

APPENDIX F – TRAFFIC IMPACT ANALYSIS



July 5, 2018

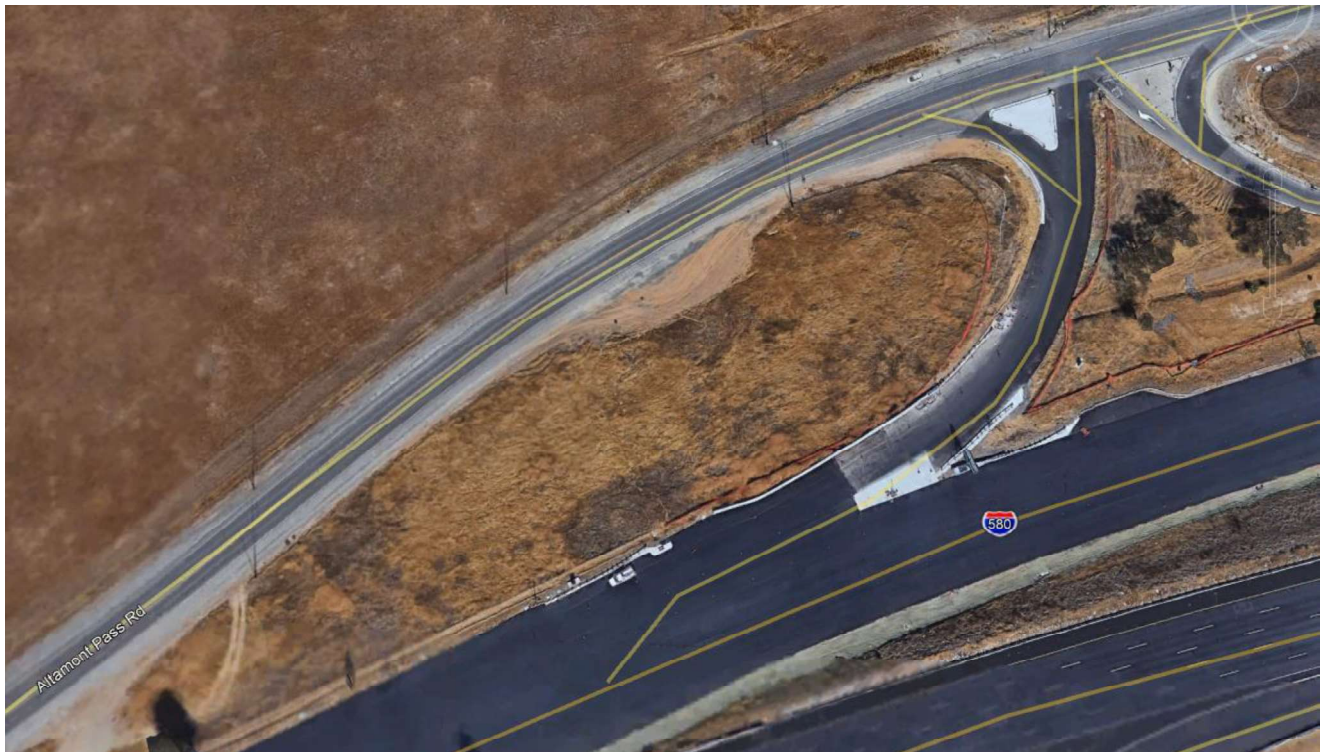
Ali Amidy
555 Campbell Technology Park, Suite 125
Campbell, CA 95008
(408)497-4137
aliamidy@aol.com

Subject: Traffic Impact Analysis Proposed Greenville Plaza at I-580 & Greenville Rd, Livermore

Dear Ali:

We understand that a new gas station-car wash, convenience store-restaurant, and retail building development (aka, Greenville Plaza) is being proposed on Altamont Pass Road, just west of the I-580 Westbound on/off ramp at Greenville Road-Laughlin Road (see Figure 1 below).

Figure 1: Proposed Project Location (Source: Google Earth, Circa 2018)



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Civil Engineers | Traffic Engineers | Surveyors

This letter summarizes the following traffic impact analysis topics:

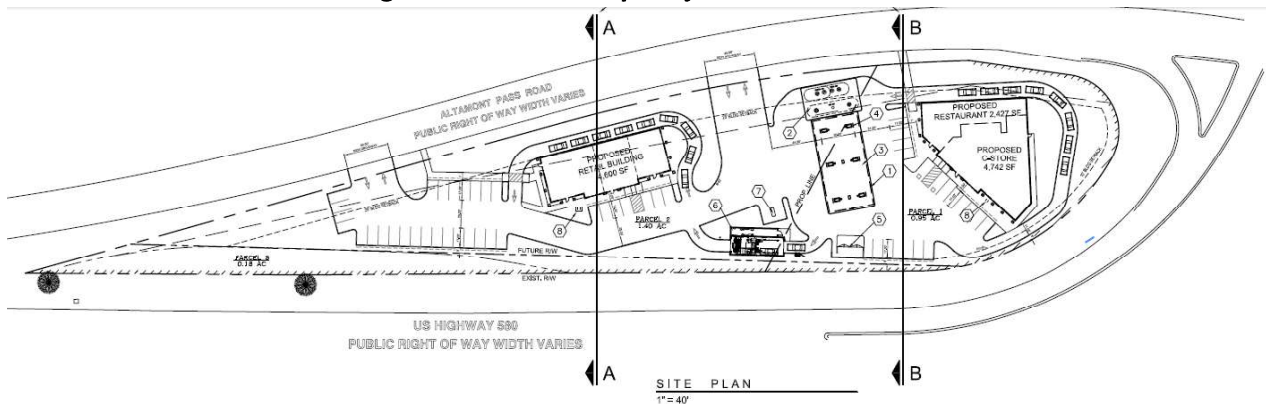
- Project Description
- Project Travel Demand
- Analysis Methodology
- Existing Conditions
- Existing Plus Project Conditions
- Existing Plus Approved/Pending (EPAP) Conditions
- EPAP Plus Project Conditions
- Year 2035 Traffic Conditions
- Sight Distance
- Queuing Analysis
- Segment Analysis

Project Description

As shown on Figure 2, the following uses are proposed for Greenville Plaza:

- Gas Station with 12 fuel pumps and Car Wash
- Convenience Store [4,742 square feet (SF)]
- Restaurant (50 seats)
- Retail Building (4,600 SF)

Figure 2: Preliminary Project Site Plan



LOT DATA:	
A.P.N.:	009B-550-2-3; 009B-550-5; 009B-550-1-2
TOTAL ACREAGE:	±100.752 SF (±2.53 AC)
EXISTING PARCELS:	3
PROPOSED PARCELS:	1
EXISTING ZONE:	COUNTY
PROPOSED ZONE:	CHS - HIGHWAY COMMERCIAL SERVICE
EXISTING USE:	VACANT
PROPOSED USE:	CONVENIENCE STORE, GASOLINE SALES, RETAIL, RESTAURANT, AND CARWASH
LOT COVERAGE:	14.4% (15,817 SF)

PARKING DATA:	
REQUIRED:	
C-STORE (4742/250 SF):	19 SPACES
RESTAURANT (50 SEATS):	17 SPACES
(50/3 = 17)	
RETAIL (4600/250 SF):	19 SPACES
CARWASH (768/400 SF):	2 SPACES
REQUIRED:	57 SPACES
STANDARD SPACE (9'x18')	48 SPACES
ACCESSIBLE SPACE (9'x18')	4 SPACES
SPACES AT FUEL PUMP:	12 SPACES
PROVIDED:	64 SPACES

SITE UTILITIES:	
SEWAGE DISPOSAL:	CITY
WATER SUPPLY:	CITY
DRAINAGE:	CITY

PROVIDED BY:	
CITY	
CITY	

APPLICANT	
AL AMIDY	
555 CAMPBELL TECHNOLOGY PARK	
SUITE 125	
CAMPBELL, CA 95008	
PHONE: (408) 497-4137	

DESIGN FIRM	
MILESTONE ASSOCIATES	
CONTACT: JULIO TINAJERO	
1000 LINCOLN ROAD, STE. H202	
YUBA CITY, CA 95991	
PHONE: (530) 755-4700	

SHEET INDEX	
DD1	PRELIMINARY SITE PLAN
DD1.1	SURVEY
DD1.2	BUILDING ENVELOPE EXHIBIT
DD2	CONCEPTUAL BUILDING A - FLOOR PLAN
DD3	CONCEPTUAL BUILDING A - EXTERIOR ELEVATIONS
DD4	CONCEPTUAL BUILDING B - FLOOR PLAN
DD5	CONCEPTUAL BUILDING B - EXTERIOR ELEVATIONS
DD6	FUEL CANOPY

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Project Travel Demand

The trip generation of the Project is based on those from the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, whose rates are national averages from similar types of uses. Table 1 presents a summary of the expected trip generation. Also, to make for a conservative analysis, a pass-by rate of only 45% was applied to the trip generation estimates. ITE estimates a pass-by rate of at least 50% for gas stations and fast food restaurants.

Table 1: Project Trip Generation

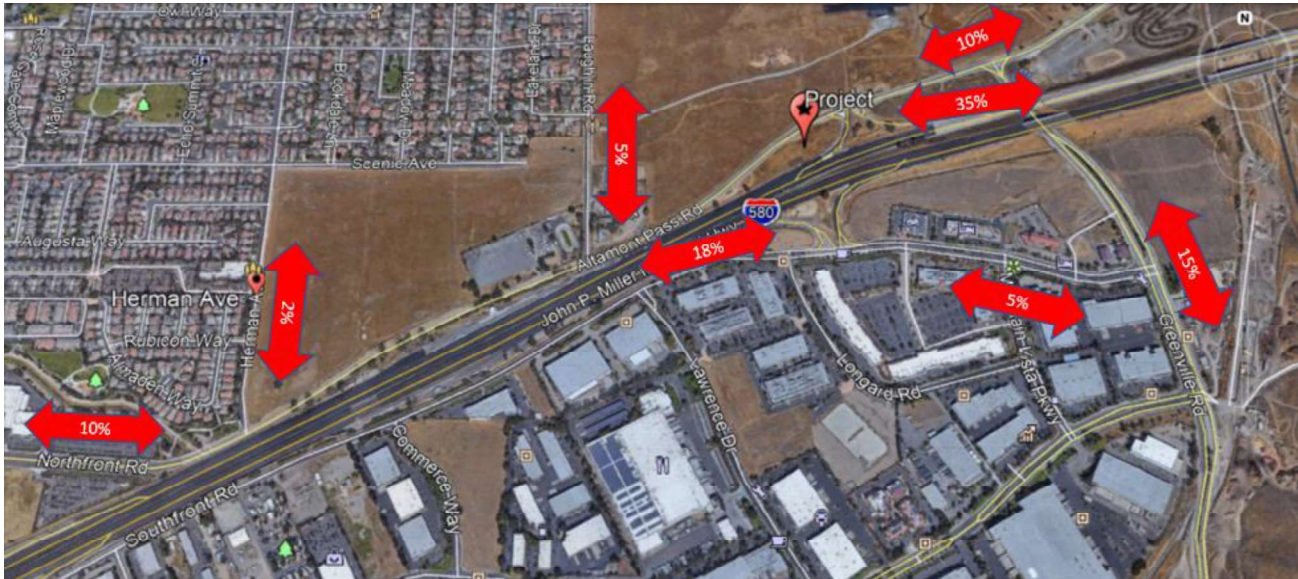
Description	Project Size	ITE LU Code ¹		AM	AM (In)	AM (Out)	PM	PM (In)	PM (Out)
Fast Food Restaurant 1 with Dirve-Thru Window	50 Seats	934	Rate	1.27	53%	47%	0.95	53%	47%
			Veh. Trips	64	34	30	48	25	22
Coffee-donut shop with drive-thru & indoor seating	600 Sq. Feet	937	Rate	101	51%	49%	40.80	50%	50%
			Veh. Trips	60	31	30	24	12	12
Specialty Retail	4,000 Sq. Feet	San Dag (2)	Rate	1.2	60%	40%	3.60	50%	50%
			Veh. Trips	5	3	2	14	7	7
Convenience Store w/ Gas Pumps and Carwash	12 Fueling stations	945	Rate	12.5	51%	49%	13.99	51%	49%
			Veh. Trips	150	76	73	168	86	82
Total Trips				278	144	135	254	130	124

1: ITE Trip Generation Manual 9th Edition, 2012.

2: Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region, April 2002.

Based on the existing traffic counts at the study intersections, traffic generated by the Project is estimated to distribute in the manner illustrated in Figure 3.

Figure 3: Project Trip Distribution



Analysis Methodology

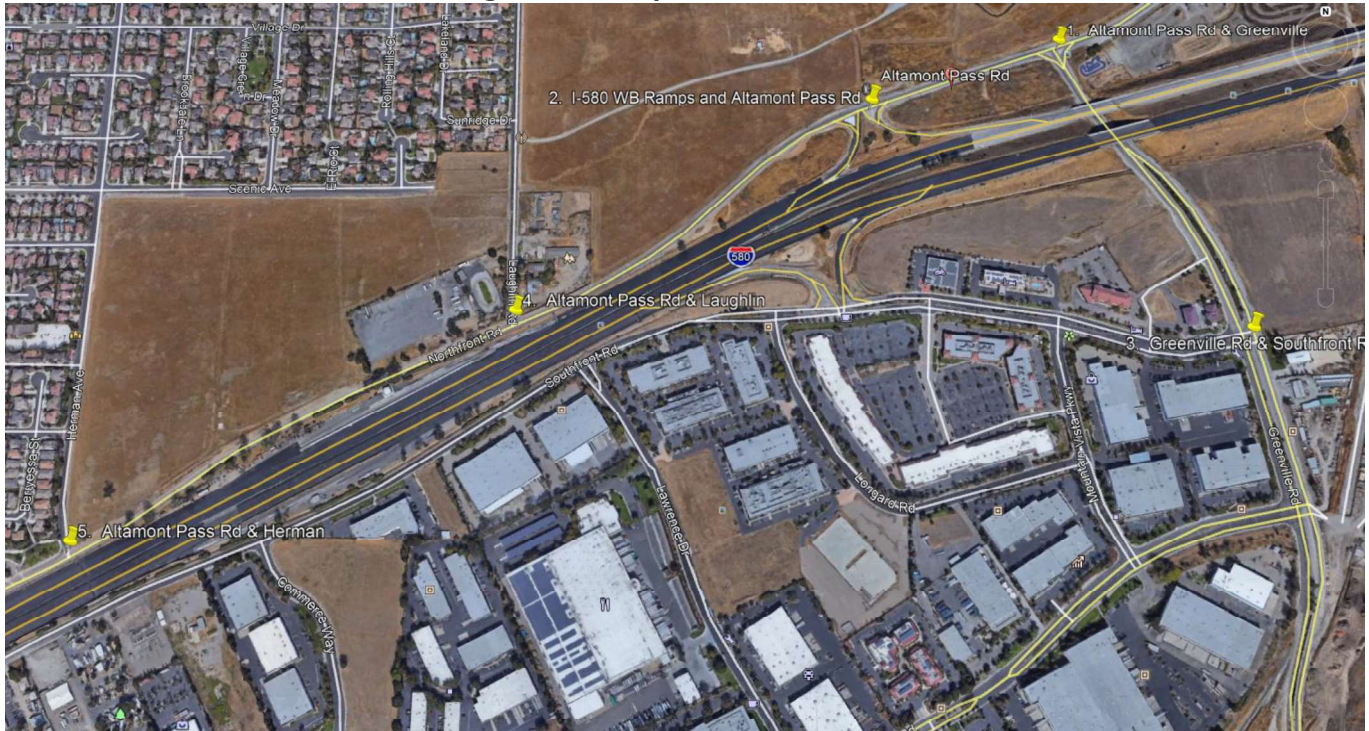
Study Intersections

In consultation with City of Livermore engineering staff, the following study intersections were selected for analysis:

1. Altamont Pass Road and Greenville Road
2. Interstate-580 Westbound Ramps and Altamont Pass Road
3. Greenville Road and Southfront Road
4. Altamont Pass Road and Laughlin Road
5. Altamont Pass Road and Herman Avenue.

