. Combined volumes for Existing (2016) and Cumulative (2035) plus Proposed Project Conditions with full access at Intersection #3 are reflected in **Exhibit 7** while volumes for Existing (2016) and Cumulative (2035) plus Proposed Project Conditions with no direct access at Intersection #3 are reflected in **Exhibit 8**.

Traffic Assessment Methodology

As previously discussed, the focus of this traffic evaluation is on vehicle queuing entering the site and the Minimum Required Throat Depth (MRTD) at each project site driveway. For this evaluation, the City's guidelines[1] were referenced to determine the driveways' MRTD and median left-turn storage required for entering vehicles. In addition, these guidelines were referenced to determine the need for right-turn deceleration lanes. Finally, Synchro was used to evaluate the anticipated operations at the signalized study intersection of Eureka Road and Rocky Ridge Drive (Intersection #4) under Cumulative (2035) conditions.

Minimum Required Throat Depth (MRTD) & Median Left-Turn Storage

MRTDs were calculated for all three site driveways (Intersections #1-#3) for the two different driveway access conditions at Intersection #3. **Table 2** through **Table 5** summarize the findings of the MRTD evaluation based on the City's guidelines. Additionally, the minimum storage lengths were calculated for the median left-turns entering the project site at Driveway #3. Although assumed to be used under both access conditions, due to the higher number of left and u-turns at the existing Eureka Road median left-turn pocket located south of Intersection #1 (shown in **Table 4** and **Table 5** as Intersection #5) under the conditions without full access at Intersection #3, the minimum storage lengths associated with these volumes were also calculated.

Table 2 – MRTD and Left-Turn Storage for Full Access Configuration at Intersection #3, AM Peak-Hour

INT	TS	Lanes	Speed	ConflVol (Left, Maj)	ConflVol (Left, Minor)	ConflVol (Right)	LT In	RT In	LT Out	RT Out	RT%	Required Storage	Minimum Required Throat Depth (MRTD)
1						482		13		7		-	**50**
2						480		58		49		-	**75**
3	1	2	40	432	688	432	32	137	35	64		**75**	-
3	1	2	40	432	688	432	32	137	35	64	65%	-	**50**

Note: All volumes for conflicting movements come from cumulative turning movement volumes provided by the City from their future year model for the Eureka Rd/Rocky Ridge Dr intersection

Table 3 – MRTD and Left-Turn Storage for Full Access Configuration at Intersection #3, PM Peak-Hour

INT	TS	Lanes	Speed	ConflVol (Left, Maj)	ConflVol (Left, Minor)	ConflVol (Right)	LT In	RT In	LT Out	RT Out	RT%	Required Storage	Minimum Required Throat Depth (MRTD)
1						509		11		40		-	**75**
2						519		66		135		-	**125**
3	1	2	40	456	708	456	28	81	73	93		**50**	-
3	1	2	40	456	708	456	28	81	73	93	56%	-	**100**

Note: All volumes for conflicting movements come from cumulative turning movement volumes provided by the City from their future year model for the Eureka Rd/Rocky Ridge Dr intersection

[1] *Section 4 Traffic Impact Studies, City of Roseville Design Standards*, January 2016.

Table 4 – MRTD and Left-Turn Storage for No Access Configuration at Intersection #3, AM Peak-Hour

INT	TS	Lanes	Speed	ConflVol (Left, Maj)	ConflVol (Left, Minor)	ConflVol (Right)	LT In	RT In	LT Out	RT Out	RT%	Required Storage	Minimum Required Throat Depth (MRTD)
1						497		25		12		-	**50**
2						492		91		60		-	**75**
3	1	2	40	346	589	346	19	48	22	41		**50**	-
3	1	2	40	346	589	346	19	48	22	41	65%	-	**25**
5	1	3	45	1526			180	0		10		**175**	**-**

Note: All volumes for conflicting movements come from cumulative turning movement volumes provided by the City from their future year model for the Eureka Rd/Rocky Ridge Dr intersection

Table 5 – MRTD and Left-Turn Storage for No Access Configuration at Intersection #3, PM Peak-Hour

INT	TS	Lanes	Speed	ConflVol (Left, Maj)	ConflVol (Left, Minor)	ConflVol (Right)	LT In	RT In	LT Out	RT Out	RT%	Required Storage	Minimum Required Throat Depth (MRTD)
1						516		17		52		-	**75**
2						528		81		192		-	**150**
3	1	2	40	443	967	443	20	44	28	29		**50**	-
3	1	2	40	443	967	443	20	44	28	29	51%	-	**50**
5	1	3	45	1598			100	0		20		**100**	**-**

Note: All volumes for conflicting movements come from cumulative turning movement volumes provided by the City from their future year model for the Eureka Rd/Rocky Ridge Dr intersection

MRTD

- Intersection #1 (right-in/right-out), as currently proposed per Exhibit 2, has a throat depth of 50-feet, which is less than the minimum required distance of 75-feet (PM peak-hour under both access conditions) that was calculated for the outbound right-turn. Based on the calculations the existing throat depth is insufficient for both access conditions.
- Intersection #2 (right-in/right-out), as currently proposed per Exhibit 2, has a throat depth of 50-feet, which is less than the minimum distance of 150-feet (PM peak-hour under the "No Access" conditions) that was calculated for the outbound right-turn. Based on the calculations the existing throat depth is insufficient for both access conditions.
- Intersection #3 (full access), as currently proposed per Exhibit 2, has a throat depth of 50-feet, which is less than the minimum distance of 100-feet (PM peak-hour under the "Full Access" conditions) that was calculated for the outbound right- and left-turns. Based on the calculations the existing throat depth is insufficient under these conditions. However, under the "No Access" conditions, this intersection has a throat depth that is consistent with the 50-foot requirement.

Left-Turn Storage

- The existing storage for the left-turns attempting to enter the project at Intersection #3 is sufficient for the calculated required distance of 75-feet (AM peak-hour under the "Full Access" conditions).
- The existing storage for the left-turns attempting to enter the project at Intersection #5 (location as described above) is sufficient for the calculated required distance of 175-feet (AM peak-hour under the "No Access" conditions).

Right-Turn Deceleration Lane

According to the City's guidelines[2]. a right-turn deceleration lane is required when all four of the following conditions are satisfied:

A. The driveway is located on an arterial or expressway.
B. Right turn ingress volume is expected to exceed fifty (50) during peak hour flows on the roadway. For right turn ingress volumes between ten (10) and fifty (50) a right turn curb taper shall be constructed in conformance with the Standard Drawings.
C. There is ample room and frontage to fit a deceleration lane as determined by the City Engineer.
D. The travel speed of the roadway, as determined by the City Engineer, equals or exceeds 45 mph.

The requirements and the conditions at Intersections #1-#3 are summarized in **Table 6** and **Table 7** below. Based on these guidelines, Intersection #2 satisfies the requirements for consideration of a right-turn deceleration lane under both access conditions.

Table 6 – Rocky Ridge Drive Deceleration Lane

Scenario	Time Period	Located on Arterial or Expressway?	Right Turn Volume	Right Turn Volume over 50?	Ample Room and Frontage?	85th Percentile Travel Speed	Travel Speed ≥ 45 mph?	Deceleration Lane Appropriate?
Intersection #3 With Access	AM	Yes	137	Yes	Yes	43.5	No	No
	PM	Yes	81	Yes	Yes	43.5	No	No
Intersection #3 With No Access	AM	Yes	48	No	Yes	43.5	No	No
	PM	Yes	44	No	Yes	43.5	No	No

Table 7 – Eureka Road Deceleration Lane

Scenario	Time Period	Located on Arterial or Expressway?	Right Turn Volume	Right Turn Volume over 50?	Ample Room and Frontage?	85th Percentile Travel Speed	Travel Speed ≥ 45 mph?	Deceleration Lane Appropriate?
Intersection #1 With Access	AM	Yes	13	No	Yes	46.2	Yes	No
	PM	Yes	11	No	Yes	46.2	Yes	No
Intersection #1 With No Access	AM	Yes	25	No	Yes	46.2	Yes	No
	PM	Yes	17	No	Yes	46.2	Yes	No
Intersection #2 With Access	AM	Yes	58	Yes	Yes	46.2	Yes	Yes
	PM	Yes	66	Yes	Yes	46.2	Yes	Yes
Intersection #2 With No Access	AM	Yes	91	Yes	Yes	46.2	Yes	Yes
	PM	Yes	81	Yes	Yes	46.2	Yes	Yes

Signalized Intersection Queuing and Operations

In an effort to confirm the adequacy of the existing configuration at the intersection of Eureka Road and Rocky Ridge Drive (Intersection #4), Synchro was used to determine the anticipated 95th percentile vehicle queues, delay, and Level of Service (LOS) under Cumulative (2035) Conditions. **Table 8** summarizes the delay and LOS at the intersection while **Table 9** summarizes the queuing for select movements. Analysis worksheets are provided in **Attachment B** (Full Access) and **Attachment C** (No Access).

[2] *Section 5 Traffic Impact Studies, City of Roseville Design Standards*, January 2016.

Table 8 – Intersection Level of Service for Cumulative (2035) Conditions

ID	Intersection	Peak Hour	Cumulative (2035) Full Access		Cumulative (2035) No Access	
			Delay (sec)	LOS	Delay (sec)	LOS
4	Eureka Rd @ Rocky Ridge Dr	AM	27.4	C	26.2	C
		PM	34.8	C	33.9	C

As shown in Table 8, the intersection is shown to operate at acceptable LOS C during both peak-hours under both access conditions. Furthermore, Table 9 displays that the queuing is acceptable for all movements in all scenarios.

