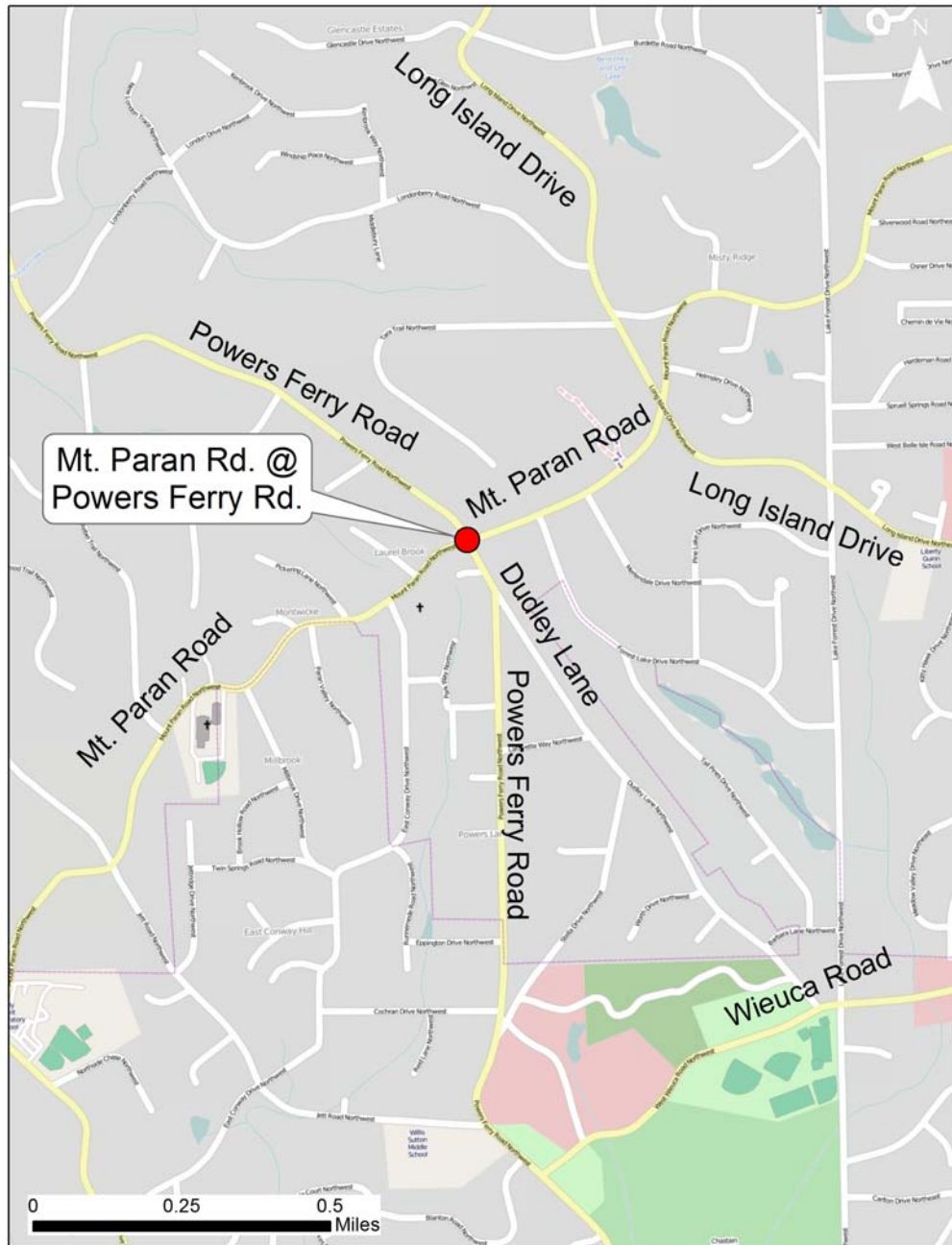


TRAFFIC ENGINEERING REPORT

For the intersection of:

Mount Paran Road and Powers Ferry Road, Fulton County



Report prepared by:

ARCADIS U.S., Inc.

2410 Paces Ferry Road, Suite 400

Atlanta, GA 30339

Telephone Number: 770.431.8666

Fax Number: 770.435.2666

Date report prepared: July 15, 2016

Location:

The study intersection is Mount Paran Road at Powers Ferry Road located in Fulton County in the City of Sandy Springs, Georgia.

Reason for the investigation:

An investigation of the Mt. Paran Road and Powers Ferry Road intersection is being conducted to see if the intersection will benefit from being upgraded from a four-way stop-controlled intersection to either a signalized intersection or a roundabout.

Description of the intersection:

Currently, the intersection of Mt. Paran Road and Powers Ferry Road is controlled by a four-way stop. The two approaches on Mt. Paran Road currently have a shared through/left/right lane and the two approaches on Powers Ferry Road currently have a shared through/left lane and a right-turn-only lane. Each leg of the intersection has one receiving lane except for the western leg that has a second receiving lane that is approximately 150 feet in length. Mt. Paran Road runs approximately east-west and Powers Ferry Road runs approximately north-south.

Traffic Volumes:

Existing year 2016 peak hour traffic volumes were developed for the study intersection based on traffic count data collected in January 2014 as well as on queue count data collected in April 2015. In an effort to increase traffic volume accuracy, queue data was collected at the study intersection during the peak hours for four days. The increases in queues over the course of the peak hours were observed for all study intersection approaches. Table 1 shows the average increase in queues that were observed during the peak hours for each approach. These queues were added to the corresponding peak hour turning movement counts (collected in January 2014) in order to account for the total intersection demand rather than the intersection throughput.

Table 1: Peak Hour Queue Increase Data (vehicles)

Intersection	Approach	AM Peak Queue Increase	PM Peak Queue Increase
Mt. Paran Road @ Powers Ferry Road	Northbound	0	0
	Southbound	0	1
	Eastbound	0	7
	Westbound	0	14

The collected existing 2014 turning movement and 2015 queue count data are located in Appendix A.

Existing traffic control:

The intersection of Mt. Paran Road and Powers Ferry Road is currently four-way stop-controlled.

Vehicular speeds:

The posted speed limit on Mt. Paran Road is 35 mph and the posted speed limit on Powers Ferry Road is 35 mph.

Pedestrian movements:

Sidewalks exist along both approaches on Mt. Paran Road as well as on the northbound Powers Ferry Road approach. Currently, crosswalks exist on both Mt. Paran Road approaches and on the northbound approach of Powers Ferry Road.

Other modes of transportation present (bicycle facilities, transit, bus stops, etc.):

Not applicable.

Parking:

Not applicable.

Adjacent intersections:

There are no signalized intersections adjacent to the study intersection. The closest intersections along Mt. Paran Road with stop-control on the mainline are Jett Road (approximately 0.9 mile to the west) and Long Island Drive (approximately 0.4 mile to the east). The closest intersections along Powers Ferry Road with stop-control on the mainline are Crest Valley Drive (approximately one mile to the north) and Dudley Lane (approximately 0.1 mile to the south).

Build Alternatives:

Two signalized intersection alternatives were analyzed. In Signal Alternative 1, exclusive left turn lanes are added on all four approaches that are approximately 150 feet in length. In Signal Alternative 2, three of the exclusive left turn lanes are 150 feet in length, but the northbound approach is shortened to 75 feet to accommodate a southbound left turn pocket into the entrance to The Schenck School. For both signal alternatives, one additional lane is added to the northbound and southbound approaches to provide a total of one left-turn-only lane, one through lane, and one right-turn-only lane. On the eastbound and westbound approaches, one additional lane is also added to each approach to provide one left-turn-only lane and one shared through/right turn lane. The left-turn phasing analysis indicated that permitted left turn phases should be used on all intersection approaches for both signal alternatives. The results of the left-turn phasing analysis are located in Appendix B.

Under the roundabout alternative, the intersection will be converted from a four-way stop-controlled intersection to a single lane roundabout that provides one entrance lane on each approach and no right-turn bypass lanes.

Operational analysis:

The existing, no-build, and signalized build scenarios were modeled using Synchro 8 (capacity analysis) and SimTraffic 8 (queuing analysis). For the roundabout build scenario, the capacity and queuing analyses were completed using SIDRA 5. For

roundabouts, the Georgia Department of Transportation (GDOT) has provided an additional spreadsheet-based tool called the GDOT Roundabout Analysis Tool. The roundabout build alternative was modeled using the GDOT Roundabout Tool as well as SIDRA. The roundabout Level of Service (LOS) method used in this report is same as for stop-controlled intersections. The operational analyses were completed for the existing year (2016) and the open year (2019).

Capacity Analysis

The capacity analyses use intersection geometry, peak hour volumes (plus queues), and optimized signal timings to determine the intersection delay based on guidance provided by the Highway Capacity Manual (HCM) 2000. Intersection delay can be associated with a level of service (LOS) or a grade given to each intersection based on its operations. Table 2 shows the average delay thresholds associated with each LOS for stop-controlled intersections, roundabouts, and signalized intersections.

Table 2: Intersection Level of Service Ranges

Level of Service (LOS)	Stop-Controlled/ Roundabout Intersection	Signalized Intersection
	Average Delay per Vehicle (Seconds/Vehicle)	
A	Less than 10	Less than 10
B	10 – 15	10 – 20
C	15.1 – 25	20.1 – 35
D	25.1 – 35	35.1 – 55
E	35.1 – 50	55.1 – 80
F	Greater than 50	Greater than 80

Table 3 shows the results of the capacity analysis. The results show that in the existing and no-build scenarios (four-way stop-control) the intersection is expected to operate at an LOS F during both the AM and PM peak hours. The capacity analysis results for the signalized alternative show that the intersection will operate at an LOS A during the AM peak period and at an LOS B during the PM peak period for Signal Alternative 1 and will operate at an LOS B for both peak periods for Signal Alternative 2. Finally, the results of the roundabout capacity analysis show that the roundabout is expected to operate between an LOS C and an LOS B.