These intersections are shown below on Figure 4.

Figure 4: Study Intersections



The following scenarios are addressed in this letter report:

- Existing
- Existing Plus Approved/Pending (EPAP) Conditions
- EPAP Plus Project
- Year 2035 Traffic Conditions

Level of Service Analysis Methodology

Level of service (LOS) is a qualitative description of vehicle traffic conditions using an A through F letter rating system to describe delay and congestion. LOS A indicates free flow conditions with little or no delay, and LOS F indicates heavy congestions with excess delays and long queues where vehicle flow exceeds the designed vehicular capacity of the roadway.

Signalized and unsignalized intersections were evaluated using the corresponding methodology contained in the 2010 Highway Capacity Manual, where the average control delay for all vehicles entering the intersection was calculated and a corresponding LOS was assigned. The following tables indicate the level of service thresholds for signalized and unsignalized intersections respectively.

Table 1: Level of Service Criteria for Signalized Intersections

LOS	Type of Flow	Control Delay/Vehicle (seconds/vehicle)
A	Stable Flow	≤ 10.0
B	Stable Flow	$> 10-20$
C	Stable Flow	$> 20-35$
D	Approaching Unstable Flow	$> 35-55$
E	Unstable Flow	$> 55-80$
F	Forced Flow	> 80

Table 2: Level of Service Criteria for Unsignalized Intersections

LOS	Type of Delay for Stop Controlled Movement	Control Delay/Vehicle (seconds/vehicle)
A	Little or no delay	≤ 10.0
B	Short traffic delays	$> 10-15$
C	Average traffic delays	$> 15-25$
D	Long traffic delays	$> 25-35$
E	Very long traffic delays	$> 35-50$
F	Extreme traffic delay	> 50

Significant Impact Criteria

According to City of Livermore General Plan's Circulation Element amended in 2014, the intersection level of service standard is a mid-level LOS D, which is 45 seconds of average stopped delay per vehicle at signalized intersections. The exceptions include selected intersections near freeway interchanges where the upper limit of acceptable level of service is LOS E; this includes the study intersection of Altamont Pass Road/I-580 Westbound Ramps.

Existing Conditions

Existing turning movement counts (see Figure 5 and Appendix A) were collected at the study intersections in late March 2018. Except for Altamont Pass Road-Greenville Road, the other four study intersections are found to operate acceptably during both the AM and PM peak hour, as summarized in Table 4. The detailed LOS calculations are included in Appendix B.

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Table 4: Intersection LOS – Existing Conditions A.M. and P.M. Peak Hour

ID	Study Intersection	Control	AM Peak (secs/veh)	AM LOS	PM Peak (secs/veh)	PM LOS
1	Altamont Pass Rd & Greenville Rd	All-way Stop	84.0	F	189.6	F
2	I-580 Westbound Ramps & Altamont Pass Rd ¹	Stop on Off-ramp left turn	12.7	B	14.3	B
3	Greenville Rd & Southfront Rd	Signalized	9.0	A	10.9	B
4	Northfront Rd / Altamont Pass Rd & Laughlin Rd	All-way Stop	8.2	A	12.0	B
5	Northfront Rd & Herman Ave ¹	Stop on Herman	12.7	B	12.9	B

1 = Approach delay, as opposed to worse movement.

Figure 5: Existing AM (top) and PM (bottom) Peak Hour Volumes



Existing Plus Approved/Pending (EPAP) Conditions

This scenario is the result of adding Approved/Pending Projects traffic (with a 45% reduction for pass-by trips) to Existing conditions. As instructed by City staff, the following Approved/Pending projects were included in the scenario:

- 225 Greenville Road (54,215 SF Warehouse Distribution Center)
- 6877 Longard Road (90,500 SF Light Industrial)
- Southfront at I-580 EB Ramps (Gas Station with 12 Fuel Pumps & 4,000 SF Fast Food).

Except for Altamont Pass Road-Greenville Road, the other four study intersections are expected to operate acceptably during both the AM and PM peak hour. See Table 5 and Appendix C.

Table 5: Intersection LOS – EPAP Conditions A.M. and P.M. Peak Hour

ID	Study Intersection	Control	AM Peak (secs/veh)	AM LOS	PM Peak (secs/veh)	PM LOS
1	Altamont Pass Rd & Greenville Rd	All-way Stop	101.5	F	188.9	F
2	I-580 Westbound Ramps & Altamont Pass Rd ¹	Stop on Off-ramp left turn	13.8	B	15.4	C
3	Greenville Rd & Southfront Rd	Signalized	9.6	A	11.6	B
4	Northfront Rd / Altamont Pass Rd & Laughlin Rd	All-way Stop	8.2	A	12.0	B
5	Northfront Rd & Herman Ave ¹	Stop on Herman	12.7	B	12.9	B

1 = Approach delay, as opposed to worse movement.

Existing Plus Approved/Pending (EPAP) Plus Project Conditions

This scenario is the result of adding Project traffic (with a 45% reduction for pass-by trips) to Existing Plus Approved/Pending conditions. Except for Altamont Pass Road-Greenville Road, the other four study intersections are expected to operate acceptably during both the AM and PM peak hour. However, with the signalization of Altamont Pass-Greenville, the intersection is expected to operate at LOS B or better. See Table 6 and Appendix D.

Table 6: Intersection LOS – EPAP Plus Project Conditions A.M. and P.M. Peak Hour

ID	Study Intersection	Control	AM Peak (secs/veh)	AM LOS	PM Peak (secs/veh)	PM LOS
1	Altamont Pass Rd & Greenville Rd - with Mitigation	All-way Stop Signalization	114.7 9.0	F A	190.5 11.2	F B
2	I-580 Westbound Ramps & Altamont Pass Rd ¹	Stop on Off- ramp left turn	19.2	C	22.2	C
3	Greenville Rd & Southfront Rd	Signalized	9.6	A	11.6	B
4	Northfront Rd / Altamont Pass Rd & Laughlin Rd	All-way Stop	8.3	A	12.2	B
5	Northfront Rd & Herman Ave ¹	Stop on Herman	12.9	B	13.5	B

1 = Approach delay, as opposed to worse movement.

Year 2035 Conditions

Using historical ADT counts (2009 to 2016, from the City's website) of South Vasco Road near the Project, an annualized growth rate for this period was calculated and rounded to be 2%. Assuming the same annual growth rate continues, traffic volume is expected to increase by approximately 40% (=2% compounded annual growth for 17 years) by 2035. Therefore, the 2035 intersection volumes are conservatively estimated by increasing the existing counts by 40%. Except for Altamont Pass Road-Greenville Road, the other four study intersections are expected to operate acceptably during both the AM and PM peak hour. However, with the signalization of Altamont Pass-Greenville and the addition of a left turn lane to the westbound Altamont Pass Road approach, the intersection is expected to operate at LOS B or better. See Table 7 and Appendix E.

Table 7: Intersection LOS – 2035 Conditions A.M. and P.M. Peak Hour

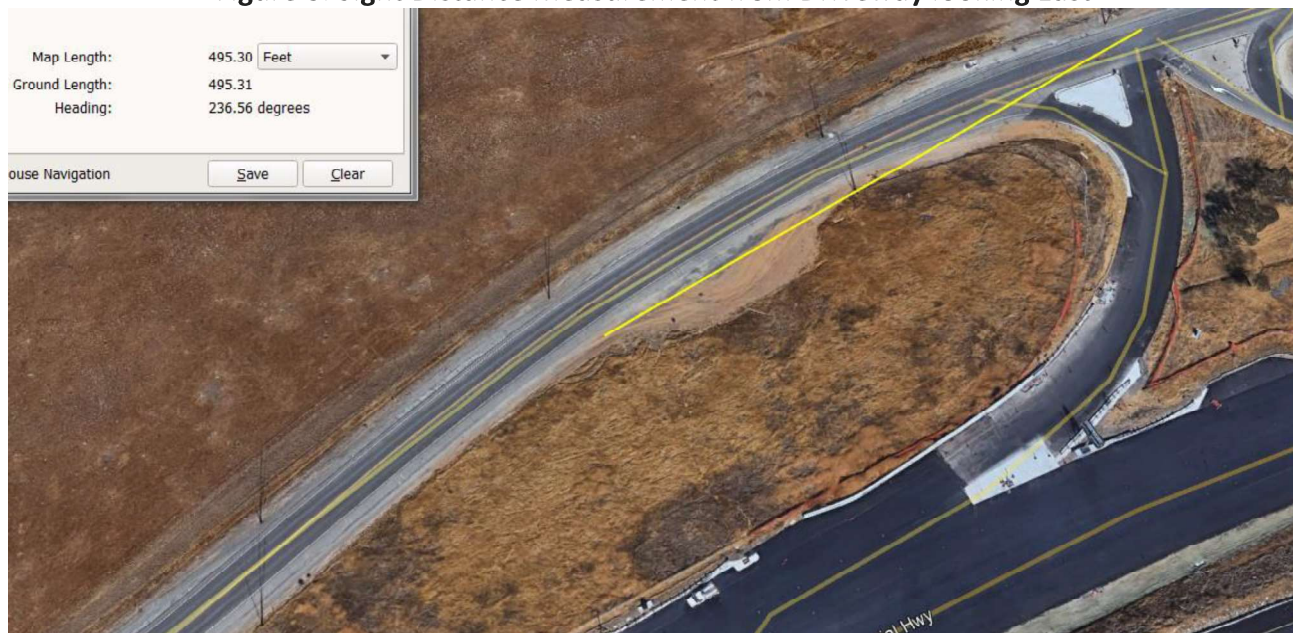
ID	Study Intersection	Control	AM Peak (secs/veh)	AM LOS	PM Peak (secs/veh)	PM LOS
1	Altamont Pass Rd & Greenville Rd - with Mitigation	All-way Stop Signalization	260.4 14.2	F B	408.8 16.4	F B
2	I-580 Westbound Ramps & Altamont Pass Rd ¹	Stop on Off- ramp left turn	20.7	C	24.6	C
3	Greenville Rd & Southfront Rd	Signalized	9.9	A	12.5	B
4	Northfront Rd / Altamont Pass Rd & Laughlin Rd	All-way Stop	9.0	A	23.5	C
5	Northfront Rd & Herman Ave ¹	Stop on Herman	12.9	B	30.3	D

1 = Approach delay, as opposed to worse movement.

Sight Distance

Given the 45-mph speed limit on Northfront Road-Altamont Pass Road, there should be at least 495 feet of sight distance at the proposed Project driveways. Figure 6 illustrates the 495 feet mark along the Project's property line and the I-580 Westbound Off-ramp and Altamont Pass Road intersection. Figure 7 is a photo (Lum, 7/4/18) that shows the view of a driver exiting the easternmost Project driveway and looking east.

Figure 6: Sight Distance Measurement from Driveway looking East



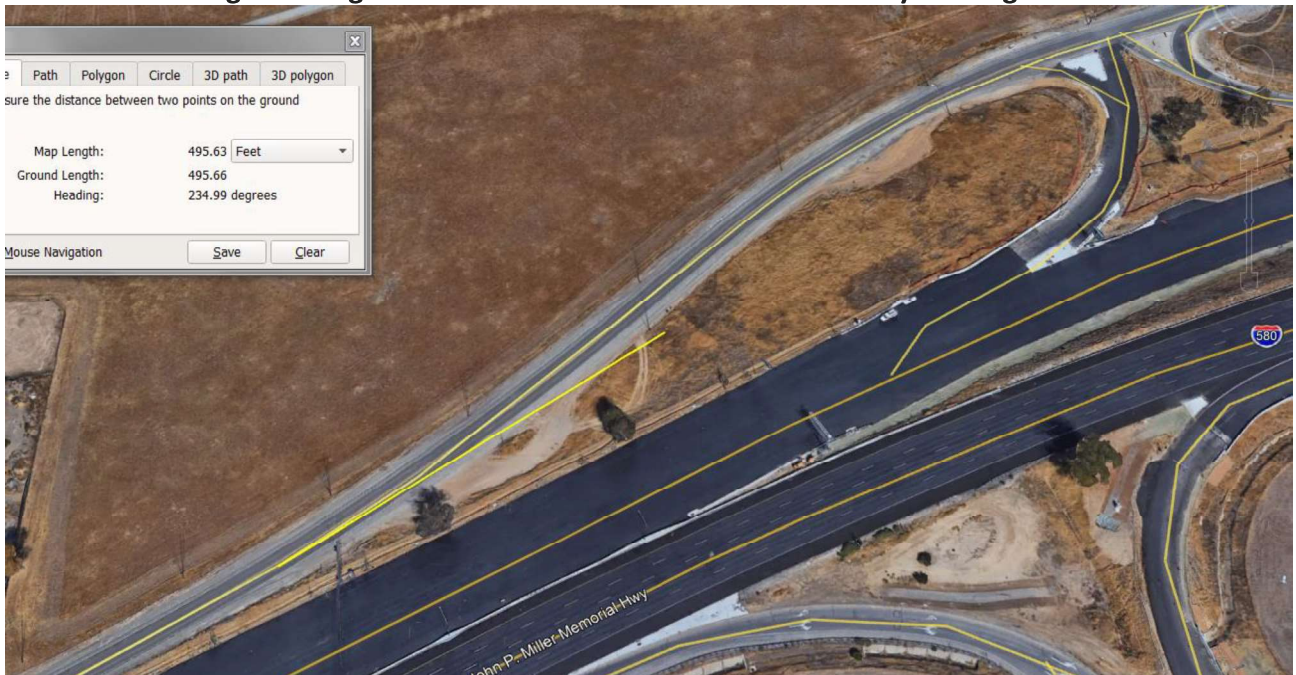
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Figure 7: Looking East at Vehicle Exiting WB I-580 (~350 feet away)



Similarly, Figure 8 illustrates a mark along eastbound Altamont Pass Road approximately 495 feet from the Project's western most driveway. At Figure 9 is a photo (Lum, 7/4/18) that shows the view of a driver exiting the easternmost Project driveway and looking west.

Figure 8: Sight Distance Measurement from Driveway looking West



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Figure 9: Looking West at an Approaching Vehicle on Eastbound Altamont Pass Road



The sight distance between an approaching eastbound Altamont Pass Road driver and a driver exiting either of the two proposed Project driveways is expected to exceed 495 feet. However, the sight distance between an approaching westbound Altamont Pass Road driver and a driver exiting the proposed easternmost driveway may be less than 495 feet. If so, drivers exiting this driveway should be required to turn right. Exiting drivers desiring to go west on Altamont Pass Road should turn left from the westernmost driveway.