Table 9 – Intersection Queuing for Cumulative (2035) Conditions

Intersection / Analysis Scenario	Movement	AM Peak-Hour		PM Peak-Hour	
		Available Storage (ft)	95th % Queue (ft)	Available Storage (ft)	95th % Queue (ft)
#4, Eureka Rd @ Rocky Ridge Dr	NBL/NBU				
Cumulative (2035) with Full Access		220	39	220	68
Cumulative (2035) with No Access			56		100
	SBL				
Cumulative (2035) with Full Access		230	168	230	146
Cumulative (2035) with No Access			89		123
	WBL				
Cumulative (2035) with Full Access		185	81	185	169
Cumulative (2035) with No Access			86		152

Source: *Highway Capacity Manual (HCM)* methodology per Synchro© v9.
Note: For approaches with dual left-turn lanes, the longest queue length is reported.

Conclusions

The following are the primary conclusions based on the analyses discussed herein:

- The three site driveways have deficient Minimum Required Throat Depth (MRTD), with the exception of the Rocky Ridge Drive driveway (Intersection #3) under the conditions where full access is not provided at this location. In all cases, the MRTD should be provided by considering "KEEP CLEAR" signing and striping to minimize the potential for driveway blockage. More specifically, while the use of a narrow raised median is appropriate at Intersection #1, due to the existing use of Intersection #2 and Intersection #3, raised medians would likely result in turn movement restrictions and access impacts for the existing, adjacent uses. As such, treatments at these two locations (Intersections #2 and #3) should be limited to signing and striping to discourage vehicles from blocking ingress movements.
- The main Eureka Road driveway (Intersection #2) satisfies the City's guidelines for requiring a right-turn deceleration lane. This condition does not exist today, and is triggered under both access conditions. However, considering the driveway's proximity to Intersection #1 (construction of a right-turn deceleration lane at Intersection #2 would likely extend back to Intersection #1 and necessitate reconstruction of both driveways), construction of a right turn curb taper in a manner consistent with the City's Standard Drawings would be considered adequate treatment for the right-turn movement into this driveway.
- The Eureka Road intersection with Rocky Ridge Drive (Intersection #4) is shown to operate at LOS C or better and have adequate storage length under Cumulative (2035) conditions to accommodate the proposed project.

Attachments:

Exhibit 1 – Vicinity Map
Exhibit 2 – Intersections and Site Plan
Exhibit 3 – Study Intersections, Traffic Control, and Lane Geometries
Exhibit 4 – No Project Volumes
Exhibit 5 – Project Only Volumes, Full Access
Exhibit 6 – Project Only Volumes, No Access
Exhibit 7 – Existing/Cumulative plus Full Access Project Volumes
Exhibit 8 – Existing/Cumulative plus No Access Project Volumes

Attachment A – Traffic Count Data Sheets
Attachment B – Cumulative Full Access Conditions
Attachment C – Cumulative No Access Conditions

City of Roseville: Eureka Road Medical Office Buildings (PL16-0169)