Table 3: Peak Hour Intersection Capacity Analysis

Analysis Year	Alternative	Peak Hour	EB Approach	WB Approach	NB Approach	SB Approach	Total Intersection
Existing Year (2016)	Existing (Stop-control)	AM	LOS F (129.7)	LOS F (160.1)	LOS E (38.7)	LOS F (97.7)	LOS F (103.8)
		PM	LOS F (62.2)	LOS F (242.2)	LOS F (87.6)	LOS E (45.8)	LOS F (123.9)
Open Year (2019)	No-Build (Stop-control)	AM	LOS F (143.9)	LOS F (176.2)	LOS E (41.5)	LOS F (108.5)	LOS F (114.4)
		PM	LOS F (70.5)	LOS F (269.0)	LOS F (101.4)	LOS F (50.9)	LOS F (138.9)
	Signal Alt 1	AM	LOS A (8.6)	LOS A (8.1)	LOS A (8.3)	LOS A (10.0)	LOS A (8.6)
		PM	LOS A (9.9)	LOS B (11.7)	LOS B (13.5)	LOS B (12.4)	LOS B (12.0)
	Signal Alt 2	AM	LOS A (9.8)	LOS A (9.8)	LOS B (11.1)	LOS B (12.4)	LOS B (10.7)
		PM	LOS A (8.6)	LOS B (10.1)	LOS B (14.1)	LOS B (12.7)	LOS B (11.4)
	Roundabout (SIDRA)	AM	LOS B (18.5)	LOS B (10.7)	LOS B (17.5)	LOS B (13.5)	LOS B (15.1)
		PM	LOS A (8.1)	LOS B (18.0)	LOS B (14.7)	LOS B (12.6)	LOS B (14.0)
	Roundabout (GDOT Tool)	AM	LOS C (21.0)	LOS B (15.0)	LOS D (28.0)	LOS C (16.0)	LOS C (20.2)
		PM	LOS B (12.0)	LOS D (28.0)	LOS C (21.0)	LOS B (14.0)	LOS C (20.4)

Queuing Analysis

Beyond the capacity analysis, a queuing analysis was also completed for the study intersection using SimTraffic simulation for the existing, no-build, and signal alternatives and using SIDRA and Roundabout Tool outputs for the roundabout alternative. The AM and PM queuing results are presented in Table 4. The queuing results show that there is very little difference between the 95th percentile queues in existing conditions and the 95th percentile queues in open year no-build conditions, as would be expected due to the difference of only three years and the low annual growth rate. From open year no-build conditions to signalized build conditions, the 95th percentile queue lengths decrease for all approaches during both the AM and PM peak period. For the two signal alternatives, the 95th percentile queue lengths differ by 50 feet (two car lengths) or less for all approaches in both peak periods. The roundabout alternative is also expected to significantly reduce queues for all approaches in both peak periods as compared with no-build conditions.

Table 4: 95th Percentile Queue Lengths (feet)

Analysis Year	Alternative	Peak Hour	EB Approach	WB Approach	NB Approach	SB Approach
Existing Year (2016)	Existing (Stop-control)	AM	598	2,326	200	825
		PM	254	2,190	259	168
Open Year (2019)	No-Build (Stop-control)	AM	1,940	1,486	249	819
		PM	259	2,986	276	186
	Signal Alt 1	AM	206	195	159	204
		PM	177	218	206	136
	Signal Alt 2	AM	171	165	168	203
		PM	181	236	250	134
	Roundabout (SIDRA)	AM	241	152	288	167
		PM	102	323	229	120
	Roundabout (GDOT Tool)	AM	141	105	228	112
		PM	74	224	162	78

Synchro, SimTraffic, SIDRA, and GDOT Roundabout Analysis Tool results reports are located in Appendix C.

Safety analysis:

In addition to the operational analysis, a crash analysis was completed for the study intersection. Crash data was obtained for the most recent five years (2011 to 2015) from the City of Sandy Springs. The data indicated that 33 crashes occurred at the study intersection within the five-year period. Of the 33 crashes, 24 were categorized as angle, 7 as rear end, and 2 as sideswipe same direction. The citation for the majority of the crashes was failure to obey the stop sign. Injury data was not available for the crashes. No fatal crashes occurred during the five years of data. Table 5 show the crash types and total crashes by year.

Table 5: Crash Analysis

Year	Crash Type			Total Crashes
	Angle	Rear End	Sideswipe – Same Direction	
2011	3	1	0	4
2012	8	0	1	9
2013	2	1	1	4
2014	6	4	0	10
2015	5	1	0	6
Total	24	7	2	33

Appendix D contains the raw crash data from the City of Sandy Springs for the years 20011-2015.

Warrant analysis:

A signal warrant study was completed for the intersection using the Highway Capacity Software. The study indicated that the intersection meets the criteria for Warrant 2 – Four-Hour Vehicular Volume and Warrant 3 – Peak Hour. Table 6 outlines each signal warrant, the conditions, and whether the condition was met for the study intersection. Some warrants were not analyzed due to non-applicability or due to the unavailability of data.

Table 6: Signal Warrant Summary

Warrant	Met (Yes/No)
Warrant 1: Eight-Hour Vehicular Volume	N/A
- A. Minimum Vehicular Volumes (Both major approaches and higher minor approach);	N/A
- B. Interruption of Continuous Traffic (Both major approaches and higher minor approach); or	N/A
- 80% Vehicular and Interruption Volumes (Both major approaches and higher minor approach)	N/A
Warrant 2: Four-Hour Vehicular Volume	Yes
- A. Four-Hour Vehicular Volumes (Both major approaches and higher minor approach)	Yes
Warrant 3: Peak Hour	Yes
- A. Peak-Hour Conditions (Minor delay and minor volume and total volume); or	Yes
- B. Peak-Hour Vehicular Volumes (Both major approaches and higher minor approach)	Yes
Warrant 4: Pedestrian Volume	N/A
- A. Pedestrian Volumes (Four hours or one hour); and	N/A
- B. Gaps Same Period (Four hours or one hour)	N/A
Warrant 5: School Crossing	N/A
- Student Volumes; and	N/A
- Gaps Same Period	N/A
Warrant 6: Coordinated Signal System	No
- Degree of Platooning (Predominant direction or both directions)	No
Warrant 7: Crash Experience	N/A
- A. Adequate trials of alternatives, observance, and enforcement failed;	N/A
- B. Reported crashes susceptible to correction by signal (12-month period); and	N/A
- C. 80% Volumes for Warrants 1A, 1B or 4 are satisfied	N/A
Warrant 8: Roadway Network	N/A
- A. Weekday Volume (Peak hour total and projected warrants 1, 2, or 3); or	N/A
- B. Weekend Volume (Five hours total)	N/A

Note: Warrant Analysis was not completed for Warrants 1, 4, 5, 7 and 8.

Warrant results are located in Appendix E.

Summary:

The intersection of Mt. Paran Road and Powers Ferry Road currently operates as a four-way stop-controlled intersection. Based on the signal warrant analysis, a traffic signal is warranted at the intersection under both the four-hour warrant (Warrant 2) and the peak hour warrant (Warrant 3). Both the installation of a traffic signal and the installation of a roundabout at this intersection, with the accompanying geometric improvements described, would significantly reduce open year delay and queues as compared with no-build conditions. Overall, the signal alternatives and the roundabout alternative provide comparable improvements in intersection performance. The signal alternatives may require more right-of-way than the roundabout alternative, however the roundabout alternative may require a take for the storage shed located in the northeast quadrant. Between the two signal alternatives, the results show that the shorter northbound left turn lane (Signal Alternative 2) could be implemented to accommodate a southbound left turn pocket into The Schenck School without sacrificing much in intersection performance.

PREPARED BY: _____ **DATE:** _____

RECOMMENDED BY: _____ **DATE:** _____

Traffic Engineering Report Appendices:

- A** Traffic Counts
- B** Left-Turn Phasing Analysis
- C** Synchro, SimTraffic, SIDRA, and Roundabout Tool Analysis Reports
- D** Accident Data
- E** Signal Warrant Summary
- F** Cost Estimate

Appendix A

Traffic Counts

All Traffic Data Service, Inc

1336 Farmer Road

Conyers, Ga 30012

404-374-1283

File Name : #2 PowersFerryRd@Mt.ParanRdAM

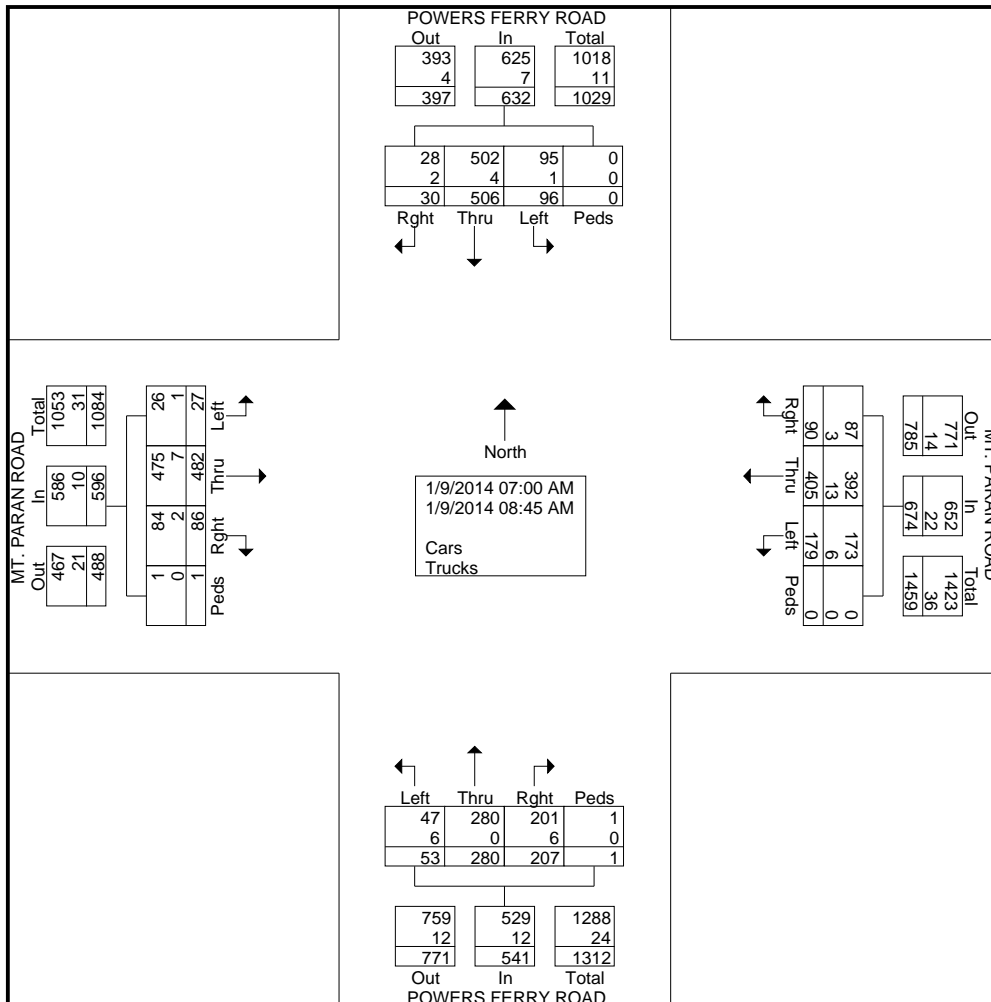
Site Code :