Queuing Analysis

The only study intersection having queuing issues is Altamont Pass Rd and Greenville Road – the 95th percentile queue lengths are expected to be longer than the right-turn pockets for all study scenarios, including existing. Table 8 summarizes the queuing analysis for Altamont Pass-Greenville, I-580 WB Ramps-Altamont Pass, and Greenville-Southfront with the highest volumes (i.e., 2035 Conditions). Both Northfront/Altamont-Laughlin and Northfront-Herman do not have turn pockets to analyze.

Table 8: Queuing Analysis for 2035 Conditions

ID	Study Intersection	Control	Turn Bay / Length (feet)	AM 95 th % Queue (feet)	PM 95 th % Queue (feet)	Exceed Storage?
1	Altamont Pass Rd & Greenville Rd – with Mitigation	All-way Stop Signalization	NBR / 100 1625	10 32	2113 2066	Yes
1	Altamont Pass Rd & Greenville Rd – with Mitigation	All-way Stop Signalization	EBR / 125 200	285 28	33 134	No

ID	Study Intersection	Control	Turn Bay / Length (feet)	AM 95th % Queue (feet)	PM 95th % Queue (feet)	Exceed Storage?
2	I-580 Westbound Ramps & Altamont Pass Rd	Stop on Off-ramp left turn	NBL / 875	48	38	No
3	Greenville Rd & Southfront Rd	Signalized	NBL / 310	32	101	No
3	Greenville Rd & Southfront Rd	Signalized	SBR / 165	16	11	No
3	Greenville Rd & Southfront Rd	Signalized	EBL / 180	24	114	No

Study intersections 4 & 5 don't have turn bays.

Segment Analysis

The Average Daily Traffic (ADT) by assuming that the PM peak hour volume is 10 percent of the daily traffic for the following segments:

- Altamont Pass Road (two lane arterial with moderate access control) west of Greenville Road
- Greenville Road (two lane arterial with high access control) south of Altamont Pass Road.

Table 9 summarizes the roadway segment LOS thresholds for ADT per *County of Sacramento Traffic Impact Analysis Guidelines, July 2004*. Table 10 summarizes the LOS for the two segments under each study scenario.

Table 9: Level of Service Criteria for Roadway Segments

Facility Type	# of Lanes	Maximum Volume for Given Service Level				
		A	B	C	D	E
Residential	2	600	1,200	2,000	3,000	4,500
Residential collector with frontage	2	1,600	3,200	4,800	6,400	8,000
Residential collector without frontage	2	6,000	7,000	8,000	9,000	10,000
Arterial, low access control	2	9,000	10,500	12,000	13,500	15,000
	4	18,000	21,000	24,000	27,000	30,000
	6	27,000	31,500	36,000	40,500	45,000
Arterial, moderate access control	2	10,800	12,600	14,400	16,200	18,000
	4	21,600	25,200	28,800	32,400	36,000
	6	32,400	37,800	43,200	48,600	54,000
Arterial, high access control	2	12,000	14,000	16,000	18,000	20,000
	4	24,000	28,000	32,000	36,000	40,000
	6	36,000	42,000	48,000	54,000	60,000
Rural, 2-lane highway	2	2,400	4,800	7,900	13,500	22,900
Rural, 2-lane road, 24'-36' of pavement, paved shoulders	2	2,200	4,300	7,100	12,200	20,000
Rural, 2-lane road, 24'-36' of pavement, no shoulders	2	1,800	3,600	5,900	10,100	17,000

Table 10: Roadway Segment Level of Service

Segment	Existing		EPAP		EPAP + Project		2035	
	ADT	LOS	ADT	LOS	ADT	LOS	ADT	LOS
Altamont Pass	8,300	A	9,400	A	10,100	A	11,600	A
Greenville Road	13,300	B	14,500	C	15,100	C	18,600	E

The above results indicated that both Altamont Pass Road and Greenville Road are expected to continue to operate at LOS C or better under EPAP and EPAP + Project Conditions. However, under 2035 Conditions, the Greenville Road segment with an ADT of 18,600, is expected to operate at LOS E.

Thank you for the opportunity to provide this analysis. Please contact me with your questions.

Sincerely,

Gordon Lum, PE
Senior Traffic Engineer

Attachments:

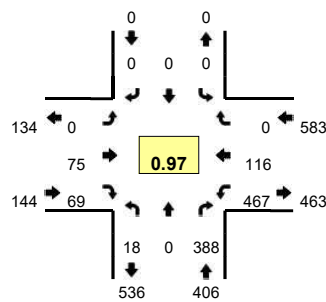
- Appendix A- Turning Movement Counts
- Appendix B-Existing Conditions LOS Calculations
- Appendix C-Existing Plus Approved/Pending (EPAP) Conditions LOS Calculations
- Appendix D-EPAP Plus Project LOS Calculations
- Appendix E-Year 2035 Traffic Conditions LOS Calculations

Appendix A

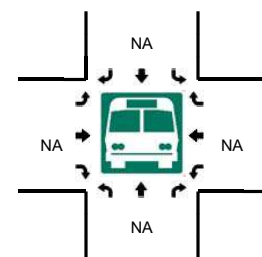
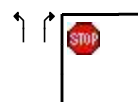
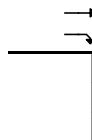
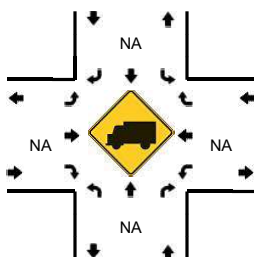
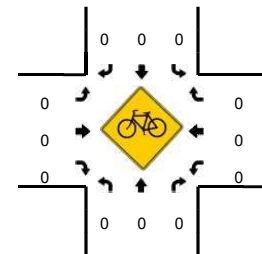
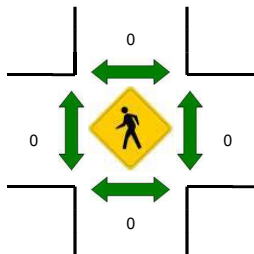
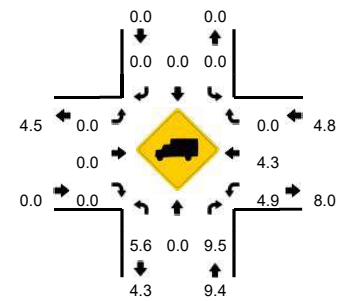
March 2018 Turning Movement Counts

LOCATION: 2. I-580 WB Ramps -- Altamont Pass Rd
CITY/STATE: Livermore, CA

QC JOB #: 14659703
DATE: Wed, Mar 21 2018



Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:15 AM -- 7:30 AM

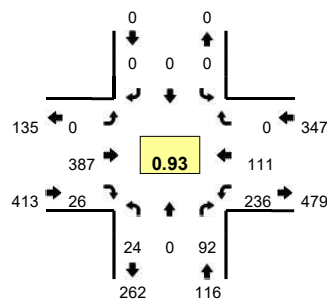


5-Min Count Period Beginning At	2. I-580 WB Ramps (Northbound)				2. I-580 WB Ramps (Southbound)				Altamont Pass Rd (Eastbound)				Altamont Pass Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	38	0	0	0	0	0	0	9	3	0	42	7	0	0	99	
7:05 AM	0	0	28	0	0	0	0	0	0	7	4	0	48	8	0	0	95	
7:10 AM	0	0	21	0	0	0	0	0	0	5	2	0	44	14	0	0	86	
7:15 AM	2	0	33	0	0	0	0	0	0	7	8	0	47	9	0	0	106	
7:20 AM	3	0	31	0	0	0	0	0	0	5	8	0	38	8	0	0	93	
7:25 AM	1	0	30	0	0	0	0	0	0	7	9	0	38	8	0	0	93	
7:30 AM	2	0	26	0	0	0	0	0	0	6	5	0	36	8	0	0	83	
7:35 AM	4	0	33	0	0	0	0	0	0	2	11	0	37	4	0	0	91	
7:40 AM	2	0	40	0	0	0	0	0	0	6	11	0	32	11	0	0	102	
7:45 AM	1	0	30	0	0	0	0	0	0	8	2	0	34	16	0	0	91	
7:50 AM	1	0	45	0	0	0	0	0	0	4	3	0	33	7	0	0	93	
7:55 AM	2	0	33	0	0	0	0	0	0	9	3	0	38	16	0	0	101	1133
8:00 AM	1	0	30	0	0	0	0	0	0	8	7	0	31	13	0	0	90	1124
8:05 AM	3	0	41	0	0	0	0	0	0	3	3	0	42	11	0	0	103	1132
8:10 AM	0	0	21	0	0	0	0	0	0	4	4	0	34	9	0	0	72	1118
8:15 AM	5	0	29	0	0	0	0	0	0	10	1	0	22	9	0	0	76	1088
8:20 AM	1	0	37	0	0	0	0	0	0	8	5	0	32	10	0	0	93	1088
8:25 AM	2	0	34	0	0	0	0	0	0	6	3	0	39	8	0	0	92	1087
8:30 AM	3	0	34	0	0	0	0	0	0	12	5	0	27	8	0	0	89	1093
8:35 AM	2	0	29	0	0	0	0	0	0	18	4	0	31	6	0	0	90	1092
8:40 AM	4	0	23	0	0	0	0	0	0	6	3	0	19	13	0	0	68	1058
8:45 AM	0	0	33	0	0	0	0	0	0	4	6	0	32	5	0	0	80	1047
8:50 AM	3	0	38	0	0	0	0	0	0	10	6	0	27	7	0	0	91	1045
8:55 AM	0	0	21	0	0	0	0	0	0	4	6	0	24	5	0	0	60	1004
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	24	0	376	0	0	0	0	0	0	76	100	0	492	100	0	0	1168	
Heavy Trucks	4	0	28	0	0	0	0	0	0	0	0	0	24	4	0	0	60	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

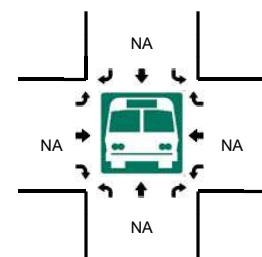
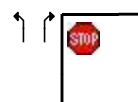
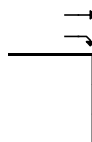
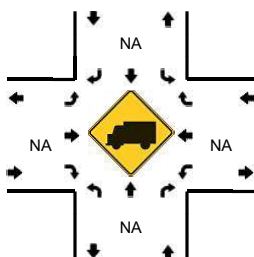
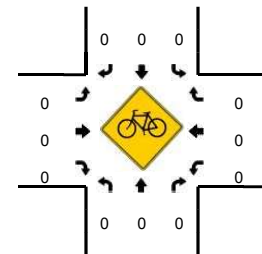
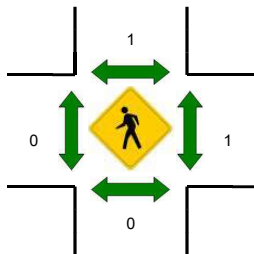
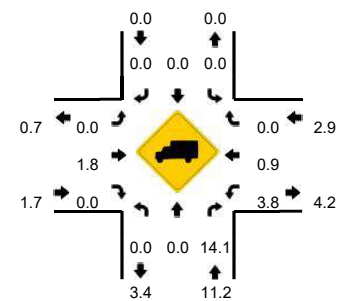
Comments:

LOCATION: 2. I-580 WB Ramps -- Altamont Pass Rd
CITY/STATE: Livermore, CA

QC JOB #: 14659704
DATE: Wed, Mar 21 2018



Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

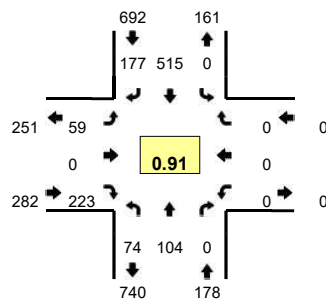


5-Min Count Period Beginning At	2. I-580 WB Ramps (Northbound)				2. I-580 WB Ramps (Southbound)				Altamont Pass Rd (Eastbound)				Altamont Pass Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	2	0	7	0	0	0	0	0	0	28	3	0	18	10	0	0	68	
4:05 PM	2	0	8	0	0	0	0	0	0	30	2	0	21	8	0	0	71	
4:10 PM	0	0	16	0	0	0	0	0	0	29	3	0	23	10	0	0	81	
4:15 PM	3	0	14	0	0	0	0	0	0	35	1	0	15	5	0	0	73	
4:20 PM	5	0	5	0	0	0	0	0	0	28	0	0	20	6	0	0	64	
4:25 PM	1	0	11	0	0	0	0	0	0	41	2	0	10	8	0	0	73	
4:30 PM	3	0	7	0	0	0	0	0	0	26	3	0	19	7	0	0	65	
4:35 PM	1	0	6	0	0	0	0	0	0	26	4	0	22	14	0	0	73	
4:40 PM	4	0	2	0	0	0	0	0	0	41	2	0	22	13	0	0	84	
4:45 PM	2	0	10	0	0	0	0	0	0	28	4	0	19	15	0	0	78	
4:50 PM	1	0	6	0	0	0	0	0	0	44	1	0	13	7	0	0	72	
4:55 PM	4	0	4	0	0	0	0	0	0	25	1	0	18	11	0	0	63	865
5:00 PM	0	0	2	0	0	0	0	0	0	33	4	0	21	6	0	0	66	863
5:05 PM	0	0	9	0	0	0	0	0	0	31	1	0	34	9	0	0	84	876
5:10 PM	2	0	10	0	0	0	0	0	0	25	2	0	25	10	0	0	74	869
5:15 PM	2	0	9	0	0	0	0	0	0	22	3	0	19	10	0	0	65	861
5:20 PM	1	0	8	0	0	0	0	0	0	27	1	0	9	9	0	0	55	852
5:25 PM	2	0	12	0	0	0	0	0	0	28	0	0	14	4	0	0	60	839
5:30 PM	0	0	6	0	0	0	0	0	0	40	1	0	15	9	0	0	71	845
5:35 PM	3	0	7	0	0	0	0	0	0	21	3	0	18	2	0	0	54	826
5:40 PM	7	0	12	0	0	0	0	0	0	27	1	0	17	4	0	0	68	810
5:45 PM	2	0	10	0	0	0	0	0	0	25	3	0	18	8	0	0	66	798
5:50 PM	4	0	10	0	0	0	0	0	0	27	2	0	16	6	0	0	65	791
5:55 PM	4	0	6	0	0	0	0	0	0	30	3	0	13	9	0	0	65	793
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	28	0	72	0	0	0	0	0	0	380	40	0	252	168	0	0	940	
Heavy Trucks	0	0	16	0	0	0	0	0	0	8	0	0	8	0	0	0	32	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