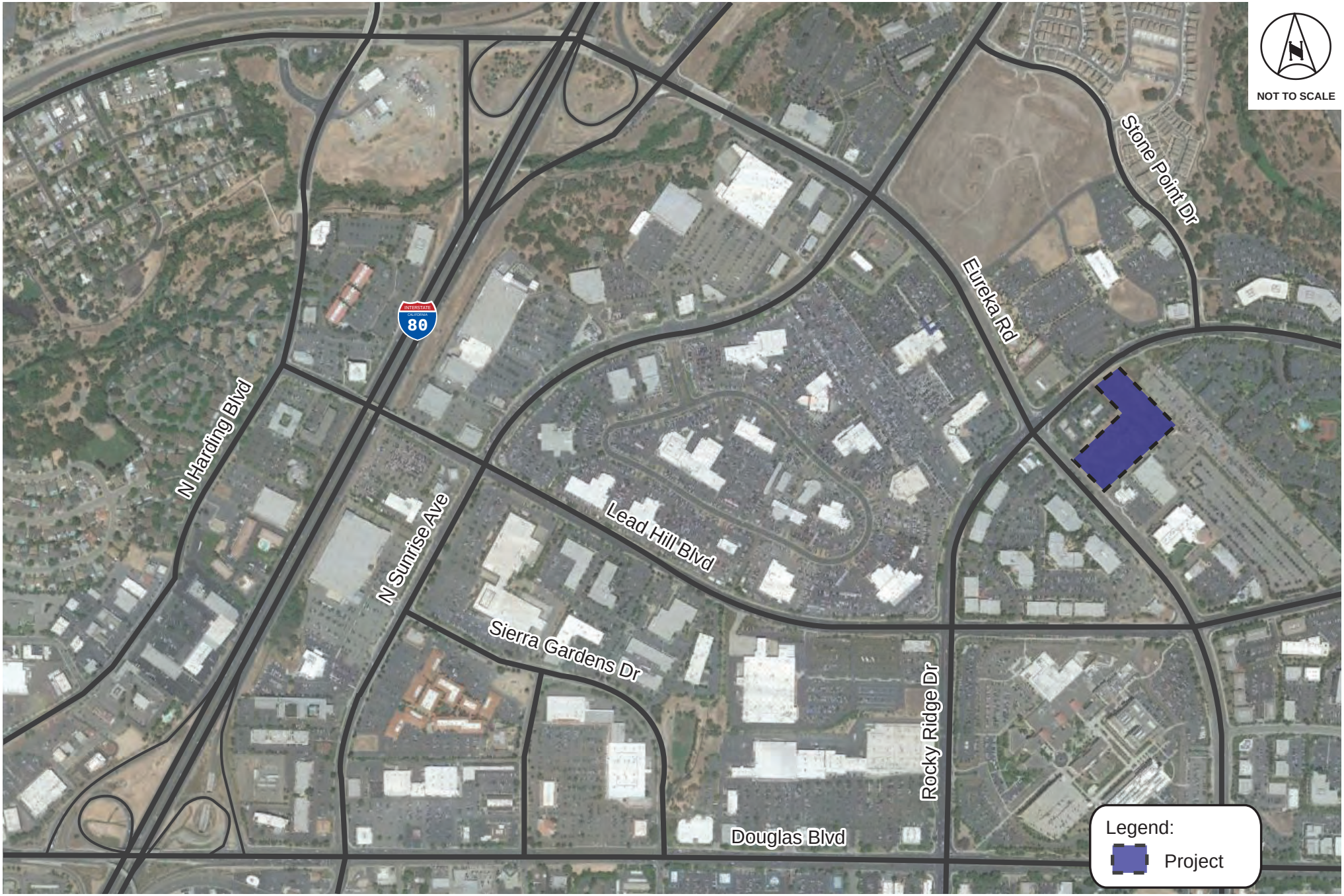

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Exhibit 1
Vicinity Map

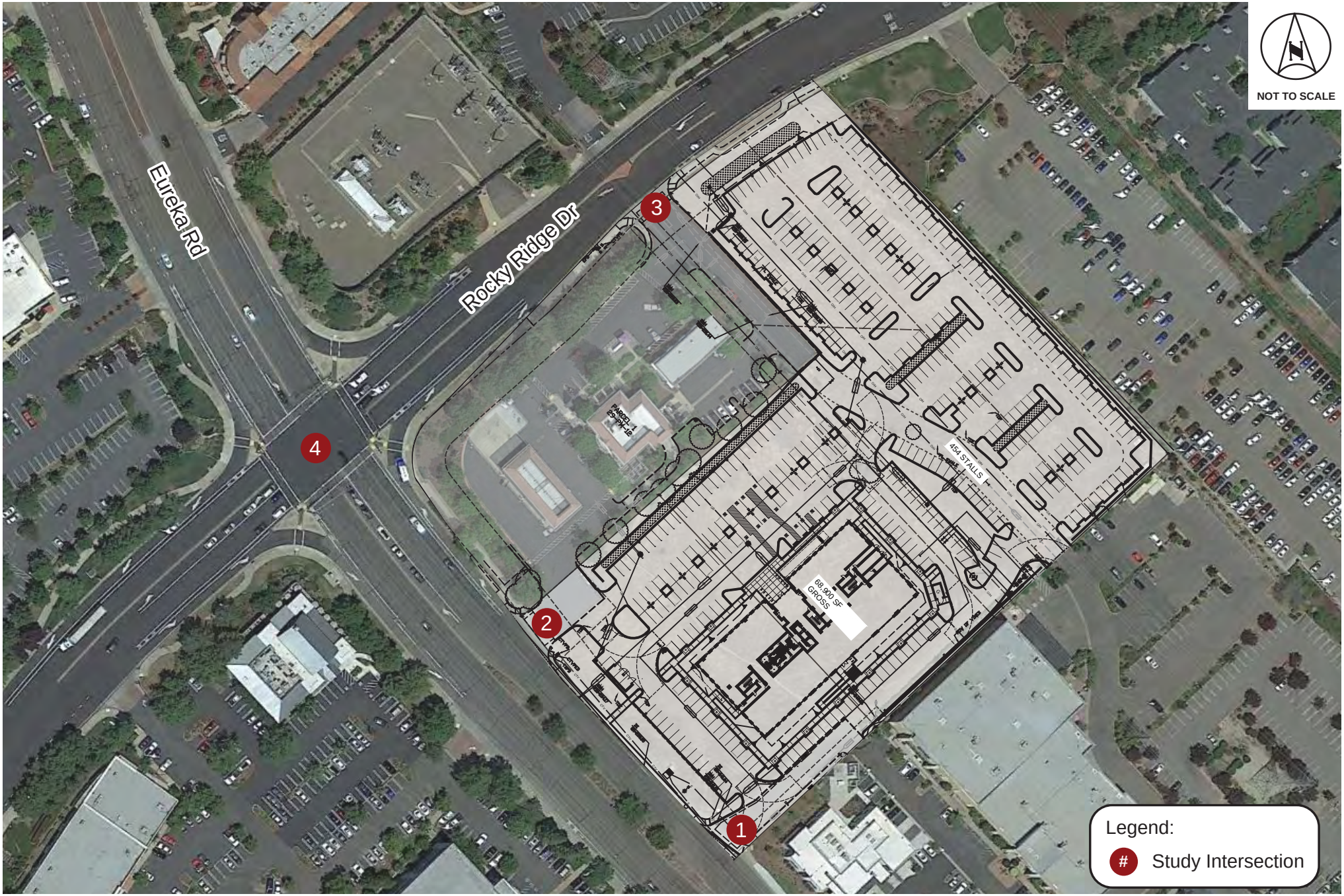

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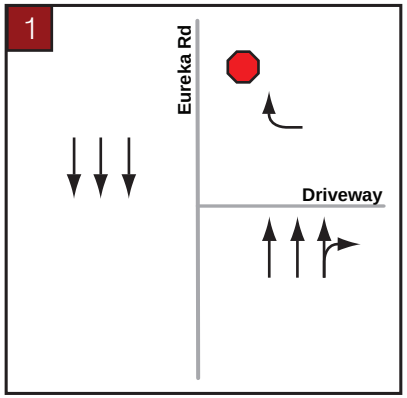
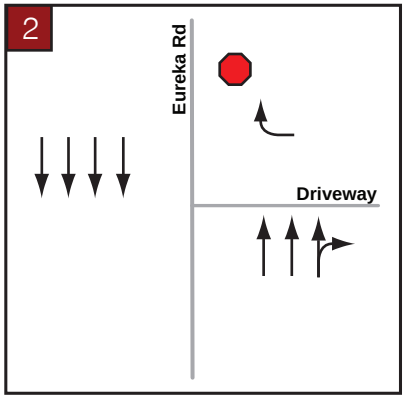
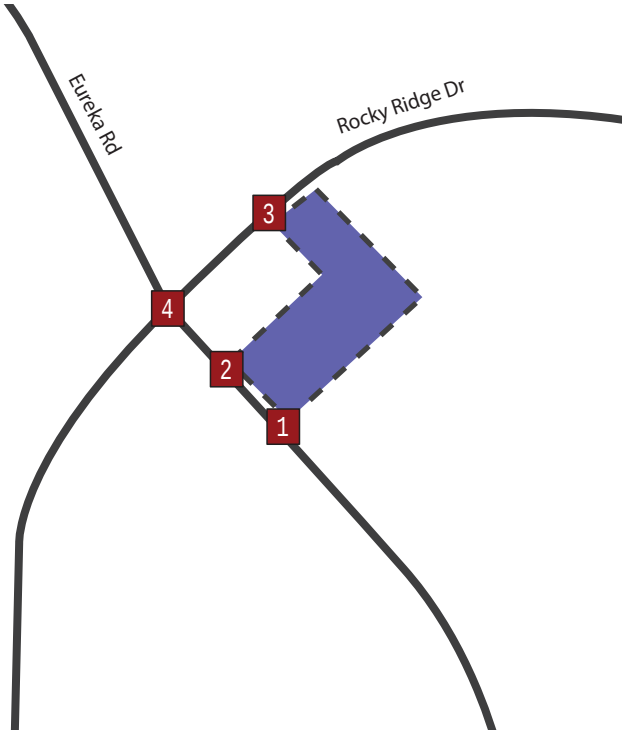
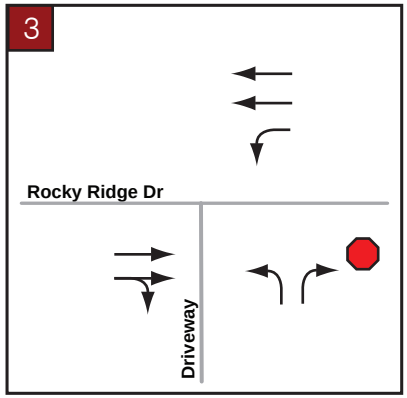
Exhibit 2
Intersections and Project Layout

NOT TO SCALE









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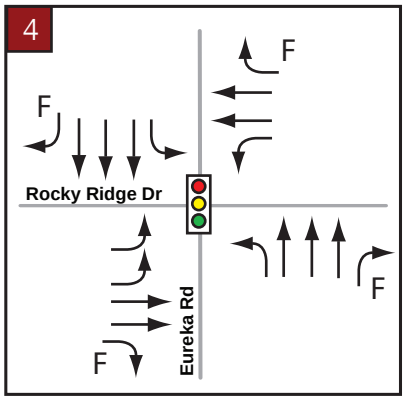

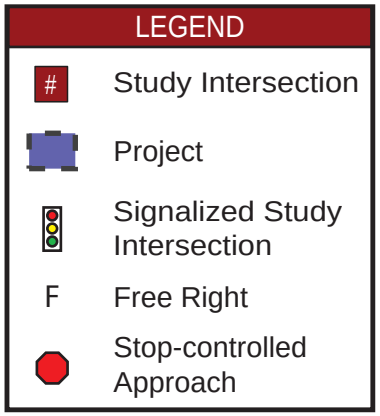

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Exhibit 3

Study Intersections, Traffic Control, and Lane Geometries

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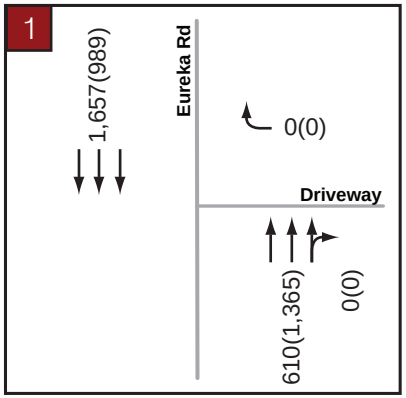

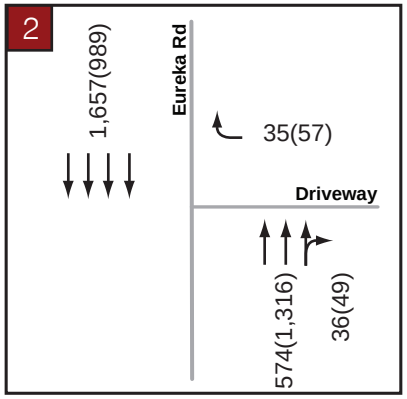

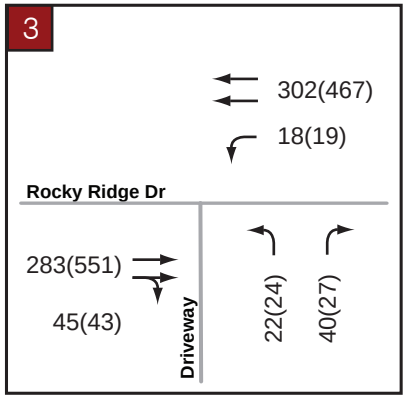

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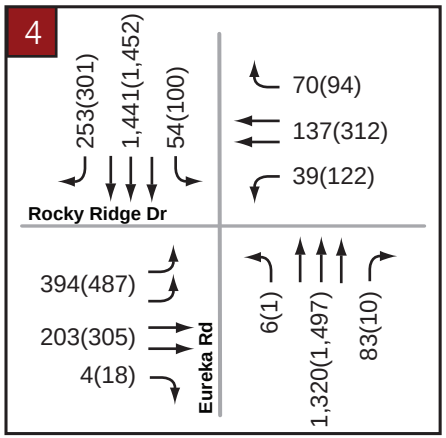

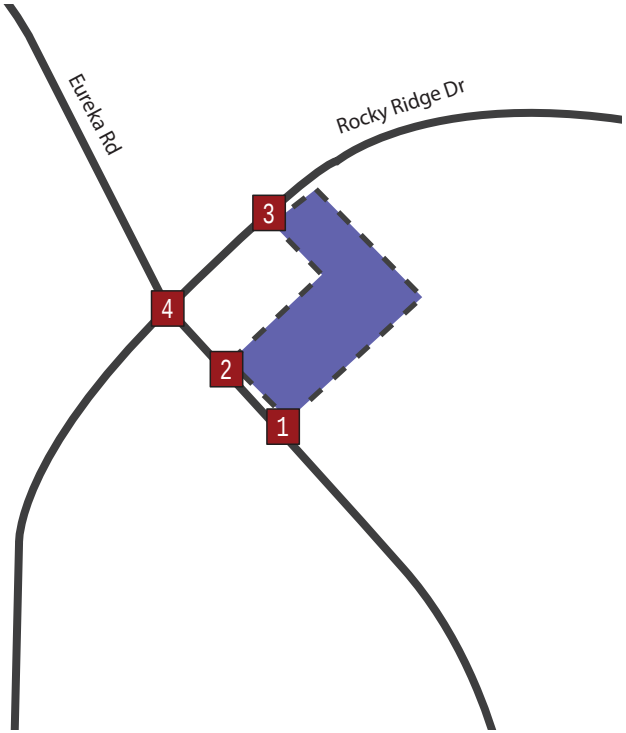

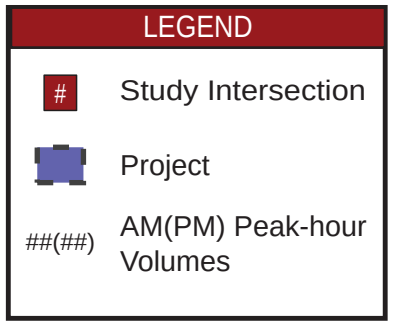

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Exhibit 4
No Project Volumes