Start Date : 1/9/2014

Page No : 1

Groups Printed- Cars - Trucks

Start Time	POWERS FERRY ROAD Southbound					MT. PARAN ROAD Westbound					POWERS FERRY ROAD Northbound					MT. PARAN ROAD Eastbound					Int. Total
	Rght	Thru	Left	Peds	App. Total	Rght	Thru	Left	Peds	App. Total	Rght	Thru	Left	Peds	App. Total	Rght	Thru	Left	Peds	App. Total	
07:00 AM	2	25	3	0	30	4	38	12	0	54	10	11	4	0	25	8	32	1	0	41	150
07:15 AM	3	75	10	0	88	6	66	28	0	100	5	32	3	0	40	10	43	2	0	55	283
07:30 AM	6	65	13	0	84	7	55	45	0	107	34	43	10	0	87	21	65	5	0	91	369
07:45 AM	8	86	12	0	106	10	52	35	0	97	59	58	20	1	138	12	78	6	0	96	437
Total	19	251	38	0	308	27	211	120	0	358	108	144	37	1	290	51	218	14	0	283	1239
08:00 AM	3	59	15	0	77	19	42	20	0	81	42	55	5	0	102	15	85	5	0	105	365
08:15 AM	2	68	13	0	83	16	55	9	0	80	23	39	5	0	67	3	59	3	0	65	295
08:30 AM	5	68	19	0	92	15	55	17	0	87	14	19	5	0	38	12	53	3	1	69	286
08:45 AM	1	60	11	0	72	13	42	13	0	68	20	23	1	0	44	5	67	2	0	74	258
Total	11	255	58	0	324	63	194	59	0	316	99	136	16	0	251	35	264	13	1	313	1204
Grand Total	30	506	96	0	632	90	405	179	0	674	207	280	53	1	541	86	482	27	1	596	2443
Apprch %	4.7	80.1	15.2	0		13.4	60.1	26.6	0		38.3	51.8	9.8	0.2		14.4	80.9	4.5	0.2		
Total %	1.2	20.7	3.9	0	25.9	3.7	16.6	7.3	0	27.6	8.5	11.5	2.2	0	22.1	3.5	19.7	1.1	0	24.4	
Cars	28	502	95	0	625	87	392	173	0	652	201	280	47	1	529	84	475	26	1	586	2392
% Cars	93.3	99.2	99	0	98.9	96.7	96.8	96.6	0	96.7	97.1	100	88.7	100	97.8	97.7	98.5	96.3	100	98.3	97.9
Trucks	2	4	1	0	7	3	13	6	0	22	6	0	6	0	12	2	7	1	0	10	51
% Trucks	6.7	0.8	1	0	1.1	3.3	3.2	3.4	0	3.3	2.9	0	11.3	0	2.2	2.3	1.5	3.7	0	1.7	2.1



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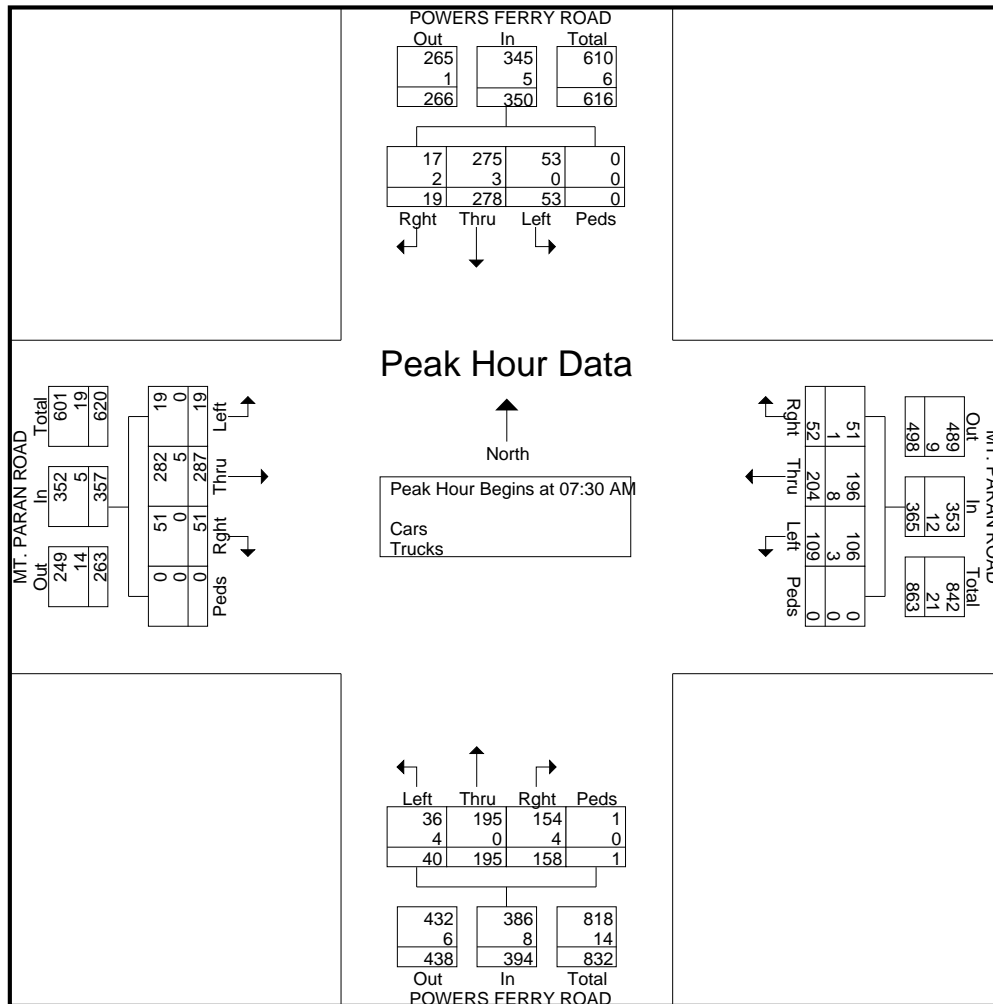
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Start Date : 1/9/2014

Page No : 2

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Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	6	65	13	0	84	7	55	45	0	107	34	43	10	0	87	21	65	5	0	91	369
07:45 AM	8	86	12	0	106	10	52	35	0	97	59	58	20	1	138	12	78	6	0	96	437
08:00 AM	3	59	15	0	77	19	42	20	0	81	42	55	5	0	102	15	85	5	0	105	365
08:15 AM	2	68	13	0	83	16	55	9	0	80	23	39	5	0	67	3	59	3	0	65	295
Total Volume	19	278	53	0	350	52	204	109	0	365	158	195	40	1	394	51	287	19	0	357	1466
% App. Total	5.4	79.4	15.1	0		14.2	55.9	29.9	0		40.1	49.5	10.2	0.3		14.3	80.4	5.3	0		
PHF	.594	.808	.883	.000	.825	.684	.927	.606	.000	.853	.669	.841	.500	.250	.714	.607	.844	.792	.000	.850	.839
Cars	17	275	53	0	345	51	196	106	0	353	154	195	36	1	386	51	282	19	0	352	1436
% Cars	89.5	98.9	100	0	98.6	98.1	96.1	97.2	0	96.7	97.5	100	90.0	100	98.0	100	98.3	100	0	98.6	98.0
Trucks	2	3	0	0	5	1	8	3	0	12	4	0	4	0	8	0	5	0	0	5	30
% Trucks	10.5	1.1	0	0	1.4	1.9	3.9	2.8	0	3.3	2.5	0	10.0	0	2.0	0	1.7	0	0	1.4	2.0