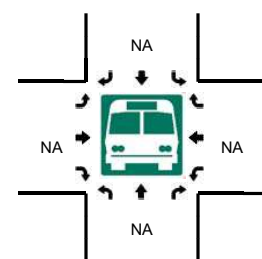
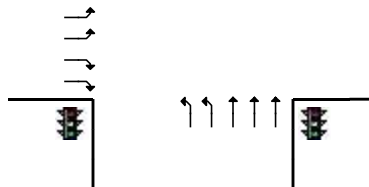
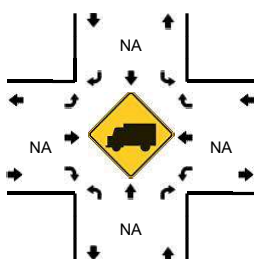
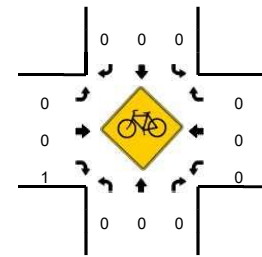
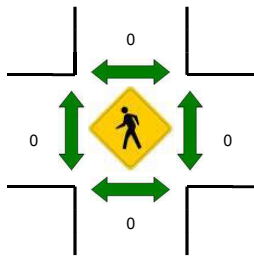
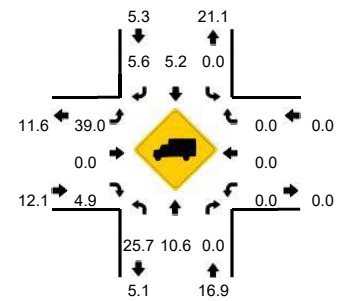
Comments:

LOCATION: 3. Greenville Rd -- Southfront Rd
CITY/STATE: Livermore, CA

QC JOB #: 14659705
DATE: Wed, Mar 21 2018



Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

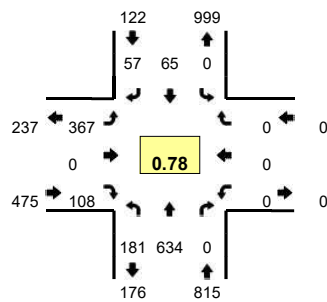


5-Min Count Period Beginning At	3. Greenville Rd (Northbound)				3. Greenville Rd (Southbound)				Southfront Rd (Eastbound)				Southfront Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	10	11	0	0	0	37	15	0	7	0	22	0	0	0	0	0	102	
7:05 AM	9	13	0	0	0	42	16	0	3	0	18	0	0	0	0	0	101	
7:10 AM	8	13	0	0	0	31	17	0	2	0	11	0	0	0	0	0	82	
7:15 AM	2	11	0	0	0	31	19	0	3	0	14	0	0	0	0	0	80	
7:20 AM	7	9	0	1	0	38	12	0	7	0	14	1	0	0	0	0	89	
7:25 AM	9	6	0	0	0	53	16	0	4	0	26	0	0	0	0	0	114	
7:30 AM	8	9	0	1	0	42	13	0	0	0	22	0	0	0	0	0	95	
7:35 AM	3	3	0	0	0	28	6	0	7	0	19	0	0	0	0	0	66	
7:40 AM	3	8	0	0	0	57	13	0	5	0	23	0	0	0	0	0	109	
7:45 AM	9	8	0	0	0	47	14	0	6	0	19	1	0	0	0	0	104	
7:50 AM	2	5	0	0	0	54	19	0	7	0	18	0	0	0	0	0	105	
7:55 AM	2	8	0	0	0	55	17	0	6	0	17	0	0	0	0	0	105	1152
8:00 AM	8	2	0	0	0	47	14	0	3	0	19	0	0	0	0	0	93	1143
8:05 AM	8	7	0	0	0	40	18	0	1	0	19	0	0	0	0	0	93	1135
8:10 AM	4	6	0	0	0	37	14	0	2	0	21	0	0	0	0	0	84	1137
8:15 AM	6	6	0	0	0	33	11	0	7	0	14	0	0	0	0	0	77	1134
8:20 AM	4	5	0	0	0	54	10	0	4	0	13	0	0	0	0	0	90	1135
8:25 AM	4	4	0	0	0	26	17	0	5	0	20	1	0	0	0	0	77	1098
8:30 AM	3	9	0	0	0	45	14	0	4	0	11	0	0	0	0	0	86	1089
8:35 AM	3	6	0	0	0	38	11	0	2	0	16	0	0	0	0	0	76	1099
8:40 AM	4	8	0	1	0	33	12	0	4	0	16	0	0	0	0	0	78	1068
8:45 AM	4	9	0	1	0	34	8	0	4	0	18	0	0	0	0	0	78	1042
8:50 AM	6	8	0	0	0	35	13	0	3	0	8	1	0	0	0	0	74	1011
8:55 AM	3	9	0	0	0	35	6	0	6	0	17	0	0	0	0	0	76	982
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	56	84	0	0	0	632	184	0	72	0	240	4	0	0	0	0	1272	
Heavy Trucks	20	8	0	0	0	40	4	0	24	0	4	0	0	0	0	0	100	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

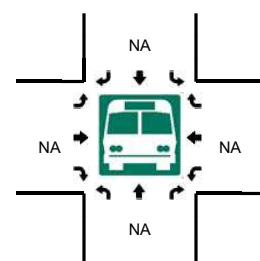
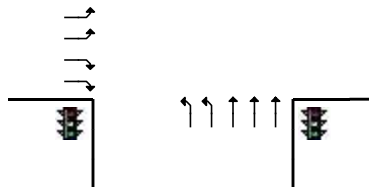
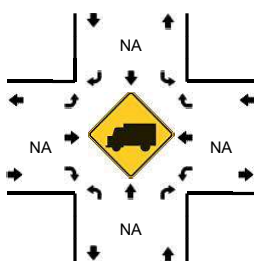
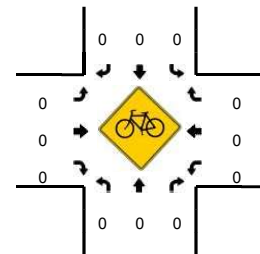
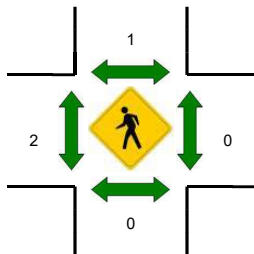
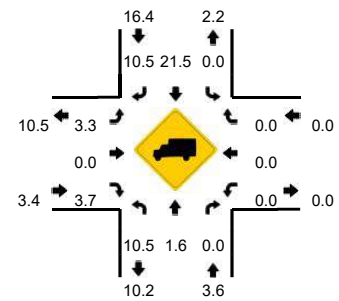
Comments:

LOCATION: 3. Greenville Rd -- Southfront Rd
CITY/STATE: Livermore, CA

QC JOB #: 14659706
DATE: Wed, Mar 21 2018



Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:00 PM -- 4:15 PM

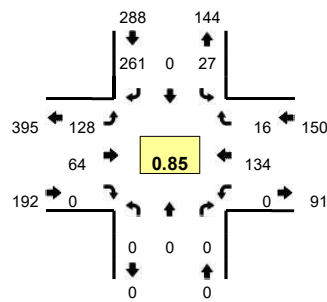


5-Min Count Period Beginning At	3. Greenville Rd (Northbound)				3. Greenville Rd (Southbound)				Southfront Rd (Eastbound)				Southfront Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	15	50	0	0	0	8	5	0	55	0	15	2	0	0	0	0	150	
4:05 PM	12	52	0	1	0	7	7	0	61	0	17	0	0	0	0	0	157	
4:10 PM	14	62	0	0	0	4	6	0	45	0	14	0	0	0	0	0	145	
4:15 PM	9	49	0	1	0	3	12	0	25	0	15	0	0	0	0	0	114	
4:20 PM	14	39	0	0	0	2	3	0	25	0	7	0	0	0	0	0	90	
4:25 PM	7	32	0	0	0	8	6	0	24	0	7	0	0	0	0	0	84	
4:30 PM	17	51	0	1	0	3	4	0	13	0	5	0	0	0	0	0	94	
4:35 PM	19	68	0	0	0	4	2	0	21	0	5	0	0	0	0	0	119	
4:40 PM	22	66	0	0	0	7	1	0	18	0	4	0	0	0	0	0	118	
4:45 PM	18	55	0	0	0	6	4	0	30	0	7	0	0	0	0	0	120	
4:50 PM	18	52	0	0	0	9	5	0	23	0	4	0	0	0	0	0	111	
4:55 PM	13	58	0	0	0	4	2	0	25	0	8	0	0	0	0	0	110	1412
5:00 PM	12	48	0	1	0	3	2	0	30	0	5	1	0	0	0	0	102	1364
5:05 PM	15	67	0	1	0	7	2	0	47	0	5	0	0	0	0	0	144	1351
5:10 PM	19	60	0	0	0	7	3	0	18	0	6	0	0	0	0	0	113	1319
5:15 PM	7	47	0	0	0	4	4	0	34	0	7	0	0	0	0	0	103	1308
5:20 PM	7	42	0	0	0	6	4	0	24	0	5	0	0	0	0	0	88	1306
5:25 PM	7	50	0	0	0	6	9	0	43	0	8	0	0	0	0	0	123	1345
5:30 PM	8	30	0	0	0	4	6	0	47	0	11	0	0	0	0	0	106	1357
5:35 PM	12	38	0	1	0	7	2	0	44	0	9	0	0	0	0	0	113	1351
5:40 PM	5	53	0	0	0	6	11	0	35	0	10	0	0	0	0	0	120	1353
5:45 PM	10	42	0	0	0	3	3	0	26	0	7	0	0	0	0	0	91	1324
5:50 PM	9	35	0	0	0	2	8	0	25	0	4	0	0	0	0	0	83	1296
5:55 PM	8	34	0	0	0	5	4	0	22	0	8	0	0	0	0	0	81	1267
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	164	656	0	4	0	76	72	0	644	0	184	8	0	0	0	0	1808	
Heavy Trucks	8	12	0	0	0	28	8	0	4	0	4	0	0	0	0	0	64	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

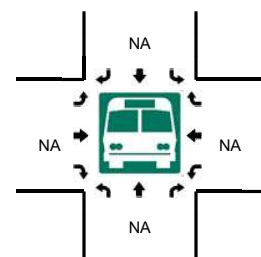
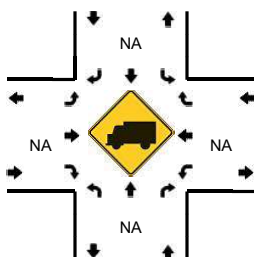
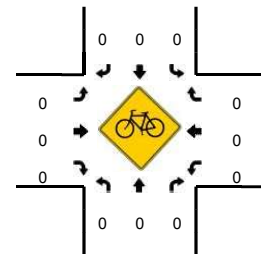
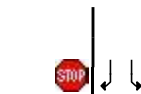
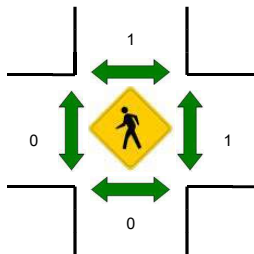
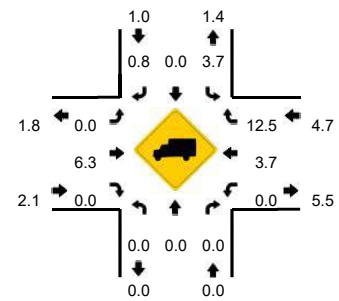
Comments:

LOCATION: 5. Herman Rd -- Altamont Pass Rd (Northfront Rd)
CITY/STATE: Livermore, CA

QC JOB #: 14659709
DATE: Wed, Mar 21 2018



Peak-Hour: 7:55 AM -- 8:55 AM
Peak 15-Min: 8:15 AM -- 8:30 AM

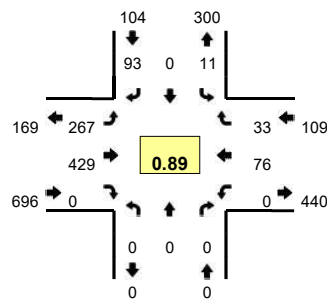


5-Min Count Period Beginning At	5. Herman Rd (Northbound)				5. Herman Rd (Southbound)				Altamont Pass Rd (Northfront Rd) (Eastbound)				Altamont Pass Rd (Northfront Rd) (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	4	0	10	0	0	3	0	0	0	9	0	0	26	
7:05 AM	0	0	0	0	3	0	11	0	5	4	0	0	0	13	1	0	37	
7:10 AM	0	0	0	0	0	0	13	0	4	4	0	0	0	16	2	0	39	
7:15 AM	0	0	0	0	3	0	12	0	3	3	0	0	0	4	1	0	26	
7:20 AM	0	0	0	0	1	0	16	0	7	2	0	0	0	13	2	0	41	
7:25 AM	0	0	0	0	1	0	20	0	9	3	0	0	0	9	2	0	44	
7:30 AM	0	0	0	0	3	0	24	0	9	3	0	0	0	12	0	0	51	
7:35 AM	0	0	0	0	2	0	22	0	7	1	0	0	0	12	1	0	45	
7:40 AM	0	0	0	0	3	0	19	0	1	2	0	0	0	11	0	0	36	
7:45 AM	0	0	0	0	1	0	17	0	7	4	0	0	0	16	0	0	45	
7:50 AM	0	0	0	0	1	0	18	0	6	3	0	0	0	11	0	0	39	
7:55 AM	0	0	0	0	4	0	11	0	8	7	0	0	0	9	3	0	42	471
8:00 AM	0	0	0	0	1	0	25	0	12	1	0	0	0	16	2	0	57	502
8:05 AM	0	0	0	0	0	0	20	0	11	3	0	0	0	12	2	0	48	513
8:10 AM	0	0	0	0	1	0	16	0	16	3	0	0	0	8	0	0	44	518
8:15 AM	0	0	0	0	2	0	28	0	13	6	0	0	0	11	3	0	63	555
8:20 AM	0	0	0	0	5	0	15	0	27	4	0	0	0	11	0	0	62	576
8:25 AM	0	0	0	0	4	0	28	0	12	3	0	0	0	14	0	0	61	593
8:30 AM	0	0	0	0	2	0	22	0	10	7	0	0	0	11	1	0	53	595
8:35 AM	0	0	0	0	4	0	33	0	4	10	0	0	0	8	3	0	62	612
8:40 AM	0	0	0	0	1	0	19	0	4	7	0	0	0	15	1	0	47	623
8:45 AM	0	0	0	0	3	0	19	0	6	6	0	0	0	9	1	0	44	622
8:50 AM	0	0	0	0	0	0	25	0	5	7	0	0	0	10	0	0	47	630
8:55 AM	0	0	0	0	0	0	14	0	2	3	0	0	0	8	0	0	27	615
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	44	0	284	0	208	52	0	0	0	144	12	0	744	
Heavy Trucks	0	0	0	0	4	0	8	0	0	4	0	0	0	4	0	0	20	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