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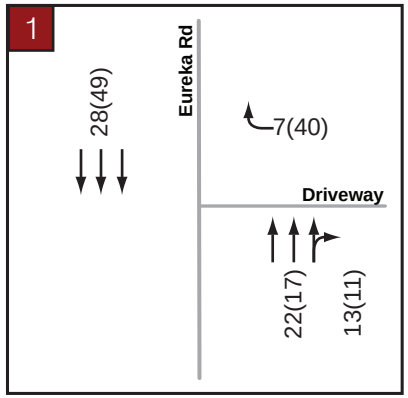

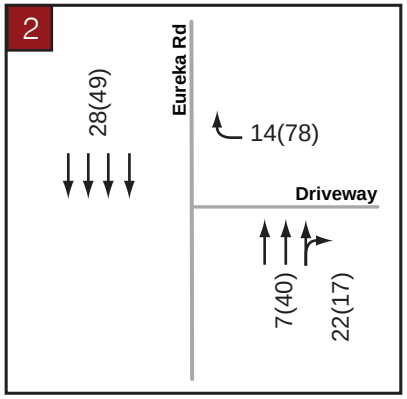

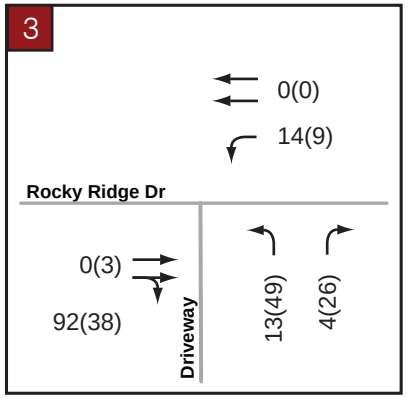

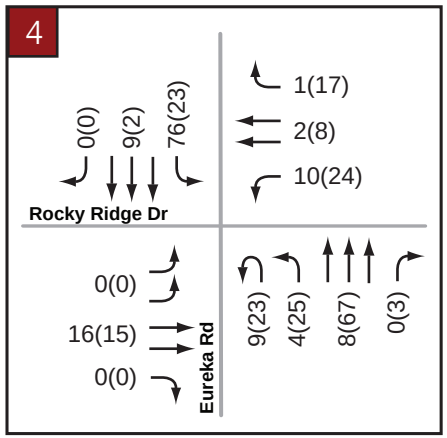

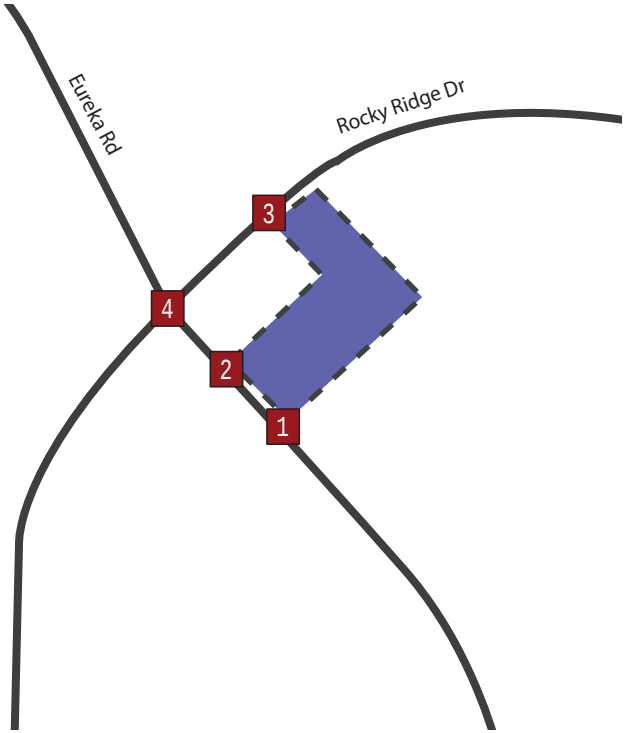

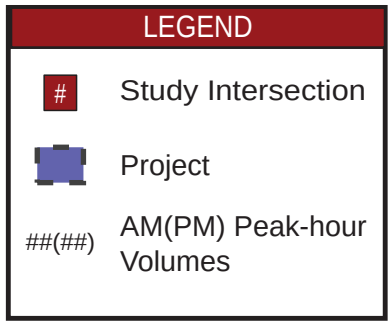

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Exhibit 5
Full Access Project Only Volumes

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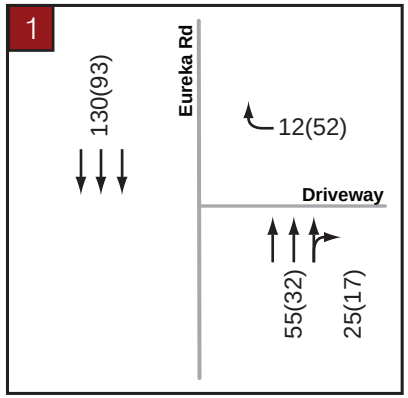
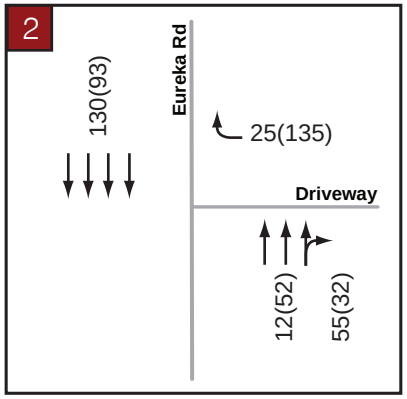
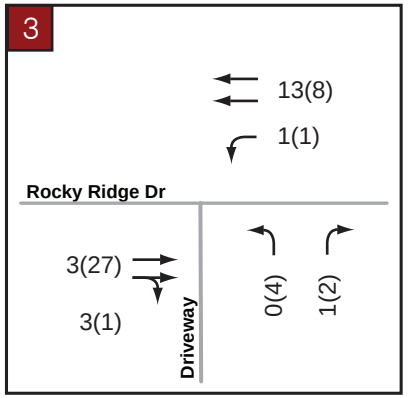
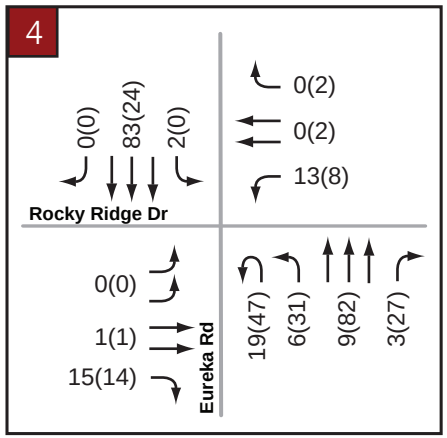
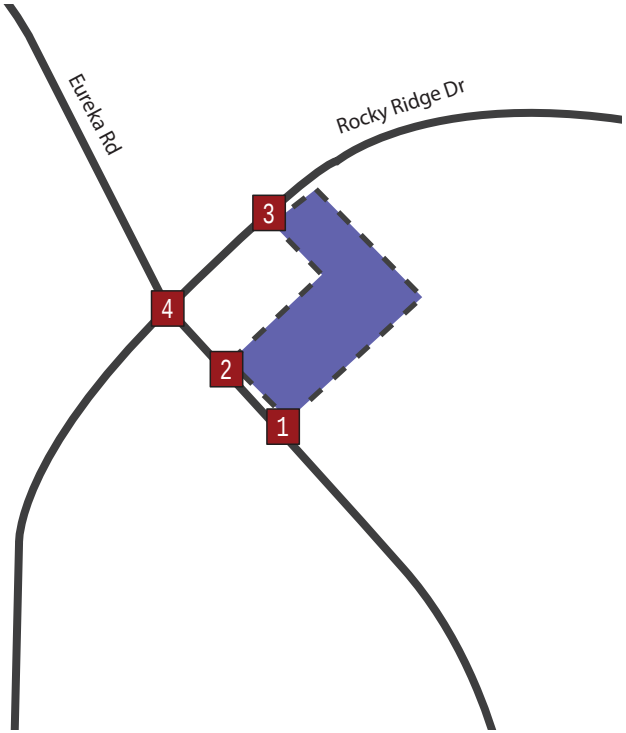
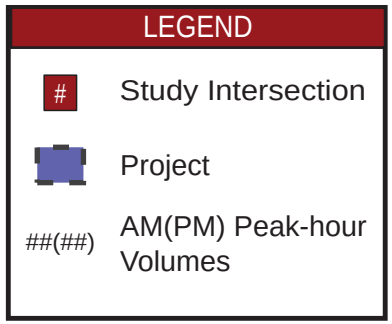