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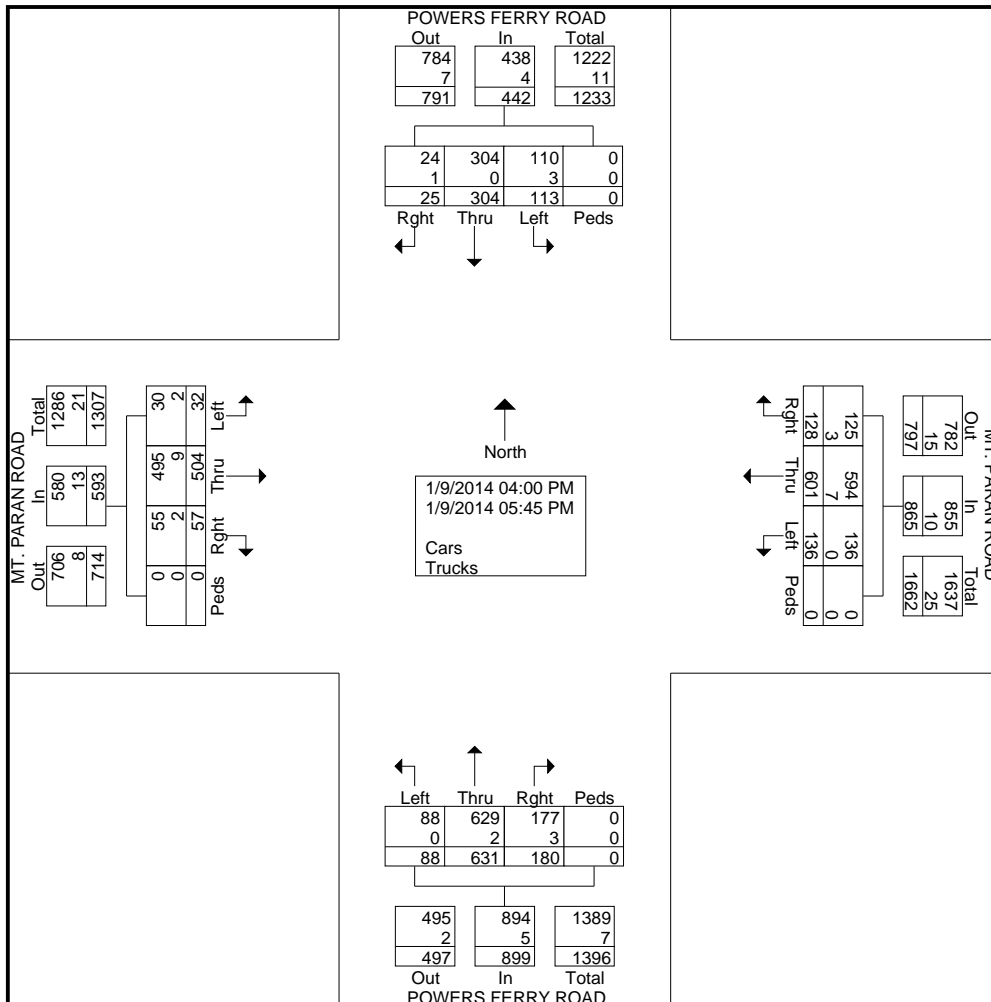
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04:00 PM	5	37	11	0	53	11	50	26	0	87	40	55	19	0	114	10	63	4	0	77	331
04:15 PM	3	36	5	0	44	10	68	28	0	106	25	75	14	0	114	4	69	3	0	76	340
04:30 PM	1	34	12	0	47	22	83	16	0	121	19	72	8	0	99	5	54	6	0	65	332
04:45 PM	2	19	10	0	31	23	99	13	0	135	18	71	10	0	99	10	51	1	0	62	327
Total	11	126	38	0	175	66	300	83	0	449	102	273	51	0	426	29	237	14	0	280	1330
05:00 PM	4	31	19	0	54	17	70	13	0	100	17	84	9	0	110	8	60	6	0	74	338
05:15 PM	1	36	17	0	54	14	79	12	0	105	27	88	11	0	126	8	76	4	0	88	373
05:30 PM	6	54	21	0	81	15	74	15	0	104	17	94	7	0	118	6	65	2	0	73	376
05:45 PM	3	57	18	0	78	16	78	13	0	107	17	92	10	0	119	6	66	6	0	78	382
Total	14	178	75	0	267	62	301	53	0	416	78	358	37	0	473	28	267	18	0	313	1469
Grand Total	25	304	113	0	442	128	601	136	0	865	180	631	88	0	899	57	504	32	0	593	2799
Apprch %	5.7	68.8	25.6	0		14.8	69.5	15.7	0		20	70.2	9.8	0		9.6	85	5.4	0		
Total %	0.9	10.9	4	0	15.8	4.6	21.5	4.9	0	30.9	6.4	22.5	3.1	0	32.1	2	18	1.1	0	21.2	
Cars	24	304	110	0	438	125	594	136	0	855	177	629	88	0	894	55	495	30	0	580	2767
% Cars	96	100	97.3	0	99.1	97.7	98.8	100	0	98.8	98.3	99.7	100	0	99.4	96.5	98.2	93.8	0	97.8	98.9
Trucks	1	0	3	0	4	3	7	0	0	10	3	2	0	0	5	2	9	2	0	13	32
% Trucks	4	0	2.7	0	0.9	2.3	1.2	0	0	1.2	1.7	0.3	0	0	0.6	3.5	1.8	6.2	0	2.2	1.1



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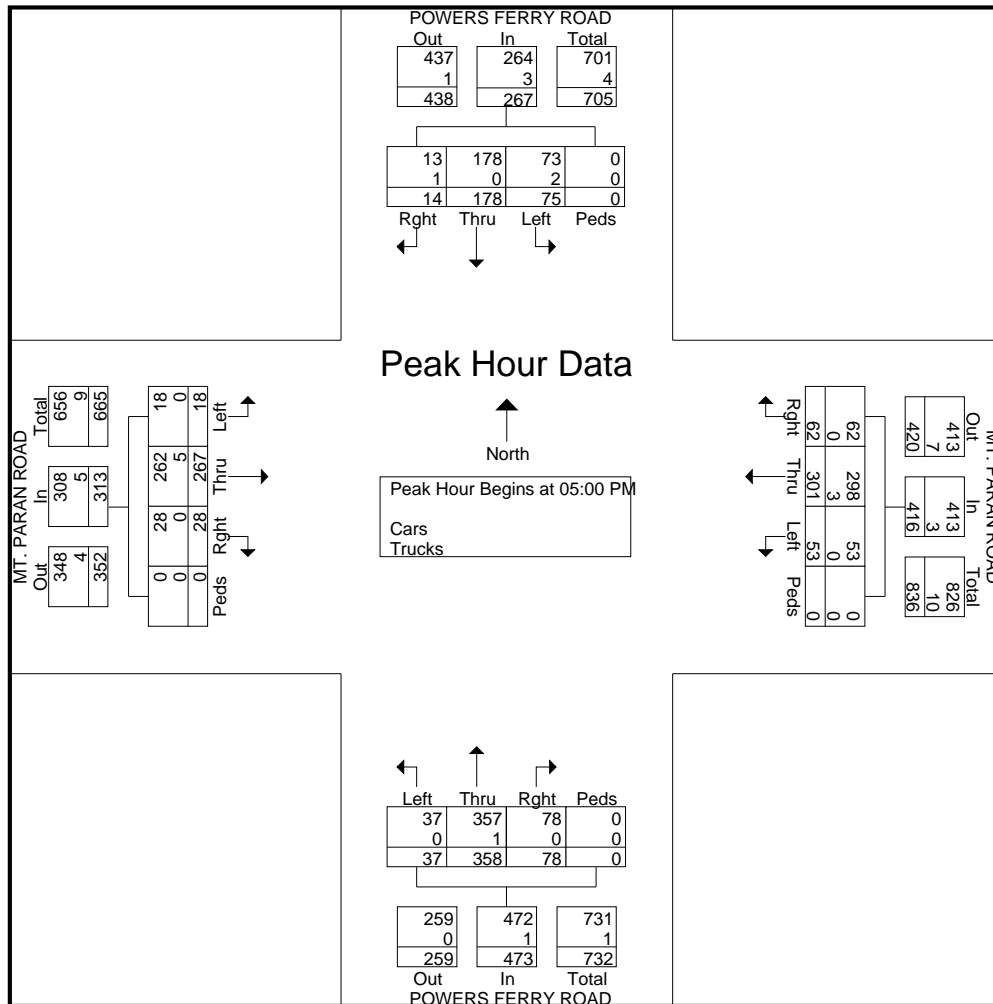
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Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	4	31	19	0	54	17	70	13	0	100	17	84	9	0	110	8	60	6	0	74	338
05:15 PM	1	36	17	0	54	14	79	12	0	105	27	88	11	0	126	8	76	4	0	88	373
05:30 PM	6	54	21	0	81	15	74	15	0	104	17	94	7	0	118	6	65	2	0	73	376
05:45 PM	3	57	18	0	78	16	78	13	0	107	17	92	10	0	119	6	66	6	0	78	382
Total Volume	14	178	75	0	267	62	301	53	0	416	78	358	37	0	473	28	267	18	0	313	1469
% App. Total	5.2	66.7	28.1	0		14.9	72.4	12.7	0		16.5	75.7	7.8	0		8.9	85.3	5.8	0		
PHF	.583	.781	.893	.000	.824	.912	.953	.883	.000	.972	.722	.952	.841	.000	.938	.875	.878	.750	.000	.889	.961
Cars	13	178	73	0	264	62	298	53	0	413	78	357	37	0	472	28	262	18	0	308	1457
% Cars	92.9	100	97.3	0	98.9	100	99.0	100	0	99.3	100	99.7	100	0	99.8	100	98.1	100	0	98.4	99.2
Trucks	1	0	2	0	3	0	3	0	0	3	0	1	0	0	1	0	5	0	0	5	12
% Trucks	7.1	0	2.7	0	1.1	0	1.0	0	0	0.7	0	0.3	0	0	0.2	0	1.9	0	0	1.6	0.8



INTERSECTION APPROACH QUEUING STUDY

Location: Powers Ferry Rd & Mt Paran Rd

City: Sandy Springs

Day: Tuesday

Date: 4/21/2015

TIME	NB Approach		SB Approach		EB Approach		WB Approach		NOTES
	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	
7:30	1	1	4	1	10	2	2	1	
7:40	4	1	7	2	20	4	19	3	
7:50	2	1	25	5	24	4	21	4	
8:00	4	1	13	3	32	5	18	3	
8:10	1	1	20	5	18	3	8	2	
8:20	1	1	11	3	9	2	3	1	
8:30	0		3	1	2	1	2	1	
16:45	7	1	2	1	3	1	27	5	
16:55	12	2	2	1	2	1	31	5	
17:05	8	2	2	1	2	1	36	6	WB extends past Merlandale Dr
17:15	1	1	0		3	1	41	6	WB extends past Merlandale Dr
17:25	0		3	1	4	1	44	7	WB extends past Saint Nicholas Cir
17:35	1	1	4	1	0		48	7	WB extends past Saint Nicholas Cir
17:45	1	1	10	2	17	3	55	7	WB extends close to Long Island Dr

INTERSECTION APPROACH QUEUING STUDY

Location: Powers Ferry Rd & Mt Paran Rd
City: Sandy Springs

Day: Wednesday
Date: 4/22/2015

TIME	NB Approach		SB Approach		EB Approach		WB Approach		NOTES
	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	
7:30	6	1	21	5	27	5	22	5	
7:40	4	1	23	5	24	4	31	6	WB extends past Merlandale Dr
7:50	3	1	10	2	19	3	34	6	WB extends past Merlandale Dr
8:00	1	1	4	1	11	2	21	4	
8:10	3	1	4	1	12	2	9	2	
8:20	5	1	8	2	8	2	7	2	
8:30	4	1	5	1	4	1	3	1	
16:45	3	1	4	2	3	1	26	5	
16:55	2	1	2	1	3	1	31	6	WB extends past Merlandale Dr
17:05	2	1	3	1	3	1	35	6	WB extends past Merlandale Dr
17:15	1	1	3	1	4	1	41	7	WB extends past Saint Nicholas Cir
17:25	1	1	0		2	1	39	6	WB extends past Merlandale Dr
17:35	0		3	1	7	2	37	6	WB extends past Merlandale Dr
17:45	2	1	2	1	9	2	27	5	WB extends past Forrest Lake Dr