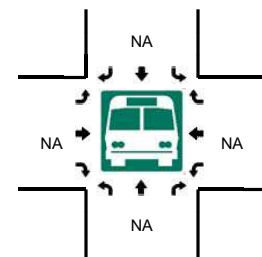
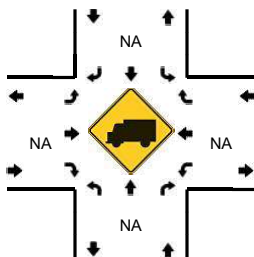
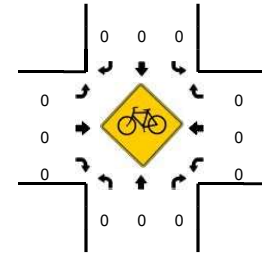
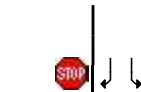
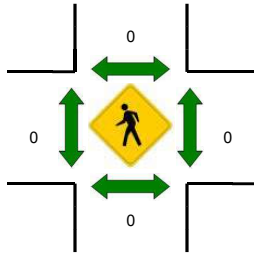
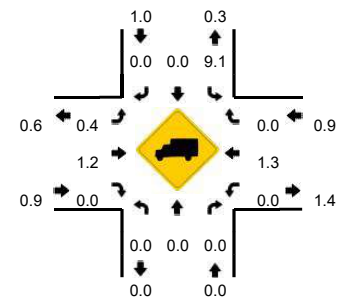
Comments:

LOCATION: 5. Herman Rd -- Altamont Pass Rd (Northfront Rd)
CITY/STATE: Livermore, CA

QC JOB #: 14659710
DATE: Wed, Mar 21 2018



Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:40 PM -- 4:55 PM



5-Min Count Period Beginning At	5. Herman Rd (Northbound)				5. Herman Rd (Southbound)				Altamont Pass Rd (Northfront Rd) (Eastbound)				Altamont Pass Rd (Northfront Rd) (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	1	0	8	0	26	31	0	0	0	5	3	0	74	
4:05 PM	0	0	0	0	1	0	6	0	15	28	0	0	0	5	1	0	56	
4:10 PM	0	0	0	0	0	0	4	0	17	45	0	0	0	4	3	0	73	
4:15 PM	0	0	0	0	0	0	2	0	28	35	0	0	0	7	3	0	75	
4:20 PM	0	0	0	0	2	0	9	0	21	26	0	0	0	8	0	0	66	
4:25 PM	0	0	0	0	1	0	13	0	23	43	0	0	0	8	3	0	91	
4:30 PM	0	0	0	0	1	0	7	0	22	34	0	0	0	9	1	0	74	
4:35 PM	0	0	0	0	0	0	8	0	23	29	0	0	0	4	1	0	65	
4:40 PM	0	0	0	0	2	0	12	0	22	43	0	0	0	5	5	0	89	
4:45 PM	0	0	0	0	1	0	10	0	34	33	0	0	0	9	4	0	91	
4:50 PM	0	0	0	0	1	0	9	0	21	40	0	0	0	2	3	0	76	
4:55 PM	0	0	0	0	0	0	3	0	17	28	0	0	0	7	4	0	59	889
5:00 PM	0	0	0	0	0	0	7	0	23	37	0	0	0	4	4	0	75	890
5:05 PM	0	0	0	0	3	0	9	0	16	36	0	0	0	9	2	0	75	909
5:10 PM	0	0	0	0	0	0	9	0	22	29	0	0	0	7	6	0	73	909
5:15 PM	0	0	0	0	0	0	6	0	21	28	0	0	0	7	3	0	65	899
5:20 PM	0	0	0	0	0	0	6	0	23	36	0	0	0	6	3	0	74	907
5:25 PM	0	0	0	0	1	0	12	0	17	36	0	0	0	4	1	0	71	887
5:30 PM	0	0	0	0	1	0	8	0	16	40	0	0	0	2	2	0	69	882
5:35 PM	0	0	0	0	2	0	15	0	19	23	0	0	0	5	1	0	65	882
5:40 PM	0	0	0	0	0	0	9	0	17	25	0	0	0	8	2	0	61	854
5:45 PM	0	0	0	0	0	0	12	0	20	31	0	0	0	4	4	0	71	834
5:50 PM	0	0	0	0	1	0	8	0	25	29	0	0	0	5	3	0	71	829
5:55 PM	0	0	0	0	2	0	13	0	18	34	0	0	0	5	4	0	76	846
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	0	0	0	0	16	0	124	0	308	464	0	0	0	64	48	0	1024	
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stopped Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Comments:

Appendix B
Level-of-Service Calculations
for Existing Conditions

Intersection

Intersection Delay, s/veh	84
Intersection LOS	F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	20	402	244	496	135	42
Future Vol, veh/h	20	402	244	496	135	42
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	423	257	522	142	44
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	16.1	139.7	13.3
HCM LOS	C	F	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	33%
Vol Thru, %	0%	0%	100%	0%	67%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	135	42	20	402	740
LT Vol	135	0	0	0	244
Through Vol	0	0	20	0	496
RT Vol	0	42	0	402	0
Lane Flow Rate	142	44	21	423	779
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.3	0.079	0.034	0.609	1.237
Departure Headway (Hd)	8.166	6.932	6.231	5.516	5.715
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	443	520	578	660	639
Service Time	5.866	4.632	3.931	3.216	3.715
HCM Lane V/C Ratio	0.321	0.085	0.036	0.641	1.219
HCM Control Delay	14.3	10.2	9.2	16.4	139.7
HCM Lane LOS	B	B	A	C	F
HCM 95th-tile Q	1.2	0.3	0.1	4.1	28.8

Intersection						
Int Delay, s/veh	8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	69	467	116	18	388
Future Vol, veh/h	75	69	467	116	18	388
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	77	71	481	120	19	400
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	77	0	1195	113
Stage 1	-	-	-	-	113	-
Stage 2	-	-	-	-	1082	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1522	-	206	940
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	325	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1522	-	136	940
Mov Cap-2 Maneuver	-	-	-	-	136	-
Stage 1	-	-	-	-	603	-
Stage 2	-	-	-	-	325	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	6.8		12.7		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	136	940	-	-	1522	-
HCM Lane V/C Ratio	0.136	0.426	-	-	0.316	-
HCM Control Delay (s)	35.6	11.6	-	-	8.5	0
HCM Lane LOS	E	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	2.2	-	-	1.4	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	65	245	81	114	566	195
v/c Ratio	0.13	0.24	0.19	0.05	0.24	0.16
Control Delay	16.7	3.4	18.8	3.0	8.1	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	3.4	18.8	3.0	8.1	0.9
Queue Length 50th (ft)	7	3	9	4	30	0
Queue Length 95th (ft)	19	20	24	10	49	11
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1470	1038	416	2532	2354	1518
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.24	0.19	0.05	0.24	0.13
Intersection Summary						

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	59	223	74	104	515	177		
Future Volume (veh/h)	59	223	74	104	515	177		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	65	245	81	114	566	195		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	484	593	248	2301	2409	973		
Arrive On Green	0.14	0.14	0.07	0.65	0.47	0.47		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	65	245	81	114	566	195		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	0.7	3.3	1.0	0.5	2.8	2.3		
Cycle Q Clear(g_c), s	0.7	3.3	1.0	0.5	2.8	2.3		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	484	593	248	2301	2409	973		
V/C Ratio(X)	0.13	0.41	0.33	0.05	0.23	0.20		
Avail Cap(c_a), veh/h	1439	1366	408	2301	2409	973		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	16.2	14.6	19.0	2.7	6.7	3.7		
Incr Delay (d2), s/veh	0.1	0.5	0.8	0.0	0.2	0.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.3	2.7	0.5	0.3	1.4	1.5		
LnGrp Delay(d),s/veh	16.3	15.1	19.7	2.8	6.9	4.1		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	310			195	761			
Approach Delay, s/veh	15.3			9.8	6.2			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		10.6	7.6	24.9		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.1	18.4		
Max Q Clear Time (g_c+I1), s		2.5		5.3	3.0	4.8		
Green Ext Time (p_c), s		0.6		0.9	0.0	3.8		
Intersection Summary								
HCM 2010 Ctrl Delay			9.0					
HCM 2010 LOS			A					

Intersection

Intersection Delay, s/veh 8.2

Intersection LOS A

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 25 63 136 13 77 26

Future Vol, veh/h 25 63 136 13 77 26

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 28 70 151 14 86 29

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 8.1 8.3 8.3

HCM LOS A A A

Lane EBLn1WBLn1 SBLn1

Vol Left, % 28% 0% 75%

Vol Thru, % 72% 91% 0%

Vol Right, % 0% 9% 25%

Sign Control Stop Stop Stop

Traffic Vol by Lane 88 149 103

LT Vol 25 0 77

Through Vol 63 136 0

RT Vol 0 13 26

Lane Flow Rate 98 166 114

Geometry Grp 1 1 1

Degree of Util (X) 0.12 0.196 0.144

Departure Headway (Hd) 4.436 4.26 4.518

Convergence, Y/N Yes Yes Yes

Cap 811 844 795

Service Time 2.45 2.273 2.533

HCM Lane V/C Ratio 0.121 0.197 0.143

HCM Control Delay 8.1 8.3 8.3

HCM Lane LOS A A A

HCM 95th-tile Q 0.4 0.7 0.5

Intersection						
Int Delay, s/veh	7.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	128	64	134	16	27	261
Future Vol, veh/h	128	64	134	16	27	261
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	151	75	158	19	32	307
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	177	0	-	0	545	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	377	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1399	-	-	-	499	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1399	-	-	-	443	876
Mov Cap-2 Maneuver	-	-	-	-	443	-
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	694	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.3	0		12.7		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1399	-	-	-	802	
HCM Lane V/C Ratio	0.108	-	-	-	0.422	
HCM Control Delay (s)	7.9	0	-	-	12.7	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.4	-	-	-	2.1	

Intersection

Intersection Delay, s/veh 189.6

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	613	116	10	46	284	920
Future Vol, veh/h	613	116	10	46	284	920
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	645	122	11	48	299	968
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	128.7	12.7	234.7
HCM LOS	F	B	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	18%
Vol Thru, %	0%	0%	100%	0%	82%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	284	920	613	116	56
LT Vol	284	0	0	0	10
Through Vol	0	0	613	0	46
RT Vol	0	920	0	116	0
Lane Flow Rate	299	968	645	122	59
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.597	1.612	1.242	0.211	0.122
Departure Headway (Hd)	7.681	6.462	7.852	7.137	8.502
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	472	571	471	507	424
Service Time	5.381	4.162	5.552	4.837	6.502
HCM Lane V/C Ratio	0.633	1.695	1.369	0.241	0.139
HCM Control Delay	21.1	300.6	150.8	11.7	12.7
HCM Lane LOS	C	F	F	B	B
HCM 95th-tile Q	3.8	49.4	23.1	0.8	0.4

Intersection

Int Delay, s/veh 4.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	387	26	236	111	24	92
Future Vol, veh/h	387	26	236	111	24	92
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	399	27	243	114	25	95

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	399
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1160
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1160
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	14.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	206	639	-	-	1160	-
HCM Lane V/C Ratio	0.12	0.148	-	-	0.21	-
HCM Control Delay (s)	24.8	11.6	-	-	8.9	0
HCM Lane LOS	C	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	0.5	-	-	0.8	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	403	119	199	697	71	63
v/c Ratio	0.52	0.09	0.51	0.34	0.03	0.05
Control Delay	18.6	2.2	25.6	6.1	10.4	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	2.2	25.6	6.1	10.4	0.9
Queue Length 50th (ft)	50	0	27	43	4	0
Queue Length 95th (ft)	82	10	57	85	12	6
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1290	1282	394	2069	2138	1377
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.09	0.51	0.34	0.03	0.05
Intersection Summary						

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	367	108	181	634	65	57		
Future Volume (veh/h)	367	108	181	634	65	57		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	403	119	199	697	71	63		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	639	799	348	2181	2116	953		
Arrive On Green	0.19	0.19	0.10	0.62	0.42	0.42		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	403	119	199	697	71	63		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	4.9	1.4	2.5	4.3	0.4	0.7		
Cycle Q Clear(g_c), s	4.9	1.4	2.5	4.3	0.4	0.7		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	639	799	348	2181	2116	953		
V/C Ratio(X)	0.63	0.15	0.57	0.32	0.03	0.07		
Avail Cap(c_a), veh/h	1364	1386	417	2181	2116	953		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.1	12.1	19.5	4.2	7.9	3.8		
Incr Delay (d2), s/veh	1.0	0.1	1.5	0.4	0.0	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.4	1.3	1.3	2.2	0.2	0.5		
LnGrp Delay(d),s/veh	18.1	12.2	21.0	4.6	7.9	3.9		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	522			896	134			
Approach Delay, s/veh	16.7			8.2	6.0			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		12.9	9.1	23.4		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.5	18.0		
Max Q Clear Time (g_c+I1), s		6.3		6.9	4.5	2.7		
Green Ext Time (p_c), s		4.9		1.5	0.1	0.5		
Intersection Summary								
HCM 2010 Ctrl Delay			10.9					
HCM 2010 LOS			B					

Intersection

Intersection Delay, s/veh 12

Intersection LOS B

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 64 376 76 79 46 36

Future Vol, veh/h 64 376 76 79 46 36

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 71 418 84 88 51 40

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 13.7 8.6 9.1

HCM LOS B A A

Lane EBLn1WBLn1 SBLn1

Vol Left, % 15% 0% 56%

Vol Thru, % 85% 49% 0%

Vol Right, % 0% 51% 44%

Sign Control Stop Stop Stop

Traffic Vol by Lane 440 155 82

LT Vol 64 0 46

Through Vol 376 76 0

RT Vol 0 79 36

Lane Flow Rate 489 172 91

Geometry Grp 1 1 1

Degree of Util (X) 0.595 0.21 0.132

Departure Headway (Hd) 4.384 4.382 5.22

Convergence, Y/N Yes Yes Yes

Cap 821 818 685

Service Time 2.41 2.415 3.268

HCM Lane V/C Ratio 0.596 0.21 0.133

HCM Control Delay 13.7 8.6 9.1

HCM Lane LOS B A A

HCM 95th-tile Q 4 0.8 0.5

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	267	429	76	33	11	93
Future Vol, veh/h	267	429	76	33	11	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	314	505	89	39	13	109

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	128	0	0 1242 109
Stage 1	-	-	- - 109 -
Stage 2	-	-	- - 1133 -
Critical Hdwy	4.12	-	- - 6.42 6.22
Critical Hdwy Stg 1	-	-	- - 5.42 -
Critical Hdwy Stg 2	-	-	- - 5.42 -
Follow-up Hdwy	2.218	-	- - 3.518 3.318
Pot Cap-1 Maneuver	1458	-	- - 193 945
Stage 1	-	-	- - 916 -
Stage 2	-	-	- - 307 -
Platoon blocked, %		-	- -
Mov Cap-1 Maneuver	1458	-	- - 135 945
Mov Cap-2 Maneuver	-	-	- - 135 -
Stage 1	-	-	- - 642 -
Stage 2	-	-	- - 307 -

Approach	EB	WB	SB
HCM Control Delay, s	3.1	0	12.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1458	-	-	-	578
HCM Lane V/C Ratio	0.215	-	-	-	0.212
HCM Control Delay (s)	8.1	0	-	-	12.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.8	-	-	-	0.8