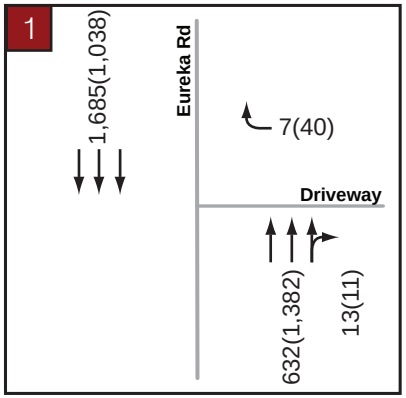


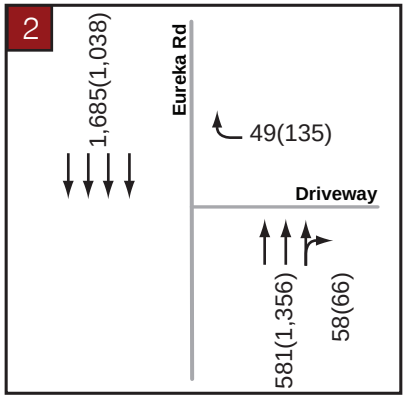
Kimley»Horn

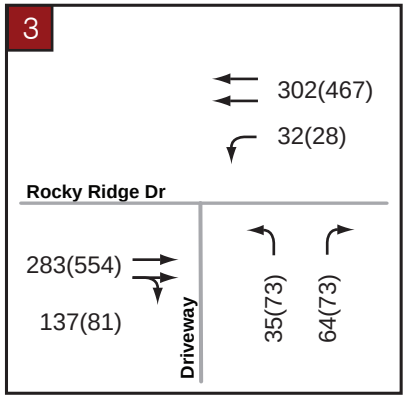
Exhibit 6
No Access Project Only Volumes

NOT TO SCALE

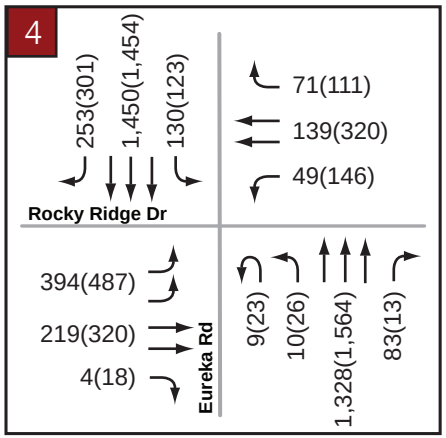
Existing (2016):

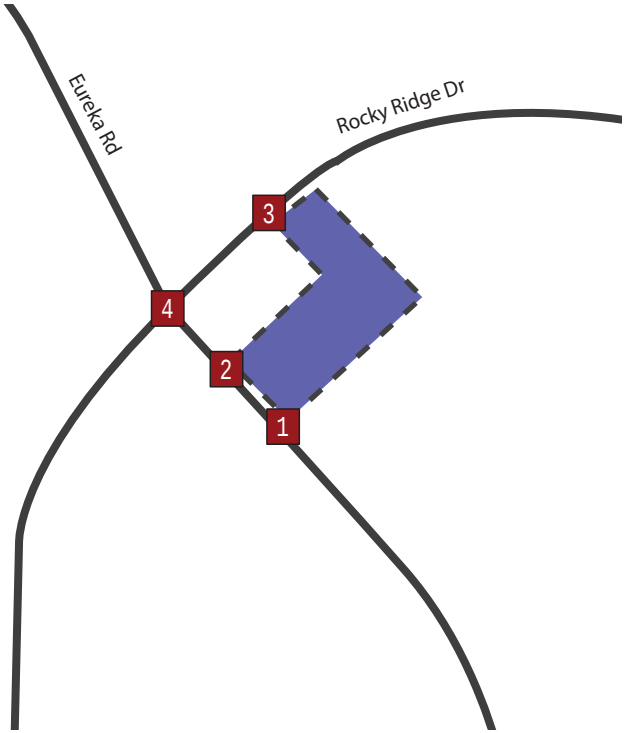


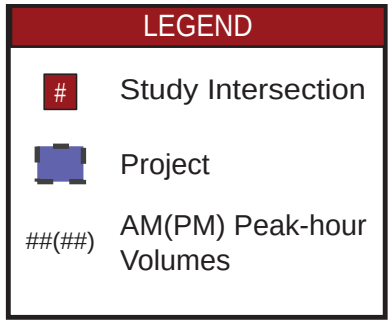




Cumulative (2035):





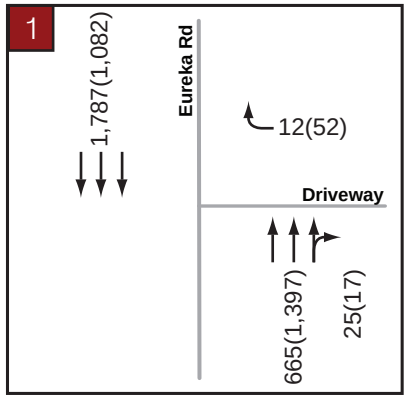


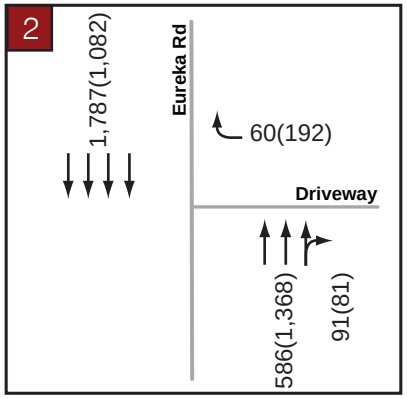
Kimley»Horn

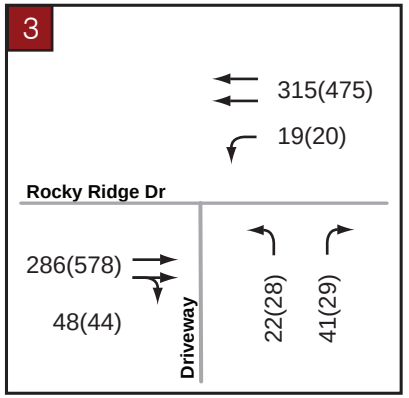
Exhibit 7

Existing/Cumulative plus Full Access Project Volumes

Existing (2016):

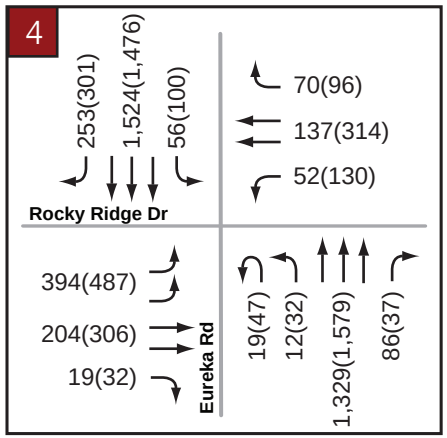


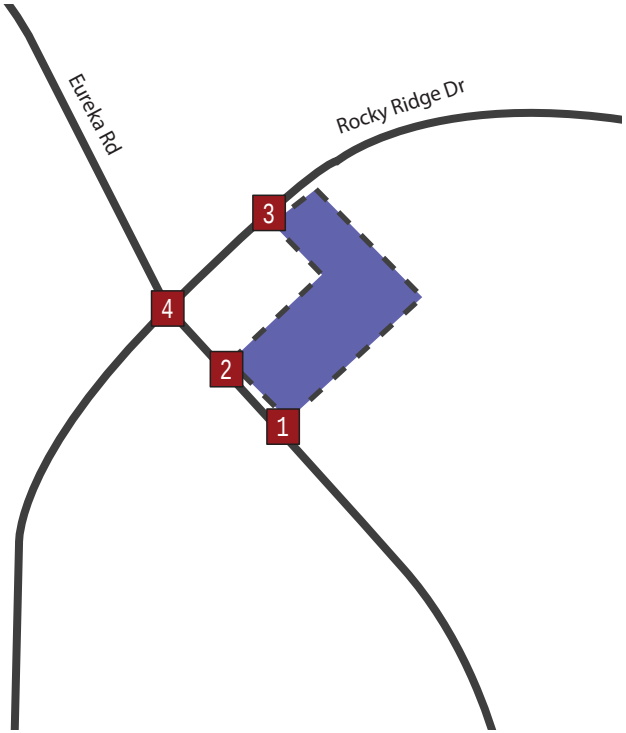


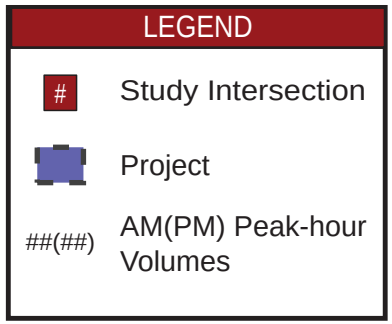


NOT TO SCALE

Cumulative (2035):







Kimley»Horn

Exhibit 8
Existing/Cumulative plus No Access Project Volumes

Kimley»Horn

Attachment A

Traffic Count Data Sheets

ALL TRAFFIC DATA

City of Roseville
All Vehicles & Uturns On Unshifted
Nothing On Bank 1
Nothing On Bank 2