INTERSECTION APPROACH QUEUING STUDY

Location: Powers Ferry Rd & Mt Paran Rd
City: Sandy Springs

Day: Tuesday
Date: 4/28/2015

TIME	NB Approach		SB Approach		EB Approach		WB Approach		NOTES
	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	
7:30	3	1	5	2	12	3	27	5	
7:40	9	2	24	5	10	2	38	6	
7:50	1	1	24	5	31	5	42	6	WB extends past Merlandale Dr
8:00	5	1	33	6+	27	5	24	5	SB went beyond Segment 6
8:10	2	1	25	5	33	5	11	2	
8:20	2	1	37	6+	34	5	1	1	
8:30	0		3	1	10	2	2	1	
16:45	4	1	5	1	2	1	29	6	WB extends past Merlandale Dr
16:55	1	1	5	1	6	1	38	6	WB extends past Merlandale Dr
17:05	0		0		2	1	40	6	WB extends past Merlandale Dr
17:15	1	1	4	2	4	1	42	6	WB extends past Merlandale Dr
17:25	1	1	0		3	1	48	7	WB extends past Saint Nicholas Cir
17:35	2	1	3	1	5	1	56	7	WB extends close to Long Island Dr
17:45	4	1	2	1	4	1	37	7	WB extends past Saint Nicholas Cir

INTERSECTION APPROACH QUEUING STUDY

Location: Powers Ferry Rd & Mt Paran Rd

City: Sandy Springs

Day: Thursday

Date: 4/30/2015

TIME	NB Approach		SB Approach		EB Approach		WB Approach		NOTES
	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	Queue	Segment Reached Observation	
7:30	1	1	4	2	5	2	2	1	
7:40	5	1	2	1	16	3	33	6	WB extends past Merlandale Dr
7:50	15	2	25	5	36	6	28	5	
8:00	7	1	21	5	37	6	9	2	
8:10	3	1	8	2	35	6	6	2	
8:20	0		1	1	23	4	2	1	
8:30	0		2	1	2	1	1	1	
16:45	5	1	5	2	0		39	6	WB extends past Merlandale Dr
16:55	2	1	6	2	0		45	6	WB Extends past Merlandale up to fire hydrant
17:05	3	1	0		1	1	44	6	WB Extends past Merlandale up to fire hydrant
17:15	6	1	4	2	1	1	54	7	WB extends past Saint Nicholas Cir
17:25	8	1	6	2	3	1	52	7	WB extends past Saint Nicholas Cir
17:35	4	1	5	2	6	2	61	7	WB extends close to Long Island Dr
17:45	8	1	5	2	4	1	59	7	WB extends close to Long Island Dr

Appendix B

Left-turn Phasing Analysis

1. Left-Turn Phasing Analysis

The purpose of this analysis is to determine the potential need for separate left-turn phases and the type of left-turn phase to be used at the intersection of Mt. Paran Road with Powers Ferry Road. Criteria defined in the Georgia Department of Transportation's Policy 6785-2-Left Turn Phasing were used as guidelines to perform the analysis for this Fulton County intersection.

1.1 Step I: Consideration for a Separate Left-Turn Phase

A separate left-turn phase should be considered under the following criteria:

- Cross product criterion:

$$V_{lt} * V_o / N_o \geq 50,000$$

Where:

V_{lt} = Left-turn flow rate, vehicles/hour

V_o = Opposing through movement flow rate, vehicles/hour

N_o = Number of lanes for the opposing through movement

- Left-turn volume criterion:

Left-turn volume exceeds 125 vehicles per hour (vph)

- Correctable crashes equal or exceed four crashes in one year or six crashes in two years.
- Additional criteria, such as sight distance, speed of opposing traffic, number of left-turn lanes, or number of opposing through lanes.

1.2 Step II: Determination of Left-Turn Phase Type

In accordance with the Left Turn Phasing Policy, a left-turn phase will typically be installed as a protected/permissive movement if at all possible. Only when conditions satisfy one or more of the following criteria will a protected-only left-turn phase be allowed:



Left-Turn Phasing Analysis

Mt. Paran Road at Powers
Ferry Road

- Left-turn crashes under a protected/permissive phasing equal or exceed five crashes in two years for the proposed movement
- Dual left turns
- Limited sight distance will not allow permissive left turns
- Conflicting left turn paths
- Left-turn movements with opposing traffic approaching in three or more lanes at speeds greater than or equal to 45 miles per hour
- Skewed intersection, high volume of pedestrians, and unusual intersection geometries

Results based on the above criteria are tabulated in the following table.

Table 1: Left-Turn Phasing Analysis for Mt. Paran Road at Powers Ferry Road

	Critical Volumes (vph)		Step 1: Consideration for Separate Left-Turn Phase					Step 2: Determination of Left-Turn Phase Type					
	Left-Turn Volume (V _{lt})	Opposite Through Volume (V _o)	Cross Product	Cross Product Criterion Met	Left-Turn Volume Criterion Met	2 Year Correctable Crash Criterion Met		Separate Left-Turn Phase Warranted	Left-Turn Crashes Criterion Met	Dual Left Turns	Limited Sight Distance	Conflicting Left Turn Paths	Required Left-Turn Phase Type
Northbound	40	280	11,200	No	No	0	N/A	No	N/A	No	No	No	Perm
Southbound	80	360	28,800	No	No	0	N/A	No	N/A	No	No	No	Perm
Eastbound	20	300	6,000	No	No	0	N/A	No	N/A	No	No	No	Perm
Westbound	110	285	31,350	No	No	0	N/A	No	N/A	No	No	No	Perm

The table above shows the criteria that were taken into account to determine the future phasing of this intersection. It was determined that permissive left-turn phasing is the most appropriate phasing for all approaches as they did not meet the criteria for a separate left turn phase.

Appendix C

Synchro, SimTraffic, SIDRA, and Roundabout Tool Analysis Reports

HCM Unsignalized Intersection Capacity Analysis
 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/11/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕	↗		↕	↗
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	19	287	51	109	204	52	40	195	158	53	278	19
Peak Hour Factor	0.79	0.84	0.61	0.61	0.93	0.68	0.50	0.84	0.67	0.88	0.81	0.59
Hourly flow rate (vph)	25	348	85	182	224	78	82	237	241	61	350	33

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	458	484	318	241	412	33
Volume Left (vph)	25	182	82	0	61	0
Volume Right (vph)	85	78	0	241	0	33
Hadj (s)	-0.08	0.03	0.17	-0.67	0.09	-0.53
Departure Headway (s)	9.2	9.3	9.8	9.0	9.6	9.0
Degree Utilization, x	1.0	1.0	0.87	0.60	1.0	0.08
Capacity (veh/h)	396	393	355	391	382	396
Control Delay (s)	129.7	160.1	50.3	23.3	104.5	11.6
Approach Delay (s)	129.7	160.1	38.7		97.7	
Approach LOS	F	F	E		F	

Intersection Summary	
Delay	103.8
Level of Service	F
Intersection Capacity Utilization	83.9%
ICU Level of Service	E
Analysis Period (min)	15

Queuing and Blocking Report
Existing Year 2016 - AM

7/5/2016

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	LT	R	LT	R
Maximum Queue (ft)	574	2161	229	95	837	160
Average Queue (ft)	373	1339	117	56	414	84
95th Queue (ft)	598	2326	200	83	825	208
Link Distance (ft)	2387	2689	2286		2656	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				350		110
Storage Blk Time (%)					70	
Queuing Penalty (veh)					22	

Network Summary

Network wide Queuing Penalty: 22

HCM Unsignalized Intersection Capacity Analysis

3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/11/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↕	↗		↕	↗
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	18	273	29	55	311	64	37	358	78	75	179	14
Peak Hour Factor	0.75	0.88	0.88	0.88	0.95	0.91	0.84	0.95	0.72	0.89	0.78	0.58
Hourly flow rate (vph)	24	316	34	80	419	90	45	384	110	86	234	25

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	375	589	429	111	320	25
Volume Left (vph)	24	80	45	0	86	0
Volume Right (vph)	34	90	0	111	0	25
Hadj (s)	-0.01	-0.05	0.05	-0.70	0.15	-0.58
Departure Headway (s)	9.0	8.9	9.3	8.5	9.7	8.9
Degree Utilization, x	0.94	1.0	1.0	0.26	0.86	0.06
Capacity (veh/h)	375	412	399	417	359	394
Control Delay (s)	62.2	242.2	106.7	13.3	48.4	11.3
Approach Delay (s)	62.2	242.2	87.6		45.8	
Approach LOS	F	F	F		E	

Intersection Summary

Delay	123.9
Level of Service	F
Intersection Capacity Utilization	95.4%
ICU Level of Service	F
Analysis Period (min)	15

Queuing and Blocking Report
Existing Year 2016 - PM

7/5/2016

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.



















Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	LT	R	LT	R
Maximum Queue (ft)	322	2301	288	76	197	160
Average Queue (ft)	130	1420	157	39	102	33
95th Queue (ft)	254	2190	259	63	168	108
Link Distance (ft)	2387	2689	2286		2656	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				350		110
Storage Blk Time (%)					10	0
Queuing Penalty (veh)					2	0

Network Summary

Network wide Queuing Penalty: 2

HCM Unsignalized Intersection Capacity Analysis
 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/5/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	19	287	51	109	204	52	40	195	158	53	278	19
Peak Hour Factor	0.79	0.84	0.61	0.61	0.93	0.68	0.50	0.84	0.67	0.88	0.81	0.59
Hourly flow rate (vph)	25	359	88	188	230	80	84	244	248	63	360	34
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total (vph)	472	498	328	248	424	34						
Volume Left (vph)	25	188	84	0	63	0						
Volume Right (vph)	88	80	0	248	0	34						
Hadj (s)	-0.08	0.03	0.17	-0.67	0.09	-0.53						
Departure Headway (s)	9.2	9.3	9.8	9.0	9.6	9.0						
Degree Utilization, x	1.0	1.0	0.89	0.62	1.0	0.08						
Capacity (veh/h)	396	393	357	392	385	395						
Control Delay (s)	143.9	176.2	54.6	24.2	116.3	11.6						
Approach Delay (s)	143.9	176.2	41.5		108.5							
Approach LOS	F	F	E		F							
Intersection Summary												
Delay			114.4									
Level of Service			F									
Intersection Capacity Utilization			86.0%	ICU Level of Service	E							
Analysis Period (min)			15									

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	LT	R	LT	R
Maximum Queue (ft)	1810	1420	337	169	792	160
Average Queue (ft)	1190	935	134	74	437	97
95th Queue (ft)	1940	1486	249	118	819	217
Link Distance (ft)	2387	2689	2286		2656	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				350		110
Storage Blk Time (%)			0		81	
Queuing Penalty (veh)			0		28	