Appendix C
Level-of-Service Calculations
for EPAP Conditions

Intersection

Intersection Delay, s/veh 101.5

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	20	477	249	496	179	46
Future Vol, veh/h	20	477	249	496	179	46
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	502	262	522	188	48
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	25.1	178.4	15.7
HCM LOS	D	F	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	33%
Vol Thru, %	0%	0%	100%	0%	67%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	179	46	20	477	745
LT Vol	179	0	0	0	249
Through Vol	0	0	20	0	496
RT Vol	0	46	0	477	0
Lane Flow Rate	188	48	21	502	784
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.411	0.089	0.037	0.773	1.328
Departure Headway (Hd)	8.484	7.244	6.624	5.907	6.096
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	428	498	544	618	596
Service Time	6.184	4.944	4.324	3.607	4.126
HCM Lane V/C Ratio	0.439	0.096	0.039	0.812	1.315
HCM Control Delay	17	10.7	9.6	25.8	178.4
HCM Lane LOS	C	B	A	D	F
HCM 95th-tile Q	2	0.3	0.1	7.2	33

Intersection

Int Delay, s/veh 8.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	69	511	116	18	463
Future Vol, veh/h	75	69	511	116	18	463
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	77	71	527	120	19	477

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	77
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1522
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1522
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	114	940	-	-	1522	-
HCM Lane V/C Ratio	0.163	0.508	-	-	0.346	-
HCM Control Delay (s)	42.6	12.7	-	-	8.6	0
HCM Lane LOS	E	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	2.9	-	-	1.6	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	115	265	110	116	574	276
v/c Ratio	0.22	0.23	0.28	0.05	0.27	0.24
Control Delay	17.1	3.6	20.0	3.3	8.9	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	3.6	20.0	3.3	8.9	1.2
Queue Length 50th (ft)	13	5	13	4	31	3
Queue Length 95th (ft)	29	23	31	11	52	16
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1410	1168	399	2261	2135	1493
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.23	0.28	0.05	0.27	0.18
Intersection Summary						

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	105	241	100	106	522	251		
Future Volume (veh/h)	105	241	100	106	522	251		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	115	265	110	116	574	276		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	522	658	290	2272	2311	960		
Arrive On Green	0.15	0.15	0.08	0.64	0.45	0.45		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	115	265	110	116	574	276		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	1.3	3.5	1.3	0.5	3.0	3.6		
Cycle Q Clear(g_c), s	1.3	3.5	1.3	0.5	3.0	3.6		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	522	658	290	2272	2311	960		
V/C Ratio(X)	0.22	0.40	0.38	0.05	0.25	0.29		
Avail Cap(c_a), veh/h	1421	1385	402	2272	2311	960		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	16.2	14.1	18.9	2.9	7.3	4.1		
Incr Delay (d2), s/veh	0.2	0.4	0.8	0.0	0.3	0.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.6	2.8	0.7	0.3	1.4	2.3		
LnGrp Delay(d),s/veh	16.4	14.5	19.7	2.9	7.6	4.9		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	380			226	850			
Approach Delay, s/veh	15.1			11.1	6.7			
Approach LOS	B			B	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		11.1	8.2	24.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.1	18.4		
Max Q Clear Time (g_c+I1), s		2.5		5.5	3.3	5.6		
Green Ext Time (p_c), s		0.6		1.2	0.0	4.0		
Intersection Summary								
HCM 2010 Ctrl Delay			9.6					
HCM 2010 LOS			A					

Intersection

Intersection Delay, s/veh 8.2

Intersection LOS A

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 25 63 136 13 77 26

Future Vol, veh/h 25 63 136 13 77 26

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 28 70 151 14 86 29

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 8.1 8.3 8.3

HCM LOS A A A

Lane EBLn1WBLn1 SBLn1

Vol Left, % 28% 0% 75%

Vol Thru, % 72% 91% 0%

Vol Right, % 0% 9% 25%

Sign Control Stop Stop Stop

Traffic Vol by Lane 88 149 103

LT Vol 25 0 77

Through Vol 63 136 0

RT Vol 0 13 26

Lane Flow Rate 98 166 114

Geometry Grp 1 1 1

Degree of Util (X) 0.12 0.196 0.144

Departure Headway (Hd) 4.436 4.26 4.518

Convergence, Y/N Yes Yes Yes

Cap 811 844 795

Service Time 2.45 2.273 2.533

HCM Lane V/C Ratio 0.121 0.197 0.143

HCM Control Delay 8.1 8.3 8.3

HCM Lane LOS A A A

HCM 95th-tile Q 0.4 0.7 0.5

Intersection						
Int Delay, s/veh	7.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	128	64	134	16	27	261
Future Vol, veh/h	128	64	134	16	27	261
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	151	75	158	19	32	307
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	177	0	-	0	545	168
Stage 1	-	-	-	-	168	-
Stage 2	-	-	-	-	377	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1399	-	-	-	499	876
Stage 1	-	-	-	-	862	-
Stage 2	-	-	-	-	694	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1399	-	-	-	443	876
Mov Cap-2 Maneuver	-	-	-	-	443	-
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	694	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.3	0		12.7		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1399	-	-	-	802	
HCM Lane V/C Ratio	0.108	-	-	-	0.422	
HCM Control Delay (s)	7.9	0	-	-	12.7	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.4	-	-	-	2.1	

Intersection

Intersection Delay, s/veh 188.9

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	613	158	14	46	356	924
Future Vol, veh/h	613	158	14	46	356	924
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	645	166	15	48	375	973
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	128.8	12.5	233.3
HCM LOS	F	B	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	23%
Vol Thru, %	0%	0%	100%	0%	77%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	356	924	613	158	60
LT Vol	356	0	0	0	14
Through Vol	0	0	613	0	46
RT Vol	0	924	0	158	0
Lane Flow Rate	375	973	645	166	63
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.755	1.636	1.262	0.293	0.131
Departure Headway (Hd)	7.758	6.538	7.87	7.156	8.276
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	468	564	465	506	436
Service Time	5.458	4.238	5.57	4.856	6.276
HCM Lane V/C Ratio	0.801	1.725	1.387	0.328	0.144
HCM Control Delay	30.7	311.4	158.7	12.8	12.5
HCM Lane LOS	D	F	F	B	B
HCM 95th-tile Q	6.4	50.5	24	1.2	0.4

Intersection

Int Delay, s/veh 5.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	387	26	308	111	24	134
Future Vol, veh/h	387	26	308	111	24	134
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	399	27	318	114	25	138

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	399
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1160
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1160
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.8	15.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	152	639	-	-	1160	-
HCM Lane V/C Ratio	0.163	0.216	-	-	0.274	-
HCM Control Delay (s)	33.2	12.2	-	-	9.3	0
HCM Lane LOS	D	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	0.8	-	-	1.1	-

Queues

3: Greenville Rd & Southfront Rd

07/05/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	479	146	218	704	74	111
v/c Ratio	0.56	0.11	0.57	0.35	0.04	0.10
Control Delay	18.8	2.0	28.7	6.8	11.2	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	2.0	28.7	6.8	11.2	1.4
Queue Length 50th (ft)	61	0	31	47	4	3
Queue Length 95th (ft)	97	11	#71	94	13	11
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1254	1338	383	2012	1858	1312
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.11	0.57	0.35	0.04	0.08

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/05/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	436	133	198	641	67	101		
Future Volume (veh/h)	436	133	198	641	67	101		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	479	146	218	704	74	111		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	719	863	346	2118	2043	967		
Arrive On Green	0.21	0.21	0.10	0.60	0.40	0.40		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	479	146	218	704	74	111		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	6.0	1.8	2.8	4.7	0.4	1.4		
Cycle Q Clear(g_c), s	6.0	1.8	2.8	4.7	0.4	1.4		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	719	863	346	2118	2043	967		
V/C Ratio(X)	0.67	0.17	0.63	0.33	0.04	0.11		
Avail Cap(c_a), veh/h	1324	1353	405	2118	2043	967		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.0	11.8	20.2	4.7	8.5	3.8		
Incr Delay (d2), s/veh	1.1	0.1	2.4	0.4	0.0	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.9	1.6	1.4	2.4	0.2	1.0		
LnGrp Delay(d),s/veh	18.1	11.9	22.6	5.1	8.5	4.1		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	625			922	185			
Approach Delay, s/veh	16.6			9.3	5.8			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		14.3	9.2	23.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.5	18.0		
Max Q Clear Time (g_c+I1), s		6.7		8.0	4.8	3.4		
Green Ext Time (p_c), s		5.0		1.8	0.0	0.6		
Intersection Summary								
HCM 2010 Ctrl Delay			11.6					
HCM 2010 LOS			B					

Intersection

Intersection Delay, s/veh 12

Intersection LOS B

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 64 376 76 79 46 36

Future Vol, veh/h 64 376 76 79 46 36

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 71 418 84 88 51 40

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 13.7 8.6 9.1

HCM LOS B A A

Lane EBLn1WBLn1 SBLn1

Vol Left, % 15% 0% 56%

Vol Thru, % 85% 49% 0%

Vol Right, % 0% 51% 44%

Sign Control Stop Stop Stop

Traffic Vol by Lane 440 155 82

LT Vol 64 0 46

Through Vol 376 76 0

RT Vol 0 79 36

Lane Flow Rate 489 172 91

Geometry Grp 1 1 1

Degree of Util (X) 0.595 0.21 0.132

Departure Headway (Hd) 4.384 4.382 5.22

Convergence, Y/N Yes Yes Yes

Cap 821 818 685

Service Time 2.41 2.415 3.268

HCM Lane V/C Ratio 0.596 0.21 0.133

HCM Control Delay 13.7 8.6 9.1

HCM Lane LOS B A A

HCM 95th-tile Q 4 0.8 0.5

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	267	429	76	33	11	93
Future Vol, veh/h	267	429	76	33	11	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	314	505	89	39	13	109
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	128	0	-	0	1242	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	1133	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1458	-	-	-	193	945
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	307	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1458	-	-	-	135	945
Mov Cap-2 Maneuver	-	-	-	-	135	-
Stage 1	-	-	-	-	642	-
Stage 2	-	-	-	-	307	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.1	0		12.9		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1458	-	-	-	578	
HCM Lane V/C Ratio	0.215	-	-	-	0.212	
HCM Control Delay (s)	8.1	0	-	-	12.9	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.8	-	-	-	0.8	

Appendix D

Level-of-Service Calculations

for EPAP Plus Project Conditions

Intersection

Intersection Delay, s/veh 114.7

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	27	505	249	504	209	46
Future Vol, veh/h	27	505	249	504	209	46
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	28	532	262	531	220	48
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	32.1	206	17.7
HCM LOS	D	F	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	33%
Vol Thru, %	0%	0%	100%	0%	67%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	209	46	27	505	753
LT Vol	209	0	0	0	249
Through Vol	0	0	27	0	504
RT Vol	0	46	0	505	0
Lane Flow Rate	220	48	28	532	793
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.485	0.091	0.051	0.842	1.392
Departure Headway (Hd)	8.65	7.407	6.886	6.166	6.321
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	420	487	523	590	579
Service Time	6.35	5.107	4.586	3.866	4.359
HCM Lane V/C Ratio	0.524	0.099	0.054	0.902	1.37
HCM Control Delay	19.2	10.8	10	33.3	206
HCM Lane LOS	C	B	A	D	F
HCM 95th-tile Q	2.6	0.3	0.2	9	36

Intersection

Int Delay, s/veh 10.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	110	96	511	154	46	463
Future Vol, veh/h	110	96	511	154	46	463
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	113	99	527	159	47	477

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	113
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1476
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1476
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.8	19.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	97	882	-	-	1476	-
HCM Lane V/C Ratio	0.489	0.541	-	-	0.357	-
HCM Control Delay (s)	73.4	13.8	-	-	8.8	0
HCM Lane LOS	F	B	-	-	A	A
HCM 95th %tile Q(veh)	2.1	3.3	-	-	1.6	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	135	265	110	130	586	295
v/c Ratio	0.24	0.22	0.28	0.06	0.28	0.26
Control Delay	17.1	3.7	20.4	3.5	9.2	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	3.7	20.4	3.5	9.2	1.3
Queue Length 50th (ft)	15	6	13	5	33	4
Queue Length 95th (ft)	32	24	32	13	56	18
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1396	1178	395	2238	2113	1480
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.22	0.28	0.06	0.28	0.20
Intersection Summary						

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	123	241	100	118	533	268		
Future Volume (veh/h)	123	241	100	118	533	268		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	135	265	110	130	586	295		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	527	662	290	2268	2306	961		
Arrive On Green	0.15	0.15	0.08	0.64	0.45	0.45		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	135	265	110	130	586	295		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	1.5	3.5	1.3	0.6	3.1	3.9		
Cycle Q Clear(g_c), s	1.5	3.5	1.3	0.6	3.1	3.9		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	527	662	290	2268	2306	961		
V/C Ratio(X)	0.26	0.40	0.38	0.06	0.25	0.31		
Avail Cap(c_a), veh/h	1418	1383	402	2268	2306	961		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	16.3	14.0	18.9	2.9	7.4	4.2		
Incr Delay (d2), s/veh	0.3	0.4	0.8	0.0	0.3	0.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.7	2.8	0.7	0.3	1.5	2.6		
LnGrp Delay(d),s/veh	16.6	14.4	19.7	3.0	7.6	5.0		
LnGrp LOS	B	B	B	A	A	A		
Approach Vol, veh/h	400			240	881			
Approach Delay, s/veh	15.1			10.7	6.7			
Approach LOS	B			B	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		11.2	8.2	24.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.1	18.4		
Max Q Clear Time (g_c+I1), s		2.6		5.5	3.3	5.9		
Green Ext Time (p_c), s		0.7		1.2	0.0	4.1		
Intersection Summary								
HCM 2010 Ctrl Delay			9.6					
HCM 2010 LOS			A					

Intersection

Intersection Delay, s/veh 8.3

Intersection LOS A

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 25 73 144 17 81 26

Future Vol, veh/h 25 73 144 17 81 26

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 28 81 160 19 90 29

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 8.2 8.4 8.4

HCM LOS A A A

Lane EBLn1WBLn1 SBLn1

Vol Left, % 26% 0% 76%

Vol Thru, % 74% 89% 0%

Vol Right, % 0% 11% 24%

Sign Control Stop Stop Stop

Traffic Vol by Lane 98 161 107

LT Vol 25 0 81

Through Vol 73 144 0

RT Vol 0 17 26

Lane Flow Rate 109 179 119

Geometry Grp 1 1 1

Degree of Util (X) 0.135 0.212 0.151

Departure Headway (Hd) 4.459 4.276 4.581

Convergence, Y/N Yes Yes Yes

Cap 807 843 785

Service Time 2.473 2.289 2.598

HCM Lane V/C Ratio 0.135 0.212 0.152

HCM Control Delay 8.2 8.4 8.4

HCM Lane LOS A A A

HCM 95th-tile Q 0.5 0.8 0.5

Intersection						
Int Delay, s/veh	7.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	128	72	141	17	27	261
Future Vol, veh/h	128	72	141	17	27	261
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	151	85	166	20	32	307
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	186	0	-	0	563	176
Stage 1	-	-	-	-	176	-
Stage 2	-	-	-	-	387	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1388	-	-	-	487	867
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	686	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1388	-	-	-	431	867
Mov Cap-2 Maneuver	-	-	-	-	431	-
Stage 1	-	-	-	-	758	-
Stage 2	-	-	-	-	686	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.1	0		12.9		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1388	-	-	-	792	
HCM Lane V/C Ratio	0.108	-	-	-	0.428	
HCM Control Delay (s)	7.9	0	-	-	12.9	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.4	-	-	-	2.2	