(916) 771-8700
orders@atdtraffic.com

File Name : 16-7721-001 Eureka Rd & Eastern Dwy
Date : 10/4/2016

Unshifted Count = All Vehicles & Uturns

	Eureka Rd Southbound					Eastern Dwy Westbound					Eureka Rd Northbound					Eastern Dwy Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	0	0	0	0	0	0	0	10	0	10	0	0	7	0	7	0	0	0	0	0	17	0
7:15	0	0	0	0	0	0	0	7	0	7	0	0	10	0	10	0	0	0	0	0	17	0
7:30	0	0	0	0	0	0	0	11	0	11	0	0	6	0	6	0	0	0	0	0	17	0
7:45	0	0	0	0	0	0	0	9	0	9	0	0	10	0	10	0	0	0	0	0	19	0
Total	0	0	0	0	0	0	0	37	0	37	0	0	33	0	33	0	0	0	0	0	70	0
8:00	0	0	0	0	0	0	0	8	0	8	0	0	10	0	10	0	0	0	0	0	18	0
8:15	0	0	0	0	0	0	0	8	0	8	0	0	4	0	4	0	0	0	0	0	12	0
8:30	0	0	0	0	0	0	0	9	0	9	0	0	9	0	9	0	0	0	0	0	18	0
8:45	0	0	0	0	0	0	0	9	0	9	0	0	12	0	12	0	0	0	0	0	21	0
Total	0	0	0	0	0	0	0	34	0	34	0	0	35	0	35	0	0	0	0	0	69	0
16:00	0	0	0	0	0	0	0	7	0	7	0	0	7	0	7	0	0	0	0	0	14	0
16:15	0	0	0	0	0	0	0	10	0	10	0	0	4	0	4	0	0	0	0	0	14	0
16:30	0	0	0	0	0	0	0	9	0	9	0	0	9	0	9	0	0	0	0	0	18	0
16:45	0	0	0	0	0	0	0	10	0	10	0	0	8	0	8	0	0	0	0	0	18	0
Total	0	0	0	0	0	0	0	36	0	36	0	0	28	0	28	0	0	0	0	0	64	0
17:00	0	0	0	0	0	0	0	12	0	12	0	0	13	0	13	0	0	0	0	0	25	0
17:15	0	0	0	0	0	0	0	16	0	16	0	0	15	0	15	0	0	0	0	0	31	0
17:30	0	0	0	0	0	0	0	14	0	14	0	0	11	0	11	0	0	0	0	0	25	0
17:45	0	0	0	0	0	0	0	15	0	15	0	0	10	0	10	0	0	0	0	0	25	0
Total	0	0	0	0	0	0	0	57	0	57	0	0	49	0	49	0	0	0	0	0	106	0
Grand Total	0	0	0	0	0	0	0	164	0	164	0	0	145	0	145	0	0	0	0	0	309	0
Apprch %	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	0.0%	0.0%	0.0%			
Total %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.1%	0.0%	53.1%	0.0%	0.0%	46.9%	0.0%	46.9%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	

AM PEAK HOUR	Eureka Rd Southbound					Eastern Dwy Westbound					Eureka Rd Northbound					Eastern Dwy Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 07:15 to 08:15																					
Peak Hour For Entire Intersection Begins at 07:15																					
7:15	0	0	0	0	0	0	0	7	0	7	0	0	10	0	10	0	0	0	0	0	17
7:30	0	0	0	0	0	0	0	11	0	11	0	0	6	0	6	0	0	0	0	0	17
7:45	0	0	0	0	0	0	0	9	0	9	0	0	10	0	10	0	0	0	0	0	19
8:00	0	0	0	0	0	0	0	8	0	8	0	0	10	0	10	0	0	0	0	0	18
Total Volume	0	0	0	0	0	0	0	35	0	35	0	0	36	0	36	0	0	0	0	0	71
% App Total	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	0.0%	0.0%	0.0%		
PHF	.000	.000	.000	.000	.000	.000	.000	.795	.000	.795	.000	.000	.900	.000	.900	.000	.000	.000	.000	.000	.934

PM PEAK HOUR	Eureka Rd Southbound					Eastern Dwy Westbound					Eureka Rd Northbound					Eastern Dwy Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 17:00 to 18:00																					
Peak Hour For Entire Intersection Begins at 17:00																					
17:00	0	0	0	0	0	0	0	12	0	12	0	0	13	0	13	0	0	0	0	0	25
17:15	0	0	0	0	0	0	0	16	0	16	0	0	15	0	15	0	0	0	0	0	31
17:30	0	0	0	0	0	0	0	14	0	14	0	0	11	0	11	0	0	0	0	0	25
17:45	0	0	0	0	0	0	0	15	0	15	0	0	10	0	10	0	0	0	0	0	25
Total Volume	0	0	0	0	0	0	0	57	0	57	0	0	49	0	49	0	0	0	0	0	106
% App Total	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	0.0%	100.0%	0.0%		0.0%	0.0%	0.0%	0.0%		
PHF	.000	.000	.000	.000	.000	.000	.000	.891	.000	.891	.000	.000	.817	.000	.817	.000	.000	.000	.000	.000	.855

ALL TRAFFIC DATA

City of Roseville
All Vehicles & Uturns On Unshifted
Nothing On Bank 1
Nothing On Bank 2

(916) 771-8700
orders@atdtraffic.com

File Name : 16-7721-002 Southern Dwy & Rocky Ridge Dr
Date : 10/4/2016

Unshifted Count = All Vehicles & Uturns

	Southern Dwy Southbound					Rocky Ridge Dr Westbound					Southern Dwy Northbound					Rocky Ridge Dr Eastbound						
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total	Uturns Total
7:00	0	0	0	0	0	4	0	0	0	4	7	0	5	0	12	0	0	5	0	5	21	0
7:15	0	0	0	0	0	1	0	0	0	1	4	0	6	0	10	0	0	10	0	10	21	0
7:30	0	0	0	0	0	4	0	0	0	4	4	0	2	0	6	0	0	14	0	14	24	0
7:45	0	0	0	0	0	3	0	0	0	3	6	0	12	0	18	0	0	5	0	5	26	0
Total	0	0	0	0	0	12	0	0	0	12	21	0	25	0	46	0	0	34	0	34	92	0
8:00	0	0	0	0	0	7	0	0	0	7	4	0	7	0	11	0	0	13	0	13	31	0
8:15	0	0	0	0	0	5	0	0	0	5	8	0	11	0	19	0	0	16	0	16	40	0
8:30	0	0	0	0	0	3	0	0	0	3	4	0	10	0	14	0	0	11	0	11	28	0
8:45	0	0	0	0	0	8	0	0	0	8	7	0	6	0	13	0	0	5	0	5	26	0
Total	0	0	0	0	0	23	0	0	0	23	23	0	34	0	57	0	0	45	0	45	125	0
16:00	0	0	0	0	0	3	0	0	0	3	6	0	14	0	20	0	0	10	0	10	33	0
16:15	0	0	0	0	0	4	0	0	0	4	2	0	8	0	10	0	0	11	0	11	25	0
16:30	0	0	0	0	0	3	0	0	0	3	5	0	10	0	15	0	0	9	0	9	27	0
16:45	0	0	0	0	0	3	0	0	0	3	5	0	8	0	13	0	0	9	0	9	25	0
Total	0	0	0	0	0	13	0	0	0	13	18	0	40	0	58	0	0	39	0	39	110	0
17:00	0	0	0	0	0	7	0	0	0	7	7	0	7	0	14	0	0	10	0	10	31	0
17:15	0	0	0	0	0	3	0	0	0	3	6	0	7	0	13	0	0	13	0	13	29	0
17:30	0	0	0	0	0	6	0	0	0	6	6	0	5	0	11	0	0	11	0	11	28	0
17:45	0	0	0	0	0	4	0	0	0	4	8	0	3	0	11	0	0	5	0	5	20	0
Total	0	0	0	0	0	20	0	0	0	20	27	0	22	0	49	0	0	39	0	39	108	0
Grand Total	0	0	0	0	0	68	0	0	0	68	89	0	121	0	210	0	0	157	0	157	435	0
Apprch %	0.0%	0.0%	0.0%	0.0%		100.0%	0.0%	0.0%	0.0%		42.4%	0.0%	57.6%	0.0%		0.0%	0.0%	100.0%	0.0%			
Total %	0.0%	0.0%	0.0%	0.0%	0.0%	15.6%	0.0%	0.0%	0.0%	15.6%	20.5%	0.0%	27.8%	0.0%	48.3%	0.0%	0.0%	36.1%	0.0%	36.1%	100.0%	

AM PEAK HOUR	Southern Dwy Southbound					Rocky Ridge Dr Westbound					Southern Dwy Northbound					Rocky Ridge Dr Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 07:45 to 08:45																					
Peak Hour For Entire Intersection Begins at 07:45																					
7:45	0	0	0	0	0	3	0	0	0	3	6	0	12	0	18	0	0	5	0	5	26
8:00	0	0	0	0	0	7	0	0	0	7	4	0	7	0	11	0	0	13	0	13	31
8:15	0	0	0	0	0	5	0	0	0	5	8	0	11	0	19	0	0	16	0	16	40
8:30	0	0	0	0	0	3	0	0	0	3	4	0	10	0	14	0	0	11	0	11	28
Total Volume	0	0	0	0	0	18	0	0	0	18	22	0	40	0	62	0	0	45	0	45	125
% App Total	0.0%	0.0%	0.0%	0.0%		100.0%	0.0%	0.0%	0.0%		35.5%	0.0%	64.5%	0.0%		0.0%	0.0%	100.0%	0.0%		
PHF	.000	.000	.000	.000	.000	.643	.000	.000	.000	.643	.688	.000	.833	.000	.816	.000	.000	.703	.000	.703	.781