Network Summary

Network wide Queuing Penalty: 28

HCM Unsignalized Intersection Capacity Analysis

3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/5/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↗		↑	↗
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	18	273	29	55	311	64	37	358	78	75	179	14
Peak Hour Factor	0.75	0.88	0.88	0.88	0.95	0.91	0.84	0.95	0.72	0.89	0.78	0.58
Hourly flow rate (vph)	25	326	35	82	429	92	46	396	114	88	241	25

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	386	603	442	114	329	25
Volume Left (vph)	25	82	46	0	88	0
Volume Right (vph)	35	92	0	114	0	25
Hadj (s)	-0.01	-0.05	0.05	-0.70	0.15	-0.58
Departure Headway (s)	9.1	9.1	9.4	8.7	9.7	9.0
Degree Utilization, x	0.98	1.0	1.0	0.27	0.89	0.06
Capacity (veh/h)	386	408	386	411	360	392
Control Delay (s)	70.5	269.0	124.0	13.7	53.9	11.4
Approach Delay (s)	70.5	269.0	101.4		50.9	
Approach LOS	F	F	F		F	

Intersection Summary

Delay	138.9
Level of Service	F
Intersection Capacity Utilization	97.6%
ICU Level of Service	F
Analysis Period (min)	15

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	WB	NB	NB	SB	SB
Directions Served	LTR	LTR	LT	R	LT	R
Maximum Queue (ft)	342	2704	313	69	231	160
Average Queue (ft)	128	1802	169	37	104	38
95th Queue (ft)	259	2986	276	59	186	121
Link Distance (ft)	2387	2689	2286		2656	
Upstream Blk Time (%)		23				
Queuing Penalty (veh)		0				
Storage Bay Dist (ft)				350		110
Storage Blk Time (%)					13	
Queuing Penalty (veh)					3	

Network Summary

Network wide Queuing Penalty: 3

HCM Signalized Intersection Capacity Analysis

3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/5/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	287	51	109	204	52	40	195	158	53	278	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	1754		1694	1706		1586	1837	1531	1745	1818	1419
Flt Permitted	0.57	1.00		0.42	1.00		0.48	1.00	1.00	0.61	1.00	1.00
Satd. Flow (perm)	1050	1754		756	1706		794	1837	1531	1115	1818	1419
Peak-hour factor, PHF	0.79	0.84	0.61	0.61	0.93	0.68	0.50	0.84	0.67	0.88	0.81	0.59
Growth Factor (vph)	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Adj. Flow (vph)	25	359	88	188	230	80	84	244	248	63	360	34
RTOR Reduction (vph)	0	13	0	0	19	0	0	0	166	0	0	23
Lane Group Flow (vph)	25	434	0	188	291	0	84	244	82	63	360	11
Heavy Vehicles (%)	0%	2%	0%	3%	4%	2%	10%	0%	2%	0%	1%	10%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2				6
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	13.5	13.5		13.5	13.5		10.6	10.6	10.6	10.6	10.6	10.6
Effective Green, g (s)	13.5	13.5		13.5	13.5		10.6	10.6	10.6	10.6	10.6	10.6
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.33	0.33	0.33	0.33	0.33	0.33
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	441	737		317	717		262	606	505	368	600	468
v/s Ratio Prot		0.25			0.17			0.13			c0.20	
v/s Ratio Perm	0.02			c0.25			0.11		0.05	0.06		0.01
v/c Ratio	0.06	0.59		0.59	0.41		0.32	0.40	0.16	0.17	0.60	0.02
Uniform Delay, d1	5.5	7.2		7.2	6.5		8.1	8.3	7.6	7.6	9.0	7.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.2		3.0	0.4		0.7	0.4	0.2	0.2	1.6	0.0
Delay (s)	5.6	8.4		10.1	6.9		8.8	8.7	7.8	7.9	10.6	7.3
Level of Service	A	A		B	A		A	A	A	A	B	A
Approach Delay (s)		8.2			8.1			8.3			10.0	
Approach LOS		A			A			A			A	

Intersection Summary

HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	32.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queuing and Blocking Report
 Open Year 2019 - Signalized - AM

7/5/2016

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	48	233	199	221	182	182	121	200	263	160
Average Queue (ft)	12	125	110	93	65	95	63	45	124	17
95th Queue (ft)	36	206	195	178	131	159	97	104	204	71
Link Distance (ft)		2383		2684		2281			2649	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	150		150		150		350	150		110
Storage Blk Time (%)		3	3	1	1	1			10	
Queuing Penalty (veh)		1	9	2	5	3			10	

Network Summary

Network wide Queuing Penalty: 30

HCM Signalized Intersection Capacity Analysis

3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/5/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	273	29	55	311	64	37	358	78	75	179	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	1778		1745	1773		1745	1837	1561	1694	1837	1459
Flt Permitted	0.33	1.00		0.48	1.00		0.57	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	604	1778		875	1773		1050	1837	1561	691	1837	1459
Peak-hour factor, PHF	0.75	0.88	0.88	0.88	0.95	0.91	0.84	0.95	0.72	0.89	0.78	0.58
Growth Factor (vph)	105%	105%	105%	131%	131%	131%	105%	105%	105%	105%	105%	105%
Adj. Flow (vph)	25	326	35	82	429	92	46	396	114	88	241	25
RTOR Reduction (vph)	0	5	0	0	10	0	0	0	70	0	0	15
Lane Group Flow (vph)	25	356	0	82	511	0	46	396	44	88	241	10
Heavy Vehicles (%)	0%	2%	0%	0%	1%	0%	0%	0%	0%	3%	0%	7%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2				6
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	26.3	26.3		26.3	26.3		21.3	21.3	21.3	21.3	21.3	21.3
Effective Green, g (s)	26.3	26.3		26.3	26.3		21.3	21.3	21.3	21.3	21.3	21.3
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.38	0.38	0.38	0.38	0.38	0.38
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	285	841		413	838		402	703	598	264	703	558
v/s Ratio Prot		0.20			c0.29			c0.22				0.13
v/s Ratio Perm	0.04			0.09			0.04		0.03	0.13		0.01
v/c Ratio	0.09	0.42		0.20	0.61		0.11	0.56	0.07	0.33	0.34	0.02
Uniform Delay, d1	8.1	9.7		8.5	10.8		11.1	13.5	10.9	12.1	12.2	10.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3		0.2	1.3		0.1	1.0	0.1	0.7	0.3	0.0
Delay (s)	8.2	10.0		8.8	12.1		11.2	14.5	10.9	12.9	12.5	10.7
Level of Service	A	B		A	B		B	B	B	B	B	B
Approach Delay (s)		9.9			11.7			13.5			12.4	
Approach LOS		A			B			B			B	

Intersection Summary

HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queuing and Blocking Report
 Open Year 2019 - Signalized - PM

7/5/2016

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	69	197	198	227	74	245	74	114	139	85
Average Queue (ft)	14	94	47	149	24	123	32	58	78	13
95th Queue (ft)	42	177	111	218	61	206	62	103	136	44
Link Distance (ft)		2383		2684		2281			2649	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	150		150		150		350	150		110
Storage Blk Time (%)		2		7		4			3	
Queuing Penalty (veh)		1		5		6			4	

Network Summary

Network wide Queuing Penalty: 16

HCM Signalized Intersection Capacity Analysis

3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/7/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↗	↘		↗	↘		↗	↑	↗	↘	↑	↗
Volume (vph)	19	287	51	109	204	52	40	195	158	53	278	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.97		1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	1754		1694	1706		1586	1837	1531	1745	1818	1419
Flt Permitted	0.54	1.00		0.40	1.00		0.43	1.00	1.00	0.58	1.00	1.00
Satd. Flow (perm)	984	1754		717	1706		726	1837	1531	1064	1818	1419
Peak-hour factor, PHF	0.79	0.84	0.61	0.61	0.93	0.68	0.50	0.84	0.67	0.88	0.81	0.59
Growth Factor (vph)	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%	105%
Adj. Flow (vph)	25	359	88	188	230	80	84	244	248	63	360	34
RTOR Reduction (vph)	0	12	0	0	17	0	0	0	156	0	0	21
Lane Group Flow (vph)	25	435	0	188	293	0	84	244	92	63	360	13
Heavy Vehicles (%)	0%	2%	0%	3%	4%	2%	10%	0%	2%	0%	1%	10%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2				6
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	22.8	22.8		22.8	22.8		18.1	18.1	18.1	18.1	18.1	18.1
Effective Green, g (s)	22.8	22.8		22.8	22.8		18.1	18.1	18.1	18.1	18.1	18.1
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.37	0.37	0.37	0.37	0.37	0.37
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	458	817		334	795		268	679	566	393	672	525
v/s Ratio Prot		0.25			0.17			0.13			c0.20	
v/s Ratio Perm	0.03			c0.26			0.12		0.06	0.06		0.01
v/c Ratio	0.05	0.53		0.56	0.37		0.31	0.36	0.16	0.16	0.54	0.02
Uniform Delay, d1	7.1	9.3		9.4	8.4		11.0	11.2	10.3	10.3	12.1	9.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	0.7		2.2	0.3		0.7	0.3	0.1	0.2	0.8	0.0
Delay (s)	7.2	9.9		11.6	8.7		11.6	11.5	10.5	10.5	12.9	9.8
Level of Service	A	A		B	A		B	B	B	B	B	A
Approach Delay (s)		9.8			9.8			11.1			12.4	
Approach LOS		A			A			B			B	

Intersection Summary

HCM 2000 Control Delay	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	48.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	48	234	199	244	99	164	98	92	219	153
Average Queue (ft)	14	104	95	85	60	86	54	38	116	19
95th Queue (ft)	38	171	158	165	110	148	89	67	203	66
Link Distance (ft)		2382		2684		148	148		2649	
Upstream Blk Time (%)						1				
Queuing Penalty (veh)						2				
Storage Bay Dist (ft)	150		150		75			150		110
Storage Blk Time (%)		1	1	0	9	13			10	
Queuing Penalty (veh)		0	4	0	22	11			10	

Intersection: 6: Powers Ferry Rd.