Intersection

Intersection Delay, s/veh 190.5

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	620	184	14	53	384	924
Future Vol, veh/h	620	184	14	53	384	924
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	653	194	15	56	404	973
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	132.8	12.6	235.1
HCM LOS	F	B	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	21%
Vol Thru, %	0%	0%	100%	0%	79%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	384	924	620	184	67
LT Vol	384	0	0	0	14
Through Vol	0	0	620	0	53
RT Vol	0	924	0	184	0
Lane Flow Rate	404	973	653	194	71
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.82	1.649	1.286	0.344	0.146
Departure Headway (Hd)	7.829	6.609	7.883	7.17	8.175
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	465	564	463	506	441
Service Time	5.529	4.309	5.583	4.87	6.175
HCM Lane V/C Ratio	0.869	1.725	1.41	0.383	0.161
HCM Control Delay	37.3	317.3	168.2	13.6	12.6
HCM Lane LOS	E	F	F	B	B
HCM 95th-tile Q	7.8	50.8	25.1	1.5	0.5

Intersection

Int Delay, s/veh 6.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	420	50	308	146	49	134
Future Vol, veh/h	420	50	308	146	49	134
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	433	52	318	151	51	138

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	433
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1127
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1127
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.4	22.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	133	602	-	-	1127	-
HCM Lane V/C Ratio	0.38	0.229	-	-	0.282	-
HCM Control Delay (s)	47.8	12.8	-	-	9.4	0
HCM Lane LOS	E	B	-	-	A	A
HCM 95th %tile Q(veh)	1.6	0.9	-	-	1.2	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	498	146	218	716	85	129
v/c Ratio	0.57	0.11	0.57	0.36	0.05	0.11
Control Delay	18.9	1.9	29.0	7.0	11.4	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	1.9	29.0	7.0	11.4	1.6
Queue Length 50th (ft)	64	0	31	50	5	4
Queue Length 95th (ft)	100	11	#71	98	15	13
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1247	1347	381	2000	1847	1304
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.11	0.57	0.36	0.05	0.10

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	453	133	198	652	77	117		
Future Volume (veh/h)	453	133	198	652	77	117		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	498	146	218	716	85	129		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	738	876	344	2104	2029	971		
Arrive On Green	0.21	0.21	0.10	0.59	0.40	0.40		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	498	146	218	716	85	129		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	6.3	1.8	2.9	4.8	0.5	1.6		
Cycle Q Clear(g_c), s	6.3	1.8	2.9	4.8	0.5	1.6		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	738	876	344	2104	2029	971		
V/C Ratio(X)	0.68	0.17	0.63	0.34	0.04	0.13		
Avail Cap(c_a), veh/h	1315	1344	402	2104	2029	971		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.0	11.7	20.4	4.9	8.7	3.8		
Incr Delay (d2), s/veh	1.1	0.1	2.5	0.4	0.0	0.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.1	1.6	1.5	2.4	0.2	1.2		
LnGrp Delay(d),s/veh	18.1	11.8	22.9	5.3	8.7	4.1		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	644			934	214			
Approach Delay, s/veh	16.7			9.4	5.9			
Approach LOS	B			A	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		14.6	9.2	23.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.5	18.0		
Max Q Clear Time (g_c+I1), s		6.8		8.3	4.9	3.6		
Green Ext Time (p_c), s		5.0		1.8	0.0	0.8		
Intersection Summary								
HCM 2010 Ctrl Delay			11.6					
HCM 2010 LOS			B					

Intersection

Intersection Delay, s/veh 12.2

Intersection LOS B

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 64 384 84 82 50 36

Future Vol, veh/h 64 384 84 82 50 36

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 71 427 93 91 56 40

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 14.1 8.8 9.2

HCM LOS B A A

Lane EBLn1 WBLn1 SBLn1

Vol Left, % 14% 0% 58%

Vol Thru, % 86% 51% 0%

Vol Right, % 0% 49% 42%

Sign Control Stop Stop Stop

Traffic Vol by Lane 448 166 86

LT Vol 64 0 50

Through Vol 384 84 0

RT Vol 0 82 36

Lane Flow Rate 498 184 96

Geometry Grp 1 1 1

Degree of Util (X) 0.61 0.226 0.14

Departure Headway (Hd) 4.412 4.419 5.285

Convergence, Y/N Yes Yes Yes

Cap 816 812 677

Service Time 2.441 2.456 3.336

HCM Lane V/C Ratio 0.61 0.227 0.142

HCM Control Delay 14.1 8.8 9.2

HCM Lane LOS B A A

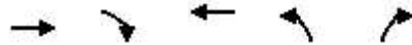
HCM 95th-tile Q 4.2 0.9 0.5

Intersection						
Int Delay, s/veh	3.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	267	436	83	34	12	93
Future Vol, veh/h	267	436	83	34	12	93
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	314	513	98	40	14	109
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	138	0	-	0	1259	118
Stage 1	-	-	-	-	118	-
Stage 2	-	-	-	-	1141	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1446	-	-	-	188	934
Stage 1	-	-	-	-	907	-
Stage 2	-	-	-	-	305	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1446	-	-	-	131	934
Mov Cap-2 Maneuver	-	-	-	-	131	-
Stage 1	-	-	-	-	631	-
Stage 2	-	-	-	-	305	-
Approach	EB	WB		SB		
HCM Control Delay, s	3.1	0		13.5		
HCM LOS				B		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1446	-	-	-	549	
HCM Lane V/C Ratio	0.217	-	-	-	0.225	
HCM Control Delay (s)	8.2	0	-	-	13.5	
HCM Lane LOS	A	A	-	-	B	
HCM 95th %tile Q(veh)	0.8	-	-	-	0.9	

Queues

1: Greenville Rd & Altamont Pass Rd

07/02/2018



Lane Group	EBT	EBR	WBT	NBL	NBR
Lane Group Flow (vph)	28	532	793	220	48
v/c Ratio	0.03	0.47	0.84	0.53	0.12
Control Delay	5.3	2.2	20.3	22.6	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	5.3	2.2	20.3	22.6	6.5
Queue Length 50th (ft)	3	0	157	62	0
Queue Length 95th (ft)	13	35	#443	115	19
Internal Link Dist (ft)	913		744	763	
Turn Bay Length (ft)		125			100
Base Capacity (vph)	1267	1247	1114	685	642
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.02	0.43	0.71	0.32	0.07

Intersection Summary

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

HCM 2010 Signalized Intersection Summary

1: Greenville Rd & Altamont Pass Rd

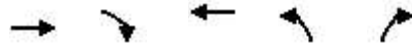
07/02/2018

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	27	505	249	504	209	46		
Future Volume (veh/h)	27	505	249	504	209	46		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863		
Adj Flow Rate, veh/h	28	0	262	531	220	0		
Adj No. of Lanes	1	1	0	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1070	909	412	687	324	289		
Arrive On Green	0.57	0.00	0.57	0.57	0.18	0.00		
Sat Flow, veh/h	1863	1583	492	1197	1774	1583		
Grp Volume(v), veh/h	28	0	793	0	220	0		
Grp Sat Flow(s),veh/h/ln	1863	1583	1689	0	1774	1583		
Q Serve(g_s), s	0.2	0.0	11.5	0.0	4.3	0.0		
Cycle Q Clear(g_c), s	0.2	0.0	13.8	0.0	4.3	0.0		
Prop In Lane		1.00	0.33		1.00	1.00		
Lane Grp Cap(c), veh/h	1070	909	1099	0	324	289		
V/C Ratio(X)	0.03	0.00	0.72	0.00	0.68	0.00		
Avail Cap(c_a), veh/h	1635	1390	1605	0	886	791		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	3.4	0.0	6.2	0.0	14.1	0.0		
Incr Delay (d2), s/veh	0.0	0.0	0.9	0.0	2.5	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.1	0.0	6.4	0.0	2.3	0.0		
LnGrp Delay(d),s/veh	3.4	0.0	7.1	0.0	16.6	0.0		
LnGrp LOS	A		A		B			
Approach Vol, veh/h	28			793	220			
Approach Delay, s/veh	3.4			7.1	16.6			
Approach LOS	A			A	B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		11.3		25.8				25.8
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		18.5		32.5				32.5
Max Q Clear Time (g_c+I1), s		6.3		2.2				15.8
Green Ext Time (p_c), s		0.5		0.1				5.5
Intersection Summary								
HCM 2010 Ctrl Delay			9.0					
HCM 2010 LOS			A					

Queues

1: Greenville Rd & Altamont Pass Rd

07/02/2018



Lane Group	EBT	EBR	WBT	NBL	NBR
Lane Group Flow (vph)	653	194	71	404	973
v/c Ratio	0.99	0.31	0.20	0.40	1.04
Control Delay	69.6	15.0	26.8	15.0	63.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	69.6	15.0	26.8	15.0	63.8
Queue Length 50th (ft)	455	50	35	152	~715
Queue Length 95th (ft)	#699	108	71	222	#965
Internal Link Dist (ft)	913		744	763	
Turn Bay Length (ft)		125			100
Base Capacity (vph)	658	617	349	999	934
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.99	0.31	0.20	0.40	1.04

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 2010 Signalized Intersection Summary

1: Greenville Rd & Altamont Pass Rd

07/02/2018

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	620	184	14	53	384	924		
Future Volume (veh/h)	620	184	14	53	384	924		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863		
Adj Flow Rate, veh/h	653	0	15	56	404	0		
Adj No. of Lanes	1	1	0	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	872	741	170	527	524	467		
Arrive On Green	0.47	0.00	0.47	0.47	0.30	0.00		
Sat Flow, veh/h	1863	1583	117	1125	1774	1583		
Grp Volume(v), veh/h	653	0	71	0	404	0		
Grp Sat Flow(s),veh/h/ln	1863	1583	1243	0	1774	1583		
Q Serve(g_s), s	10.9	0.0	0.2	0.0	7.9	0.0		
Cycle Q Clear(g_c), s	10.9	0.0	11.1	0.0	7.9	0.0		
Prop In Lane		1.00	0.21		1.00	1.00		
Lane Grp Cap(c), veh/h	872	741	696	0	524	467		
V/C Ratio(X)	0.75	0.00	0.10	0.00	0.77	0.00		
Avail Cap(c_a), veh/h	1907	1621	1496	0	2900	2588		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	8.3	0.0	5.9	0.0	12.2	0.0		
Incr Delay (d2), s/veh	1.3	0.0	0.1	0.0	2.4	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.8	0.0	0.4	0.0	4.2	0.0		
LnGrp Delay(d),s/veh	9.6	0.0	5.9	0.0	14.7	0.0		
LnGrp LOS	A		A		B			
Approach Vol, veh/h	653			71	404			
Approach Delay, s/veh	9.6			5.9	14.7			
Approach LOS	A			A	B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		15.7		22.3				22.3
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		62.1		38.9				38.9
Max Q Clear Time (g_c+I1), s		9.9		12.9				13.1
Green Ext Time (p_c), s		1.3		4.9				0.4
Intersection Summary								
HCM 2010 Ctrl Delay			11.2					
HCM 2010 LOS			B					

Appendix E
Level-of-Service Calculations
for Year 2035 Conditions

Intersection

Intersection Delay, s/veh 260.4

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	28	563	342	694	189	59
Future Vol, veh/h	28	563	342	694	189	59
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	593	360	731	199	62
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	45.3	441.2	17.7
HCM LOS	E	F	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	33%
Vol Thru, %	0%	0%	100%	0%	67%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	189	59	28	563	1036
LT Vol	189	0	0	0	342
Through Vol	0	0	28	0	694
RT Vol	0	59	0	563	0
Lane Flow Rate	199	62	29	593	1091
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.445	0.118	0.052	0.923	1.931
Departure Headway (Hd)	9.454	8.196	7.304	6.58	6.373
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	384	440	493	557	578
Service Time	7.154	5.896	5.004	4.28	4.39
HCM Lane V/C Ratio	0.518	0.141	0.059	1.065	1.888
HCM Control Delay	19.5	12	10.4	47	441.2
HCM Lane LOS	C	B	B	E	F
HCM 95th-tile Q	2.2	0.4	0.2	11.4	71.3

Intersection

Int Delay, s/veh 11.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	97	654	162	25	543
Future Vol, veh/h	105	97	654	162	25	543
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	108	100	674	167	26	560

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	108
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1483
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1483
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.6	20.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	52	887	-	-	1483	-
HCM Lane V/C Ratio	0.496	0.631	-	-	0.455	-
HCM Control Delay (s)	129	15.7	-	-	9.4	0
HCM Lane LOS	F	C	-	-	A	A
HCM 95th %tile Q(veh)	1.9	4.6	-	-	2.4	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	91	343	114	160	792	273
v/c Ratio	0.18	0.31	0.27	0.07	0.37	0.24
Control Delay	16.9	8.2	19.6	3.2	9.5	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	8.2	19.6	3.2	9.5	1.3
Queue Length 50th (ft)	10	24	13	5	46	2
Queue Length 95th (ft)	24	48	31	13	72	16
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1419	1094	418	2275	2125	1494
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.31	0.27	0.07	0.37	0.18
Intersection Summary						

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations	 	 	 	 	  			
Traffic Volume (veh/h)	83	312	104	146	721	248		
Future Volume (veh/h)	83	312	104	146	721	248		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	91	343	114	160	792	273		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	609	729	291	2204	2229	974		
Arrive On Green	0.18	0.18	0.08	0.62	0.44	0.44		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	91	343	114	160	792	273		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	1.0	4.7	1.4	0.8	4.7	3.6		
Cycle Q Clear(g_c), s	1.0	4.7	1.4	0.8	4.7	3.6		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	609	729	291	2204	2229	974		
V/C Ratio(X)	0.15	0.47	0.39	0.07	0.36	0.28		
Avail Cap(c_a), veh/h	1378	1351	406	2204	2229	974		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	15.6	14.0	19.5	3.4	8.4	4.0		
Incr Delay (d2), s/veh	0.1	0.5	0.9	0.1	0.4	0.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.5	3.7	0.7	0.4	2.2	2.5		
LnGrp Delay(d),s/veh	15.8	14.5	20.4	3.4	8.8	4.7		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	434			274	1065			
Approach Delay, s/veh	14.7			10.5	7.8			
Approach LOS	B			B	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		12.5	8.3	24.2		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.3	18.2		
Max Q Clear Time (g_c+I1), s		2.8		6.7	3.4	6.7		
Green Ext Time (p_c), s		0.9		1.3	0.1	5.0		
Intersection Summary								
HCM 2010 Ctrl Delay			9.9					
HCM 2010 LOS			A					

Intersection

Intersection Delay, s/veh 9

Intersection LOS A

Movement EBL EBT WBT WBR SBL SBRLane Configurations 

Traffic Vol, veh/h 35 88 190 18 108 36

Future Vol, veh/h 35 88 190 18 108 36

Peak Hour Factor 0.90 0.90 0.90 0.90 0.90 0.90

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 39 98 211 20 120 40

Number of Lanes 0 1 1 0 1 0

Approach EB WB SB

Opposing Approach WB EB

Opposing Lanes 1 1 0

Conflicting Approach Left SB WB

Conflicting Lanes Left 1 0 1

Conflicting Approach Right SB EB

Conflicting Lanes Right 0 1 1

HCM Control Delay 8.7 9.2 9.1

HCM LOS A A A

Lane EBLn1WBLn1 SBLn1

Vol Left, % 28% 0% 75%

Vol Thru, % 72% 91% 0%

Vol Right, % 0% 9% 25%

Sign Control Stop Stop Stop

Traffic Vol by Lane 123 208 144

LT Vol 35 0 108

Through Vol 88 190 0

RT Vol 0 18 36

Lane Flow Rate 137 231 160

Geometry Grp 1 1 1

Degree of Util (X) 0.176 0.285 0.212

Departure Headway (Hd) 4.642 4.436 4.768

Convergence, Y/N Yes Yes Yes

Cap 772 811 752

Service Time 2.673 2.463 2.8

HCM Lane V/C Ratio 0.177 0.285 0.213

HCM Control Delay 8.7 9.2 9.1

HCM Lane LOS A A A

HCM 95th-tile Q 0.6 1.2 0.8

Intersection						
Int Delay, s/veh	10.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	179	90	188	22	38	365
Future Vol, veh/h	179	90	188	22	38	365
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	211	106	221	26	45	429
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	247	0	-	0	762	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	528	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1319	-	-	-	373	805
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	592	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1319	-	-	-	310	805
Mov Cap-2 Maneuver	-	-	-	-	310	-
Stage 1	-	-	-	-	668	-
Stage 2	-	-	-	-	592	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.5	0		20.2		
HCM LOS				C		
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1319	-	-	-	700	
HCM Lane V/C Ratio	0.16	-	-	-	0.677	
HCM Control Delay (s)	8.2	0	-	-	20.2	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.6	-	-	-	5.3	

Intersection

Intersection Delay, s/veh 408.8

Intersection LOS F

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	858	162	14	64	398	1288
Future Vol, veh/h	858	162	14	64	398	1288
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	903	171	15	67	419	1356
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	329	13.7	475.4
HCM LOS	F	B	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	18%
Vol Thru, %	0%	0%	100%	0%	82%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	398	1288	858	162	78
LT Vol	398	0	0	0	14
Through Vol	0	0	858	0	64
RT Vol	0	1288	0	162	0
Lane Flow Rate	419	1356	903	171	82
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.851	2.302	1.798	0.306	0.17
Departure Headway (Hd)	8.598	7.372	8.482	7.767	8.871
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	423	515	434	466	407
Service Time	6.298	5.072	6.182	5.467	6.871
HCM Lane V/C Ratio	0.991	2.633	2.081	0.367	0.201
HCM Control Delay	44.2	608.7	388.5	13.9	13.7
HCM Lane LOS	E	F	F	B	B
HCM 95th-tile Q	8.3	84.5	48.3	1.3	0.6

Intersection						
Int Delay, s/veh	6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	542	36	330	155	34	129
Future Vol, veh/h	542	36	330	155	34	129
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	-	-	845	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	559	37	340	160	35	133
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	559	0	1418	578
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	840	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1012	-	151	516
Stage 1	-	-	-	-	561	-
Stage 2	-	-	-	-	424	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1012	-	95	516
Mov Cap-2 Maneuver	-	-	-	-	95	-
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	424	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		7		24.6	
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	95	516	-	-	1012	-
HCM Lane V/C Ratio	0.369	0.258	-	-	0.336	-
HCM Control Delay (s)	63.5	14.4	-	-	10.3	0
HCM Lane LOS	F	B	-	-	B	A
HCM 95th %tile Q(veh)	1.5	1	-	-	1.5	-

Queues

3: Greenville Rd & Southfront Rd

07/02/2018



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	565	166	278	976	100	88
v/c Ratio	0.62	0.12	0.74	0.50	0.06	0.08
Control Delay	19.3	1.8	38.1	8.6	11.9	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	1.8	38.1	8.6	11.9	1.8
Queue Length 50th (ft)	74	0	41	79	6	4
Queue Length 95th (ft)	114	11	#101	148	17	11
Internal Link Dist (ft)	843			1123	763	
Turn Bay Length (ft)	180		410			165
Base Capacity (vph)	1223	1385	374	1962	1813	1274
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.12	0.74	0.50	0.06	0.07

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 2010 Signalized Intersection Summary

3: Greenville Rd & Southfront Rd

07/02/2018

								
Movement	EBL	EBR	NBL	NBT	SBT	SBR		
Lane Configurations								
Traffic Volume (veh/h)	514	151	253	888	91	80		
Future Volume (veh/h)	514	151	253	888	91	80		
Number	7	14	5	2	6	16		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863		
Adj Flow Rate, veh/h	565	166	278	976	100	88		
Adj No. of Lanes	2	2	2	2	3	1		
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	803	968	392	2053	1896	960		
Arrive On Green	0.23	0.23	0.11	0.58	0.37	0.37		
Sat Flow, veh/h	3442	2787	3442	3632	5253	1583		
Grp Volume(v), veh/h	565	166	278	976	100	88		
Grp Sat Flow(s),veh/h/ln	1721	1393	1721	1770	1695	1583		
Q Serve(g_s), s	7.3	2.0	3.8	7.7	0.6	1.1		
Cycle Q Clear(g_c), s	7.3	2.0	3.8	7.7	0.6	1.1		
Prop In Lane	1.00	1.00	1.00			1.00		
Lane Grp Cap(c), veh/h	803	968	392	2053	1896	960		
V/C Ratio(X)	0.70	0.17	0.71	0.48	0.05	0.09		
Avail Cap(c_a), veh/h	1283	1357	392	2053	1896	960		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	17.0	10.9	20.6	5.9	9.7	4.0		
Incr Delay (d2), s/veh	1.1	0.1	5.8	0.8	0.1	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.6	1.8	2.1	3.9	0.3	0.8		
LnGrp Delay(d),s/veh	18.1	11.0	26.4	6.7	9.7	4.1		
LnGrp LOS	B	B	C	A	A	A		
Approach Vol, veh/h	731			1254	188			
Approach Delay, s/veh	16.5			11.0	7.1			
Approach LOS	B			B	A			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.5		15.8	10.0	22.5		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		28.0		18.0	5.5	18.0		
Max Q Clear Time (g_c+I1), s		9.7		9.3	5.8	3.1		
Green Ext Time (p_c), s		6.8		2.0	0.0	0.7		
Intersection Summary								
HCM 2010 Ctrl Delay			12.5					
HCM 2010 LOS			B					

Intersection

Intersection Delay, s/veh 23.5

Intersection LOS C

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	90	526	106	111	64	50
Future Vol, veh/h	90	526	106	111	64	50
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	100	584	118	123	71	56
Number of Lanes	0	1	1	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left SB			WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	30.7	10.1	10.5
HCM LOS	D	B	B

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	15%	0%	56%
Vol Thru, %	85%	49%	0%
Vol Right, %	0%	51%	44%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	616	217	114
LT Vol	90	0	64
Through Vol	526	106	0
RT Vol	0	111	50
Lane Flow Rate	684	241	127
Geometry Grp	1	1	1
Degree of Util (X)	0.874	0.318	0.208
Departure Headway (Hd)	4.599	4.749	5.919
Convergence, Y/N	Yes	Yes	Yes
Cap	780	747	611
Service Time	2.667	2.839	3.919
HCM Lane V/C Ratio	0.877	0.323	0.208
HCM Control Delay	30.7	10.1	10.5
HCM Lane LOS	D	B	B
HCM 95th-tile Q	10.9	1.4	0.8

Intersection

Int Delay, s/veh 6.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
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Lane Configurations						
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Traffic Vol, veh/h	374	601	106	46	15	130
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Future Vol, veh/h	374	601	106	46	15	130
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Conflicting Peds, #/hr	0	0	0	0	0	0
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Sign Control	Free	Free	Free	Free	Stop	Stop
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RT Channelized	-	None	-	None	-	None
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Storage Length	-	-	-	-	0	-
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Veh in Median Storage, #	-	0	0	-	0	-
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Grade, %	-	0	0	-	0	-
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Peak Hour Factor	85	85	85	85	85	85
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Heavy Vehicles, %	2	2	2	2	2	2
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Mvmt Flow	440	707	125	54	18	153
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Major/Minor	Major1	Major2	Minor2
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Conflicting Flow All	179	0	0
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Stage 1	-	-	-
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Stage 2	-	-	-
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Critical Hdwy	4.12	-	-
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Critical Hdwy Stg 1	-	-	-
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Critical Hdwy Stg 2	-	-	-
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Follow-up Hdwy	2.218	-	-
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Pot Cap-1 Maneuver	1397	-	-
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Stage 1	-	-	-
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Stage 2	-	-	-
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Platoon blocked, %	-	-	-
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Mov Cap-1 Maneuver	1397	-	-
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Mov Cap-2 Maneuver	-	-	-
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Stage 1	-	-	-
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Stage 2	-	-	-
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Approach	EB	WB	SB
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HCM Control Delay, s	3.4	0	30.3
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HCM LOS			D
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Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
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Capacity (veh/h)	1397	-	-	-	308
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HCM Lane V/C Ratio	0.315	-	-	-	0.554
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HCM Control Delay (s)	8.8	0	-	-	30.3
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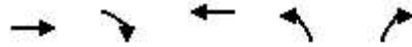
HCM Lane LOS	A	A	-	-	D
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HCM 95th %tile Q(veh)	1.4	-	-	-	3.1
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Queues

1: Greenville Rd & Altamont Pass Rd

07/02/2018



Lane Group	EBT	EBR	WBT	NBL	NBR
Lane Group Flow (vph)	29	593	1091	199	62
v/c Ratio	0.02	0.46	0.93	0.65	0.19
Control Delay	4.0	1.6	27.2	43.3	9.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	4.0	1.6	27.2	43.3	9.8
Queue Length 50th (ft)	4	0	406	102	0
Queue Length 95th (ft)	12	28	#865	172	32
Internal Link Dist (ft)	913		744	763	
Turn Bay Length (ft)		200			
Base Capacity (vph)	1442	1359	1267	409	413
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.02	0.44	0.86	0.49	0.15

Intersection Summary

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

HCM 2010 Signalized Intersection Summary

1: Greenville Rd & Altamont Pass Rd

07/02/2018

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	28	563	342	694	189	59		
Future Volume (veh/h)	28	563	342	694	189	59		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863		
Adj Flow Rate, veh/h	29	0	360	731	199	0		
Adj No. of Lanes	1	1	0	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1343	1141	462	815	255	228		
Arrive On Green	0.72	0.00	0.72	0.72	0.14	0.00		
Sat Flow, veh/h	1863	1583	541	1130	1774	1583		
Grp Volume(v), veh/h	29	0	1091	0	199	0		
Grp Sat Flow(s),veh/h/ln	1863	1583	1671	0	1774	1583		
Q Serve(g_s), s	0.3	0.0	34.0	0.0	7.2	0.0		
Cycle Q Clear(g_c), s	0.3	0.0	34.8	0.0	7.2	0.0		
Prop In Lane		1.00	0.33		1.00	1.00		
Lane Grp Cap(c), veh/h	1343	1141	1277	0	255	228		
V/C Ratio(X)	0.02	0.00	0.85	0.00	0.78	0.00		
Avail Cap(c_a), veh/h	1751	1489	1642	0	494	441		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	2.6	0.0	7.4	0.0	27.5	0.0		
Incr Delay (d2), s/veh	0.0	0.0	3.7	0.0	5.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.1	0.0	16.8	0.0	3.9	0.0		
LnGrp Delay(d),s/veh	2.6	0.0	11.1	0.0	32.6	0.0		
LnGrp LOS	A		B		C			
Approach Vol, veh/h	29			1091	199			
Approach Delay, s/veh	2.6			11.1	32.6			
Approach LOS	A			B	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		14.1		52.4				52.4
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		18.5		62.5				62.5
Max Q Clear Time (g_c+I1), s		9.2		2.3				36.8
Green Ext Time (p_c), s		0.4		0.1				11.1
Intersection Summary								
HCM 2010 Ctrl Delay			14.2					
HCM 2010 LOS			B					

Queues

1: Greenville Rd & Altamont Pass Rd

07/02/2018



Lane Group	EBT	EBR	WBT	NBL	NBR
Lane Group Flow (vph)	903	171	82	419	1356
v/c Ratio	1.36	0.28	0.28	0.41	1.45
Control Delay	209.4	22.5	37.8	18.5	233.7
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	209.4	22.5	37.8	18.5	233.8
Queue Length 50th (ft)	~1158	73	57	216	~1795
Queue Length 95th (ft)	#1417	134	106	294	#2066
Internal Link Dist (ft)	913		744	763	
Turn Bay Length (ft)		200			
Base Capacity (vph)	664	605	294	1032	938
Starvation Cap Reductn	0	0	0	0	19
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.36	0.28	0.28	0.41	1.48

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM 2010 Signalized Intersection Summary

1: Greenville Rd & Altamont Pass Rd

07/02/2018

								
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations								
Traffic Volume (veh/h)	858	162	14	64	398	1288		
Future Volume (veh/h)	858	162	14	64	398	1288		
Number	4	14	3	8	5	12		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863		
Adj Flow Rate, veh/h	903	0	15	67	419	0		
Adj No. of Lanes	1	1	0	1	1	1		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	1064	905	113	454	495	442		
Arrive On Green	0.57	0.00	0.57	0.57	0.28	0.00		
Sat Flow, veh/h	1863	1583	73	795	1774	1583		
Grp Volume(v), veh/h	903	0	82	0	419	0		
Grp Sat Flow(s),veh/h/ln	1863	1583	868	0	1774	1583		
Q Serve(g_s), s	24.3	0.0	1.0	0.0	13.4	0.0		
Cycle Q Clear(g_c), s	24.3	0.0	25.3	0.0	13.4	0.0		
Prop In Lane		1.00	0.18		1.00	1.00		
Lane Grp Cap(c), veh/h	1064	905	567	0	495	442		
V/C Ratio(X)	0.85	0.00	0.14	0.00	0.85	0.00		
Avail Cap(c_a), veh/h	1656	1408	999	0	2580	2302		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	10.7	0.0	7.9	0.0	20.5	0.0		
Incr Delay (d2), s/veh	2.6	0.0	0.1	0.0	4.1	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	13.1	0.0	0.6	0.0	7.1	0.0		
LnGrp Delay(d),s/veh	13.3	0.0	8.1	0.0	24.6	0.0		
LnGrp LOS	B		A		C			
Approach Vol, veh/h	903			82	419			
Approach Delay, s/veh	13.3			8.1	24.6			
Approach LOS	B			A	C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4				8
Phs Duration (G+Y+Rc), s		21.3		38.9				38.9
Change Period (Y+Rc), s		4.5		4.5				4.5
Max Green Setting (Gmax), s		87.5		53.5				53.5
Max Q Clear Time (g_c+I1), s		15.4		26.3				27.3
Green Ext Time (p_c), s		1.4		8.1				0.5
Intersection Summary								
HCM 2010 Ctrl Delay			16.4					
HCM 2010 LOS			B					