PM PEAK HOUR	Southern Dwy Southbound					Rocky Ridge Dr Westbound					Southern Dwy Northbound					Rocky Ridge Dr Eastbound					
START TIME	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	Total
Peak Hour Analysis From 16:45 to 17:45																					
Peak Hour For Entire Intersection Begins at 16:45																					
16:45	0	0	0	0	0	3	0	0	0	3	5	0	8	0	13	0	0	9	0	9	25
17:00	0	0	0	0	0	7	0	0	0	7	7	0	7	0	14	0	0	10	0	10	31
17:15	0	0	0	0	0	3	0	0	0	3	6	0	7	0	13	0	0	13	0	13	29
17:30	0	0	0	0	0	6	0	0	0	6	6	0	5	0	11	0	0	11	0	11	28
Total Volume	0	0	0	0	0	19	0	0	0	19	24	0	27	0	51	0	0	43	0	43	113
% App Total	0.0%	0.0%	0.0%	0.0%		100.0%	0.0%	0.0%	0.0%		47.1%	0.0%	52.9%	0.0%		0.0%	0.0%	100.0%	0.0%		
PHF	.000	.000	.000	.000	.000	.679	.000	.000	.000	.679	.857	.000	.844	.000	.911	.000	.000	.827	.000	.827	.911

Turning Movement Volume Report

10/13/2016

Eureka & Rocky Ridge

Intersection: 39

	NW				SE				NE				SW				
Date & Time	**Left**	**Thru**	**Right**	**App. Total**	**Left**	**Thru**	**Right**	**App. Total**	**Left**	**Thru**	**Right**	**App. Total**	**Left**	**Thru**	**Right**	**App. Total**	**Int. Total**
10/04/16 07:00-07:14	5	115	2	122	16	230	43	289	27	27	0	54	6	31	18	55	520
10/04/16 07:15-07:29	4	120	3	127	16	261	43	320	24	38	3	65	5	62	18	85	597
10/04/16 07:30-07:44	6	156	5	167	27	269	50	346	46	44	1	91	10	51	10	71	675
10/04/16 07:45-07:59	11	154	10	175	17	330	90	437	35	57	3	95	13	52	11	76	783
10/04/16 08:00-08:14	5	135	3	143	26	463	69	558	40	38	1	79	11	52	6	69	849
10/04/16 08:15-08:29	9	120	3	132	25	419	73	517	34	52	4	90	11	45	12	68	807
10/04/16 08:30-08:44	9	146	4	159	27	385	59	471	45	66	5	116	12	79	20	111	857
10/04/16 08:45-08:59	11	132	6	149	22	302	60	384	33	54	1	88	14	65	12	91	712
Total:	**60**	**1,078**	**36**	**1,174**	**176**	**2,659**	**487**	**3,322**	**284**	**376**	**18**	**678**	**82**	**437**	**107**	**626**	**5,800**
Approach %:	5%	91%	3%		5%	80%	14%		41%	55%	2%		13%	69%	17%		
Int. %:	1%	18%	0%	20%	3%	45%	8%	57%	4%	6%	0%	11%	1%	7%	1%	10%	

Turning Movement Volume Report

10/13/2016

Eureka & Rocky Ridge

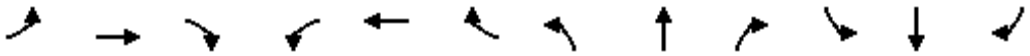
Intersection: 39

	NW				SE				NE				SW				
Date & Time	**Left**	**Thru**	**Right**	**App. Total**	**Left**	**Thru**	**Right**	**App. Total**	**Left**	**Thru**	**Right**	**App. Total**	**Left**	**Thru**	**Right**	**App. Total**	**Int. Total**
10/04/16 16:00-16:14	25	300	10	335	26	224	65	315	81	73	7	161	18	71	31	120	931
10/04/16 16:15-16:29	19	245	6	270	32	198	62	292	92	67	7	166	11	63	18	92	820
10/04/16 16:30-16:44	14	308	6	328	23	198	63	284	112	111	7	230	11	67	28	106	948
10/04/16 16:45-16:59	17	256	12	285	31	183	68	282	102	80	2	184	10	56	25	91	842
10/04/16 17:00-17:14	8	425	10	443	36	246	83	365	118	148	6	272	16	89	51	156	1,236
10/04/16 17:15-17:29	17	324	21	362	32	176	74	282	95	99	5	199	15	79	31	125	968
10/04/16 17:30-17:44	21	278	16	315	31	212	91	334	89	101	8	198	12	72	24	108	955
10/04/16 17:45-17:59	14	237	2	253	23	270	70	363	60	75	6	141	17	63	22	102	859
Total:	**135**	**2,373**	**83**	**2,591**	**234**	**1,707**	**576**	**2,517**	**749**	**754**	**48**	**1,551**	**110**	**560**	**230**	**900**	**7,559**
Approach %:	5%	91%	3%		9%	67%	22%		48%	48%	3%		12%	62%	25%		
Int. %:	1%	31%	1%	34%	3%	22%	7%	33%	9%	9%	0%	20%	1%	7%	3%	11%	

Kimley»Horn

Attachment B

Cumulative Full Access Conditions



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	428	238	4	53	151	77	21	1443	90	141	1576	275
v/c Ratio	0.77	0.33	0.00	0.45	0.46	0.05	0.15	0.61	0.06	0.69	0.57	0.17
Control Delay	57.5	42.0	0.0	65.1	56.0	0.1	50.7	27.0	0.1	67.8	21.7	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	42.0	0.0	65.1	56.0	0.1	50.7	27.0	0.1	67.8	21.7	0.2
Queue Length 50th (ft)	165	85	0	40	59	0	16	297	0	107	233	0
Queue Length 95th (ft)	211	118	0	81	92	0	39	427	0	168	459	0
Internal Link Dist (ft)		808			235			295			308	
Turn Bay Length (ft)	225		225	185		185	220		220	230		
Base Capacity (vph)	1001	982	1583	236	412	1583	236	2369	1583	246	2786	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.24	0.00	0.22	0.37	0.05	0.09	0.61	0.06	0.57	0.57	0.17

Intersection Summary

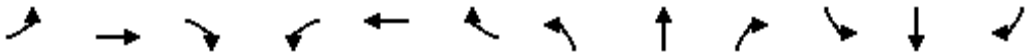
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	394	219	4	49	139	71	9	10	1328	83	130	1450
Future Volume (vph)	394	219	4	49	139	71	9	10	1328	83	130	1450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.7	4.0	4.0	6.0	4.0		4.0	5.7	4.0	4.0	5.7
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	428	238	4	53	151	77	10	11	1443	90	141	1576
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	428	238	4	53	151	77	0	21	1443	90	141	1576
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	5	2		1	6		3	3	8		7	4
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	19.5	24.6	120.0	7.1	11.9	120.0		6.4	55.1	120.0	13.8	62.5
Effective Green, g (s)	19.5	24.6	120.0	7.1	11.9	120.0		6.4	55.1	120.0	13.8	62.5
Actuated g/C Ratio	0.16	0.21	1.00	0.06	0.10	1.00		0.05	0.46	1.00	0.12	0.52
Clearance Time (s)	4.0	5.7		4.0	6.0			4.0	5.7		4.0	5.7
Vehicle Extension (s)	2.0	4.3		2.0	3.9			2.0	4.3		2.0	4.3
Lane Grp Cap (vph)	557	725	1583	104	350	1583		94	2334	1583	203	2648
v/s Ratio Prot	c0.12	0.07		0.03	c0.04			0.01	c0.28		c0.08	0.31
v/s Ratio Perm			0.00			0.05				0.06		
v/c Ratio	0.77	0.33	0.00	0.51	0.43	0.05		0.22	0.62	0.06	0.69	0.60
Uniform Delay, d1	48.1	40.7	0.0	54.8	50.9	0.0		54.4	24.5	0.0	51.1	20.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7	0.4	0.0	1.4	1.1	0.1		0.4	1.2	0.1	8.0	1.0
Delay (s)	53.8	41.1	0.0	56.2	52.0	0.1		54.9	25.7	0.1	59.1	21.0
Level of Service	D	D	A	E	D	A		D	C	A	E	C
Approach Delay (s)		48.9			38.6				24.7			20.8
Approach LOS		D			D				C			C

Intersection Summary			
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	253
Future Volume (vph)	253
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	275
RTOR Reduction (vph)	0
Lane Group Flow (vph)	275
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	120.0
Effective Green, g (s)	120.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.17
v/c Ratio	0.17
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.2
Delay (s)	0.2
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	529	348	20	159	348	121	53	1700	14	134	1580	327
v/c Ratio	0.86	0.56	0.01	0.72	0.83	0.08	0.23	0.84	0.01	0.66	0.78	0.21
Control Delay	56.6	43.9	0.0	62.5	63.1	0.1	41.8	33.9	0.0	59.8	32.3	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.6	43.9	0.0	62.5	63.1	0.1	41.8	33.9	0.0	59.8	32.3	0.3
Queue Length 50th (ft)	176	113	0	104	122	0	32	376	0	87	360	0
Queue Length 95th (ft)	#252	165	0	169	#201	0	68	#505	0	146	425	0
Internal Link Dist (ft)		808			235			295			308	
Turn Bay Length (ft)	225		225	185		185	220		220	230		
Base Capacity (vph)	653	624	1583	269	419	1583	269	2033	1583	269	2034	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.56	0.01	0.59	0.83	0.08	0.20	0.84	0.01	0.50	0.78	0.21