Movement	NB
Directions Served	T
Maximum Queue (ft)	52
Average Queue (ft)	3
95th Queue (ft)	20
Link Distance (ft)	1898
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 51

HCM Signalized Intersection Capacity Analysis

3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

7/7/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	273	29	55	311	64	37	358	78	75	179	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	1778		1745	1773		1745	1837	1561	1694	1837	1459
Flt Permitted	0.35	1.00		0.49	1.00		0.57	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	635	1778		899	1773		1049	1837	1561	666	1837	1459
Peak-hour factor, PHF	0.75	0.88	0.88	0.88	0.95	0.91	0.84	0.95	0.72	0.89	0.78	0.58
Growth Factor (vph)	105%	105%	105%	131%	131%	131%	105%	105%	105%	105%	105%	105%
Adj. Flow (vph)	25	326	35	82	429	92	46	396	114	88	241	25
RTOR Reduction (vph)	0	5	0	0	10	0	0	0	73	0	0	16
Lane Group Flow (vph)	25	356	0	82	511	0	46	396	41	88	241	9
Heavy Vehicles (%)	0%	2%	0%	0%	1%	0%	0%	0%	0%	3%	0%	7%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2				6
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	25.2	25.2		25.2	25.2		18.3	18.3	18.3	18.3	18.3	18.3
Effective Green, g (s)	25.2	25.2		25.2	25.2		18.3	18.3	18.3	18.3	18.3	18.3
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.36	0.36	0.36	0.36	0.36	0.36
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	310	870		439	867		372	652	554	236	652	518
v/s Ratio Prot		0.20			c0.29			c0.22				0.13
v/s Ratio Perm	0.04			0.09			0.04		0.03	0.13		0.01
v/c Ratio	0.08	0.41		0.19	0.59		0.12	0.61	0.07	0.37	0.37	0.02
Uniform Delay, d1	7.0	8.4		7.4	9.4		11.2	13.6	11.0	12.3	12.3	10.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3		0.2	1.0		0.2	1.6	0.1	1.0	0.4	0.0
Delay (s)	7.1	8.7		7.6	10.5		11.3	15.3	11.0	13.3	12.7	10.8
Level of Service	A	A		A	B		B	B	B	B	B	B
Approach Delay (s)		8.6			10.1			14.1			12.7	
Approach LOS		A			B			B			B	

Intersection Summary

HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	51.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 3: Powers Ferry Rd. & Mt. Paran Rd./ Mt. Paran Rd.

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	R	L	T	R
Maximum Queue (ft)	192	188	199	259	100	164	76	110	137	148
Average Queue (ft)	22	104	64	153	29	122	37	58	79	13
95th Queue (ft)	80	181	146	236	82	185	60	101	134	58
Link Distance (ft)		2382		2683		151	151		2649	
Upstream Blk Time (%)						5				
Queuing Penalty (veh)						12				
Storage Bay Dist (ft)	150		150		75			150		110
Storage Blk Time (%)		2		7	0	26			3	
Queuing Penalty (veh)		1		6	1	12			3	

Intersection: 6: Powers Ferry Rd.

Movement	NB	NB
Directions Served	T	TR
Maximum Queue (ft)	96	120
Average Queue (ft)	20	4
95th Queue (ft)	65	40
Link Distance (ft)	2018	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		100
Storage Blk Time (%)	0	0
Queuing Penalty (veh)	0	0

Network Summary

Network wide Queuing Penalty: 35

MOVEMENT SUMMARY

Site: Mt Paran Rd @ Powers Ferry Rd AM Rdbt

AM Peak Mt Paran Rd @ Powers Ferry Rd Roundabout Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph	
South: Powers Ferry Rd												
3	L	84	10.0	0.773	21.5	LOS C	11.3	288.1	1.00	1.14	22.6	
8	T	244	0.0	0.773	16.6	LOS B	11.3	288.1	1.00	1.13	23.9	
18	R	248	2.5	0.773	17.1	LOS B	11.3	288.1	1.00	1.13	23.6	
Approach		576	2.5	0.773	17.5	LOS B	11.3	288.1	1.00	1.13	23.5	
East: Mt Paran Rd												
1	L	188	2.8	0.589	14.5	LOS B	5.9	152.2	0.85	0.89	23.6	
6	T	231	3.9	0.589	8.0	LOS A	5.9	152.2	0.85	0.81	24.7	
16	R	80	1.9	0.589	9.7	LOS A	5.9	152.2	0.85	0.84	24.9	
Approach		499	3.2	0.589	10.7	LOS B	5.9	152.2	0.85	0.85	24.3	
North: Powers Ferry Rd												
7	L	63	0.0	0.623	17.4	LOS B	6.6	166.6	0.92	1.03	24.3	
4	T	361	1.1	0.623	12.8	LOS B	6.6	166.6	0.92	0.99	25.9	
14	R	34	10.5	0.623	13.4	LOS B	6.6	166.6	0.92	1.01	25.6	
Approach		458	1.6	0.623	13.5	LOS B	6.6	166.6	0.92	1.00	25.6	
West: Mt Paran Rd												
5	L	25	0.0	0.741	24.3	LOS C	9.5	241.2	1.00	1.25	20.4	
2	T	357	1.7	0.741	17.8	LOS B	9.5	241.2	1.00	1.25	20.9	
12	R	89	0.0	0.741	19.6	LOS B	9.5	241.2	1.00	1.25	21.2	
Approach		471	1.3	0.741	18.5	LOS B	9.5	241.2	1.00	1.25	20.9	
All Vehicles		2005	2.2	0.773	15.1	LOS B	11.3	288.1	0.94	1.06	23.5	

Level of Service (LOS) Method: Delay (HCM 2000).
 Roundabout LOS Method: Same as Signalised Intersections.
 Vehicle movement LOS values are based on average delay per movement
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 Roundabout Capacity Model: SIDRA Standard.
 SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Mt Paran Rd @ Powers Ferry Rd PM Rdbt

PM Peak Mt Paran Rd @ Powers Ferry Rd Roundabout Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Powers Ferry Rd											
3	L	46	0.0	0.715	19.0	LOS B	9.1	228.6	0.95	1.07	23.6
8	T	395	0.3	0.715	14.3	LOS B	9.1	228.6	0.95	1.04	25.1
18	R	114	0.0	0.715	14.6	LOS B	9.1	228.6	0.95	1.05	24.8
Approach		555	0.2	0.715	14.7	LOS B	9.1	228.6	0.95	1.05	24.9
East: Mt Paran Rd											
1	L	82	0.0	0.806	23.2	LOS C	12.8	322.9	1.00	1.21	20.7
6	T	427	1.0	0.806	16.8	LOS B	12.8	322.9	1.00	1.21	21.2
16	R	92	0.0	0.806	18.6	LOS B	12.8	322.9	1.00	1.21	21.5
Approach		601	0.7	0.806	18.0	LOS B	12.8	322.9	1.00	1.21	21.2
North: Powers Ferry Rd											
7	L	88	2.7	0.527	16.2	LOS B	4.8	120.1	0.91	0.98	24.7
4	T	241	0.0	0.527	11.4	LOS B	4.8	120.1	0.91	0.94	26.5
14	R	26	7.1	0.527	12.0	LOS B	4.8	120.1	0.91	0.95	26.2
Approach		355	1.2	0.527	12.6	LOS B	4.8	120.1	0.91	0.95	26.0
West: Mt Paran Rd											
5	L	25	0.0	0.491	14.0	LOS B	4.0	101.5	0.80	0.90	24.0
2	T	327	1.9	0.491	7.5	LOS A	4.0	101.5	0.80	0.78	25.2
12	R	34	0.0	0.491	9.3	LOS A	4.0	101.5	0.80	0.82	25.4
Approach		386	1.6	0.491	8.1	LOS A	4.0	101.5	0.80	0.79	25.1
All Vehicles		1897	0.8	0.806	14.0	LOS B	12.8	322.9	0.93	1.03	23.8

Level of Service (LOS) Method: Delay (HCM 2000).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay per movement

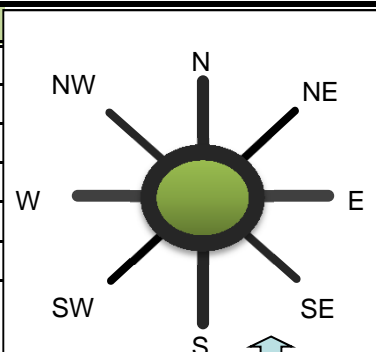
Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model used.

General & Site Information v2.1

Analyst:	KP
Agency/Co:	ARCADIS US, INC.
Date:	7/6/2016
Project or PI#:	Sandy Springs Signals
Year, Peak Hour:	2019, AM Peak
County/District:	Cobb County, District 7
Intersection Name:	Mt Paran Rd @ Powers Ferry Rd



Roundabout Type	Standard Single Lane or Urban Compact
Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	707	NA	749	NA	706	NA	635	NA
Entry Flow Rates, vph	443	NA	451	NA	582	NA	441	NA
V/C ratio	0.63		0.60		0.82		0.69	
Control Delay, s/veh	16		15		28		21	
LOS	C		B		D		C	
95th % Queue (ft)	112		105		228		141	
Calibrated Model (future)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	914	NA	953	NA	911	NA	839	NA
Entry Flow Rates, vph	443	NA	451	NA	582	NA	441	NA
V/C ratio	0.49		0.49		0.65		0.53	
Control Delay, sec/pcu	10		10		14		12	
LOS	B		A		B		B	
95th % Queue (ft)	69		71		127		82	

Notes:

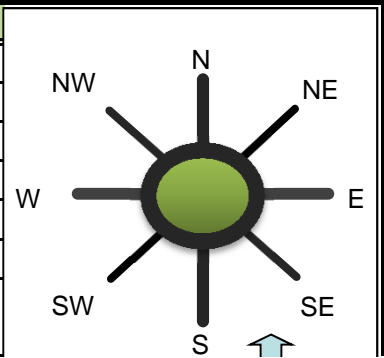
v2.1

Unit Legend:

- vph = vehicles per hour
- PHF = peak hour factor
- F_{HV} = heavy vehicle factor
- pcu = passenger car unit

General & Site Information v2.1

Analyst:	KP
Agency/Co:	ARCADIS US, INC.
Date:	7/6/2016
Project or PI#:	Sandy Springs Signals
Year, Peak Hour:	2019, PM Peak
County/District:	Cobb County, District 7
Intersection Name:	Mt Paran Rd @ Powers Ferry Rd



Roundabout Type	Standard Single Lane or Urban Compact
Enter type here...	Standard Single Lane

Results: Approach Measures of Effectiveness

HCM 2010 Model (build)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	653	NA	706	NA	722	NA	743	NA
Entry Flow Rates, vph	344	NA	580	NA	529	NA	378	NA
V/C ratio	0.53		0.82		0.73		0.51	
Control Delay, s/veh	14		28		21		12	
LOS	B		D		C		B	
95th % Queue (ft)	78		224		162		74	
Calibrated Model (future)	N	NE	E	SE	S	SW	W	NW
Entry Capacity, vph	858	NA	913	NA	931	NA	950	NA
Entry Flow Rates, vph	344	NA	580	NA	529	NA	378	NA
V/C ratio	0.41		0.64		0.57		0.40	
Control Delay, sec/pcu	9		14		12		8	
LOS	A		B		B		A	
95th % Queue (ft)	50		120		92		50	

Notes:

v2.1

Unit Legend:

- vph = vehicles per hour
- PHF = peak hour factor
- F_{HV} = heavy vehicle factor
- pcu = passenger car unit

Appendix D

Accident Data

Mt. Paran Rd. @ Powers Ferry Rd. Accident Data 2011-2015

DATE OF ACCIDENT	ACCIDENT #	PRIMARY RD	INTERSECTION	DOW	TIME	FAT	M/C	WTHR	DIRECTION OF TRAVEL	CONTROL	SPECIAL	CITATION	TYPE OF ACCIDENT
3/26/11	11-003633	POWERS FERRY ROAD	MOUNT PARAN ROAD	SAT	1529	0	1	2	SOUTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
7/26/11	11-009059	POWERS FERRY ROAD	MOUNT PARAN ROAD	TUES	824	0	1	2	NORTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
11/11/11	11-014045	MOUNT PARAN ROAD	POWERS FERRY ROAD	FRI	2316	0	1	1	NORTH	LANES		NONE	ANGLE
12/10/11	11-015330	MOUNT PARAN ROAD	POWERS FERRY ROAD	SAT	1641	0	1	1	NORTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	REAR END
3/13/12	12-003225	POWERS FERRY ROAD	MOUNT PARAN ROAD	TUE	734	0	1	3	SOUTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
5/13/12	12-006014	POWERS FERRY ROAD	MOUNT PARAN ROAD	SUN	1650	0	1	3	NORTH	SIGNAL		ILLEGAL U-TURN	ANGLE
8/11/12	2012010414	POWERS FERRY ROAD	MOUNT PARAN ROAD	SAT	1030	0	1	2	NORTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
11/12/12	2012014925	MOUNT PARAN ROAD	POWERS FERRY ROAD	MON	1610	0	1	3	SOUTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
12/6/12	2012016095	POWERS FERRY ROAD	MOUNT PARAN ROAD	THU	739	0	1	2	SOUTH	LANES		NONE	ANGLE
12/23/12	2012016975	POWERS FERRY ROAD	MOUNT PARAN ROAD	SUN	1526	0	1	1	NORTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
12/28/12	2012017131	POWERS FERRY ROAD	MOUNT PARAN ROAD	FRI	1222	0	4	1	NORTH	LANES	DUI, RECKLESS DRIVING	FAILURE TO DRIVE ON RIGHT SIDE OF ROAD	SIDE SWIPE SAME DIRECTION
12/29/12	2012017179	POWERS FERRY ROAD	MOUNT PARAN ROAD	SAT	1121	0	1	2	NORTH	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
12/30/12	2012017208	MOUNT PARAN ROAD	POWERS FERRY ROAD	SUN	1412	0	1	1	EAST	STOP OR YIELD SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
3/18/13	2013003646	MOUNT PARAN ROAD	POWERS FERRY ROAD	MON	2100	0	1	7	NORTH	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
5/22/13	2013006918	MOUNT PARAN ROAD	POWERS FERRY ROAD	WED	1508	0	1	1	EAST	LANES		NONE	SIDE SWIPE SAME DIRECTION
12/18/13	2013017605	MOUNT PARAN ROAD	POWERS FERRY ROAD	WED	1445	0	3	1	WEST	LANES		FOLLOWING TOO CLOSELY	REAR END
12/22/13	2013017832	MOUNT PARAN ROAD	POWERS FERRY ROAD	SUN	1721	0	1	3	NORTH	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
2/26/14	2014002507	MOUNT PARAN ROAD	POWERS FERRY ROAD	WED	1423	0	1	1	NORTH	STOP SIGN	MIDDLE	FAILURE TO OBEY TRAFFIC SIGN	ANGLE
5/11/14	2014006185	POWERS FERRY ROAD	MOUNT PARAN ROAD	SUN	1340	0	3	1	SOUTH	STOP SIGN	APPROACH	FOLLOWING TOO CLOSELY	REAR END
6/28/14	2014008571	MOUNT PARAN ROAD	POWERS FERRY ROAD	SAT	2141	0	1	2	NORTH	STOP SIGN	NO INSURANCE	FAILURE TO OBEY TRAFFIC SIGN	ANGLE
7/30/2014	2014010059	MOUNT PARAN ROAD	POWERS FERRY ROAD	WED	2003	0	1	1	NORTH	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
8/1/2014	2014010165	POWERS FERRY ROAD	MOUNT PARAN ROAD	FRI	1649	0	1	1	NORTH	STOP SIGN		NONE	ANGLE
09/11/14	2014012040	MOUNT PARAN ROAD	POWERS FERRY RD	THU	1300	0	1	1	SOUTH	STOP SIGN		NONE	ANGLE
10/06/14	2014013190	MOUNT PARAN ROAD	POWERS FERRY RD	MON	1836	0	3	1	WEST	STOP SIGN		FOLLOWING TOO CLOSELY	REAR END
10/22/2014	2014013981	MOUNT PARAN RD	POWERS FERRY RD	WED	1814	0	3	1	WEST	LANES		FOLLOWING TOO CLOSELY	REAR END
10/22/2014	2014013980	MOUNT PARAN RD	POWERS FERRY RD	WED	1814	0	3	1	WEST	LANES		FOLLOWING TOO CLOSELY	REAR END
12/5/2014	2014015985	POWERS FERRY RD	MOUNT PARAN RD	FRI	1411	0	1	2	SOUTH	LANES		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
7/13/2015	2015008477	MOUNT PARAN ROAD	POWERS FERRY ROAD	MON	0830	0	1	1	WEST	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
7/13/2015	2015008477	MOUNT PARAN ROAD	POWERS FERRY ROAD	MON	0830	0	1	1	WEST	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
7/16/2015	2015008685	POWERS FERRY ROAD	MOUNT PARAN ROAD	THU	1838	0	1	1	SOUTH	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE
8/5/2015	2015009621	MOUNT PARAN ROAD	POWERS FERRY ROAD	WED	1727	0	3	1	EAST	STOP SIGN		FOLLOWING TOO CLOSELY	REAR END
8/22/2015	2015010403	POWERS FERRY ROAD	MOUNT PARAN ROAD	SAT	1320	0	1	1	EAST	STOP SIGN		NONE	ANGLE
9/28/2015	2015012159	POWERS FERRY ROAD	MOUNT PARAN ROAD	MON	1643	0	1	3	WEST	STOP SIGN		FAILURE TO OBEY TRAFFIC SIGN	ANGLE

Appendix E

Signal Warrant Summary

Warrants Summary													
Information													
Analyst ARCADIS			Intersection			Mt. Paran Rd./Powers Ferry Rd.							
Agency/Co			Jurisdiction			City of Sandy Springs							
Date Performed 5/7/2015			Units			U.S. Customary							
Project ID			Time Period Analyzed			AM & PM Peak Hours							
East/West Street Mt. Paran Road			North/South Street			Powers Ferry Road							
File Name MtParan_PowersFerry_May2015.xhy			Major Street			North-South							
Project Description													
General								Roadway Network					
Major Street Speed (mph)		35	<input type="checkbox"/>	Population < 10,000			Two Major Routes		<input type="checkbox"/>				
Nearest Signal (ft)		0	<input type="checkbox"/>	Coordinated Signal System			Weekend Count		<input type="checkbox"/>				
Crashes (per year)		0	<input type="checkbox"/>	Adequate Trials of Alternatives			5-yr Growth Factor		0				
Geometry and Traffic		EB			WB			NB			SB		
		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N		0	1	0	0	1	0	0	1	1	0	1	1
Lane usage		LTR			LTR			LT R		LT R			
Vehicle Volume Averages (vph)		4	82	11	26	84	18	11	75	32	17	67	4
Peds (ped/h) / Gaps (gaps/h)		--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Delay (s/veh) / (veh-hr)		--	10.5 / 0.9	--	--	18.9 / 2.2	--	--	11.5 / 1.3	--	--	9.4 / 0.7	--
Warrant 1: Eight-Hour Vehicular Volume												<input type="checkbox"/>	
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>	
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>	
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)												<input type="checkbox"/>	
Warrant 2: Four-Hour Vehicular Volume												<input checked="" type="checkbox"/>	
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>	
Warrant 3: Peak Hour												<input checked="" type="checkbox"/>	
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--												<input checked="" type="checkbox"/>	
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>	
Warrant 4: Pedestrian Volume												<input type="checkbox"/>	
4 A. Four Hour Volumes --or--												<input type="checkbox"/>	
4 B. One-Hour Volumes												<input type="checkbox"/>	
Warrant 5: School Crossing												<input type="checkbox"/>	
5. Student Volumes --and--												<input type="checkbox"/>	
5. Gaps Same Period												<input type="checkbox"/>	
Warrant 6: Coordinated Signal System												<input type="checkbox"/>	
6. Degree of Platooning (Predominant direction or both directions)												<input type="checkbox"/>	
Warrant 7: Crash Experience												<input type="checkbox"/>	
7 A. Adequate trials of alternatives, observance and enforcement failed --and--												<input type="checkbox"/>	
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--												<input type="checkbox"/>	

7 C. 80% Volumes for Warrants 1A, 1B --or-- 4 are satisfied	<input type="checkbox"/>
Warrant 8: Roadway Network	<input type="checkbox"/>
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	<input type="checkbox"/>
8 B. Weekend Volume (Five hours total)	<input type="checkbox"/>
Warrant 9: Grade Crossing	<input type="checkbox"/>
9 A. Grade Crossing within 140 ft --and--	<input type="checkbox"/>
9 B. Peak-Hour Vehicular Volumes	<input type="checkbox"/>

Appendix F

Cost Estimate