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	487	320	18	146	320	111	23	26	1564	13	123	1454
Future Volume (vph)	487	320	18	146	320	111	23	26	1564	13	123	1454
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.7	4.0	4.0	6.0	4.0		4.0	5.7	4.0	4.0	5.7
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	529	348	20	159	348	121	25	28	1700	14	134	1580
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	529	348	20	159	348	121	0	53	1700	14	134	1580
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	5	2		1	6		3	3	8		7	4
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	18.8	18.5	105.0	13.1	12.5	105.0		12.8	42.0	105.0	12.0	41.2
Effective Green, g (s)	18.8	18.5	105.0	13.1	12.5	105.0		12.8	42.0	105.0	12.0	41.2
Actuated g/C Ratio	0.18	0.18	1.00	0.12	0.12	1.00		0.12	0.40	1.00	0.11	0.39
Clearance Time (s)	4.0	5.7		4.0	6.0			4.0	5.7		4.0	5.7
Vehicle Extension (s)	2.0	4.3		2.0	3.9			2.0	4.3		2.0	4.3
Lane Grp Cap (vph)	614	623	1583	220	421	1583		215	2034	1583	202	1995
v/s Ratio Prot	c0.15	0.10		0.09	c0.10			0.03	c0.33		0.08	c0.31
v/s Ratio Perm			0.01			0.08				0.01		
v/c Ratio	0.86	0.56	0.01	0.72	0.83	0.08		0.25	0.84	0.01	0.66	0.79
Uniform Delay, d1	41.8	39.5	0.0	44.2	45.2	0.0		41.7	28.4	0.0	44.6	28.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.5	1.5	0.0	9.5	13.0	0.1		0.2	4.3	0.0	6.2	3.3
Delay (s)	53.4	41.0	0.0	53.7	58.2	0.1		42.0	32.7	0.0	50.8	31.4
Level of Service	D	D	A	D	E	A		D	C	A	D	C
Approach Delay (s)		47.4			45.9				32.7			27.7
Approach LOS		D			D				C			C

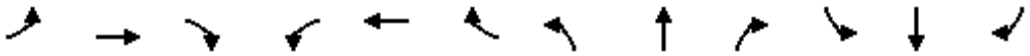
Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	301
Future Volume (vph)	301
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	327
RTOR Reduction (vph)	0
Lane Group Flow (vph)	327
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	105.0
Effective Green, g (s)	105.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.21
v/c Ratio	0.21
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.3
Delay (s)	0.3
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Attachment C
Cumulative No Access Conditions



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	428	222	21	57	149	76	34	1445	93	61	1657	275
v/c Ratio	0.77	0.31	0.01	0.47	0.46	0.05	0.20	0.54	0.06	0.49	0.63	0.17
Control Delay	57.5	42.1	0.0	65.4	56.0	0.1	50.0	21.7	0.1	65.7	25.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.5	42.1	0.0	65.4	56.0	0.1	50.0	21.7	0.1	65.7	25.3	0.2
Queue Length 50th (ft)	165	79	0	43	58	0	24	270	0	46	376	0
Queue Length 95th (ft)	211	112	0	86	91	0	56	384	0	89	491	0
Internal Link Dist (ft)		808			235			295			308	
Turn Bay Length (ft)	225		225	185		185	220		220	230		
Base Capacity (vph)	1001	982	1583	236	412	1583	236	2673	1583	236	2620	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.23	0.01	0.24	0.36	0.05	0.14	0.54	0.06	0.26	0.63	0.17

Intersection Summary

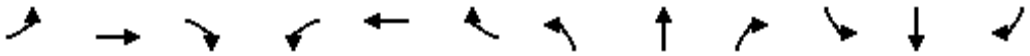
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	394	204	19	52	137	70	19	12	1329	86	56	1524
Future Volume (vph)	394	204	19	52	137	70	19	12	1329	86	56	1524
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.7	4.0	4.0	6.0	4.0		4.0	5.7	4.0	4.0	5.7
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	428	222	21	57	149	76	21	13	1445	93	61	1657
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	428	222	21	57	149	76	0	34	1445	93	61	1657
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	5	2		1	6		3	3	8		7	4
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	19.5	24.2	120.0	7.3	11.7	120.0		9.6	61.5	120.0	7.6	59.5
Effective Green, g (s)	19.5	24.2	120.0	7.3	11.7	120.0		9.6	61.5	120.0	7.6	59.5
Actuated g/C Ratio	0.16	0.20	1.00	0.06	0.10	1.00		0.08	0.51	1.00	0.06	0.50
Clearance Time (s)	4.0	5.7		4.0	6.0			4.0	5.7		4.0	5.7
Vehicle Extension (s)	2.0	4.3		2.0	3.9			2.0	4.3		2.0	4.3
Lane Grp Cap (vph)	557	713	1583	107	345	1583		141	2606	1583	112	2521
v/s Ratio Prot	c0.12	0.06		0.03	c0.04			0.02	c0.28		0.03	c0.33
v/s Ratio Perm			0.01			0.05				0.06		
v/c Ratio	0.77	0.31	0.01	0.53	0.43	0.05		0.24	0.55	0.06	0.54	0.66
Uniform Delay, d1	48.1	40.8	0.0	54.7	51.0	0.0		51.8	19.9	0.0	54.5	22.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7	0.4	0.0	2.5	1.2	0.1		0.3	0.9	0.1	2.9	1.4
Delay (s)	53.8	41.2	0.0	57.2	52.2	0.1		52.1	20.8	0.1	57.4	24.0
Level of Service	D	D	A	E	D	A		D	C	A	E	C
Approach Delay (s)		47.9			39.1				20.2			21.7
Approach LOS		D			D				C			C

Intersection Summary			
HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	253
Future Volume (vph)	253
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	275
RTOR Reduction (vph)	0
Lane Group Flow (vph)	275
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	120.0
Effective Green, g (s)	120.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.17
v/c Ratio	0.17
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.2
Delay (s)	0.2
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	529	333	35	141	341	104	86	1716	40	109	1604	327
v/c Ratio	0.86	0.51	0.02	0.68	0.82	0.07	0.37	0.82	0.03	0.60	0.79	0.21
Control Delay	56.6	42.5	0.0	60.5	62.2	0.1	45.1	32.3	0.0	58.0	32.7	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.6	42.5	0.0	60.5	62.2	0.1	45.1	32.3	0.0	58.0	32.7	0.3
Queue Length 50th (ft)	176	106	0	92	120	0	52	372	0	71	367	0
Queue Length 95th (ft)	#252	158	0	152	#195	0	100	#505	0	123	434	0
Internal Link Dist (ft)		808			235			295			308	
Turn Bay Length (ft)	225		225	185		185	220		220	230		
Base Capacity (vph)	653	647	1583	269	417	1583	269	2096	1583	269	2037	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.51	0.02	0.52	0.82	0.07	0.32	0.82	0.03	0.41	0.79	0.21

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	487	306	32	130	314	96	47	32	1579	37	100	1476
Future Volume (vph)	487	306	32	130	314	96	47	32	1579	37	100	1476
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.7	4.0	4.0	6.0	4.0		4.0	5.7	4.0	4.0	5.7
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00		1.00	0.91	1.00	1.00	0.91
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.95	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	3539	1583	1770	3539	1583		1770	5085	1583	1770	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	529	333	35	141	341	104	51	35	1716	40	109	1604
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	529	333	35	141	341	104	0	86	1716	40	109	1604
Turn Type	Prot	NA	Free	Prot	NA	Free	Prot	Prot	NA	Free	Prot	NA
Protected Phases	5	2		1	6		3	3	8		7	4
Permitted Phases			Free			Free				Free		
Actuated Green, G (s)	18.8	19.2	105.0	12.3	12.4	105.0		12.8	43.3	105.0	10.8	41.3
Effective Green, g (s)	18.8	19.2	105.0	12.3	12.4	105.0		12.8	43.3	105.0	10.8	41.3
Actuated g/C Ratio	0.18	0.18	1.00	0.12	0.12	1.00		0.12	0.41	1.00	0.10	0.39
Clearance Time (s)	4.0	5.7		4.0	6.0			4.0	5.7		4.0	5.7
Vehicle Extension (s)	2.0	4.3		2.0	3.9			2.0	4.3		2.0	4.3
Lane Grp Cap (vph)	614	647	1583	207	417	1583		215	2096	1583	182	2000
v/s Ratio Prot	c0.15	0.09		0.08	c0.10			0.05	c0.34		0.06	c0.32
v/s Ratio Perm			0.02			0.07				0.03		
v/c Ratio	0.86	0.51	0.02	0.68	0.82	0.07		0.40	0.82	0.03	0.60	0.80
Uniform Delay, d1	41.8	38.7	0.0	44.5	45.2	0.0		42.6	27.4	0.0	45.0	28.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.5	1.1	0.0	7.1	12.3	0.1		0.4	3.7	0.0	3.5	3.5
Delay (s)	53.4	39.8	0.0	51.6	57.5	0.1		43.0	31.1	0.0	48.5	31.7
Level of Service	D	D	A	D	E	A		D	C	A	D	C
Approach Delay (s)		46.2			45.9				31.0			27.6
Approach LOS		D			D				C			C

Intersection Summary			
HCM 2000 Control Delay	33.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SBR
Lane Configurations	
Traffic Volume (vph)	301
Future Volume (vph)	301
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.0
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	327
RTOR Reduction (vph)	0
Lane Group Flow (vph)	327
Turn Type	Free
Protected Phases	
Permitted Phases	Free
Actuated Green, G (s)	105.0
Effective Green, g (s)	105.0
Actuated g/C Ratio	1.00
Clearance Time (s)	
Vehicle Extension (s)	
Lane Grp Cap (vph)	1583
v/s Ratio Prot	
v/s Ratio Perm	0.21
v/c Ratio	0.21
Uniform Delay, d1	0.0
Progression Factor	1.00
Incremental Delay, d2	0.3
Delay (s)	0.3
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary