10 c. Additional Analysis for Somerset Coral Gables UBC Campus Traffic Study (06-07-10)

TECHNICAL MEMORANDUM

To: James J. Kay, P.E.
Engineering Division Supervisor
Public Works Department
City of Coral Gables
2800 SW 72 Avenue, Bldg #6
Miami, Florida 33155

From: Richard Garcia, P.E.
Richard Garcia & Associates, Inc.
13117 NW 107th Avenue, Unit 4
Hialeah Gardens, Florida 33018
Phone (305) 595-7505
Fax (305) 675-6474

Date: June 7th, 2010

SUBJECT: Additional Analysis for Somerset C.G. UBC Campus Traffic Study

In response to your email request dated June 4th, 2010 (attached) for the referenced project we are providing you herewith the additional information and analysis for your review and consideration. I hope this addresses your request; however, should you need additional information or wish to discuss this further, please feel free to contact me at the numbers above.

- As you mentioned we have evaluated the existing condition and proposed traffic condition with the school and the proposed median improvements on Segovia Street. We have further evaluated the proposed conditions with the school and without the landscape median. Please note, the two Segovia Street improvements (i.e. with landscaping and without landscaping) projects are virtually the same from a capacity or level of service standpoint. Additionally, since the approach lanes are the same for both alternatives, the results are the same as we reported in our Traffic Impact Study dated June 3rd, 2010. As you will see in the accompanying figures the medians were removed by lengthening the northbound and southbound left turn lanes consistent with the City's proposed improvements.
- Additionally, we have evaluated the proposed conditions without any improvements along Segovia Street for comparison with the improved conditions. Again, the differences are marginal especially in delay and the resulting LOS being the same. As stated in our report, this is due to the lack or need for the additional lanes on Segovia Street. Therefore, the City's improvements along Segovia Street do not make a significant change to the level of service. The following Table summarized the report as well as the additional analysis provided herewith.

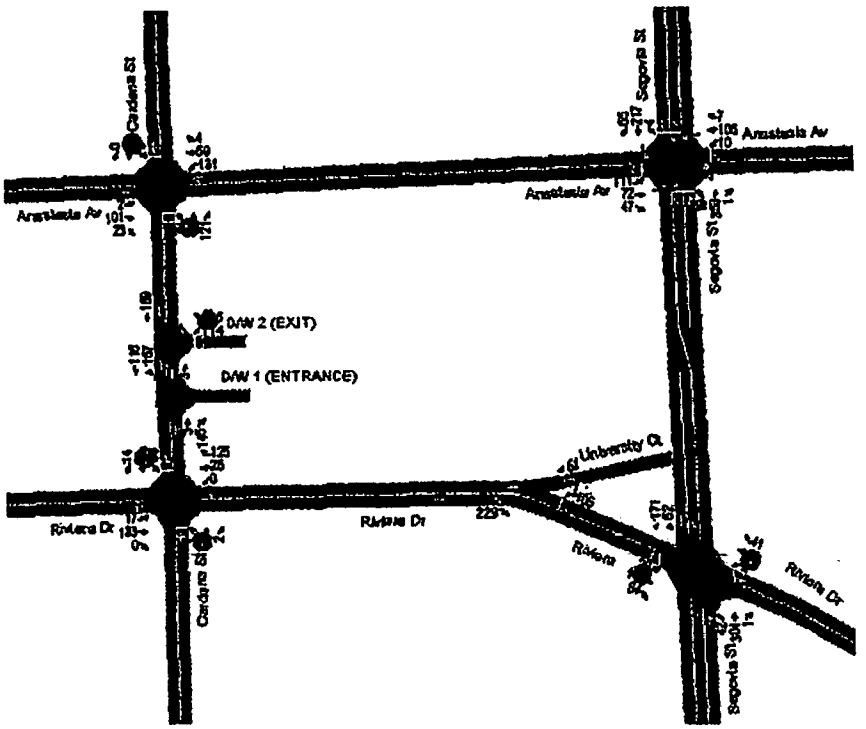

Figure 1: Proposed AM Condition without Landscaping (School Scenario A)

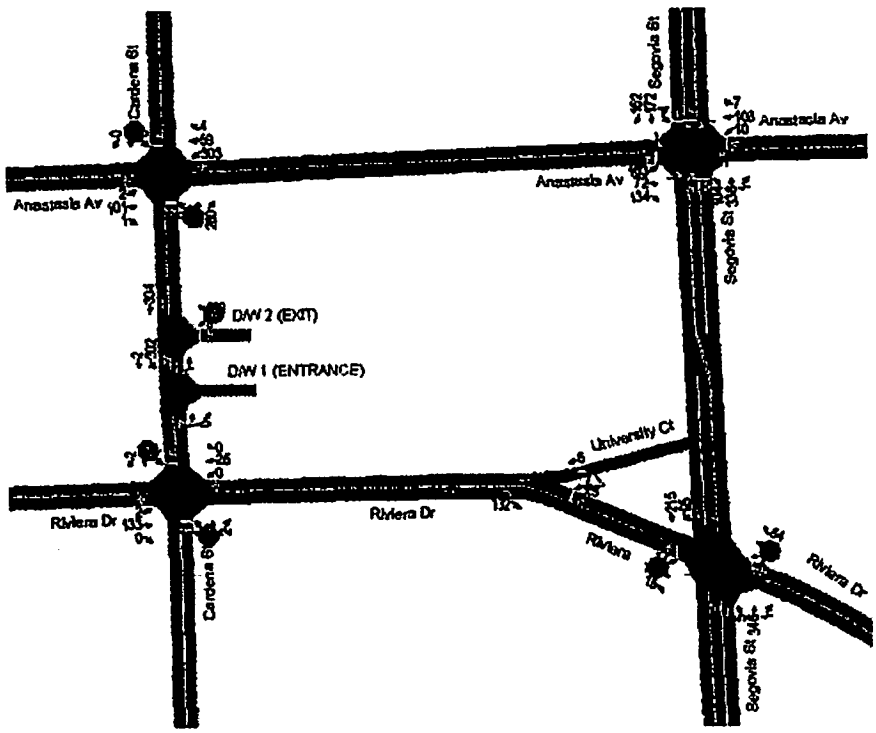

Figure 2: Proposed AM Condition without Landscaping (School Scenario B-Segovia Access)

Location	Intersection Control	Existing AM Peak Hour		Proposed AM Peak Hour			
				Scenario A		Scenario B	
		Ave Veh Delay (sec)	LOS	Ave Veh Delay	LOS	Ave Veh Delay	LOS
Segovia Street & Anastasia Avenue	Signalized	8.2	A	13.7	B	34.9	C
Segovia Street & Riviera Drive	2-Way Stop (E/W)	5.0	A	7.9	A	5.2	A
Anastasia Avenue & Cardena Street	2-Way Stop (N/S)	0.3	A	5.8	A	7.3	A
Riviera Drive & Cardena Street	2-Way Stop (N/S)	0.5	A	3.8	A	0.5	A
Driveway 2 (Exit) & Cardena Street	2-Way Stop (E/W)			6.4	A	4.4	A

Location	Intersection Control	ADDITIONAL ANALYSIS							
		Proposed (Without L.S. Median) AM Peak Hour				Proposed (Without Any Improvements) AM Peak Hour			
		Scenario A		Scenario B		Scenario A		Scenario B	
		Ave Veh Delay	LOS	Ave Veh Delay	LOS	Ave Veh Delay	LOS	Ave Veh Delay	LOS
Segovia Street & Anastasia Avenue	Signalized	13.7	B	34.9	C	12.7	B	31.5	C
Segovia Street & Riviera Drive	2-Way Stop (E/W)	7.9	A	5.2	A	10.5	B	4.7	A

Table 1: LOS Summary

ATTACHMENTS

Richard Garcia

From: Kay, James [jkay@coralgables.com]
Sent: Friday, June 04, 2010 4:31 PM
To: rgarcia@rgatraffic.com
Cc: Pino, Ernesto; Zabalo, Esther; Hickman, Lina
Subject: RE: Traffic Study - University Baptist Church Charter School

Dear Mr. Garcia,

My apologies. I confused your name with another traffic engineer, Carlos Perez.

Yes, the message below is for you. Please let us know if you will be able to assist.

Regards,

James J. Kay, P.E.

Engineering Division Supervisor

Public Works Department

City of Coral Gables

2800 SW 72 Avenue, Bldg #6

Miami, Florida 33155

305-460-5069 (p.)

305-460-5080 (f.)

jkay@coralgables.com

From: rgarcia@rgatraffic.com [mailto:rgarcia@rgatraffic.com]
Sent: Friday, June 04, 2010 4:15 PM
To: Kay, James
Cc: Pino, Ernesto; Zabalo, Esther; Hickman, Lina
Subject: Re: Traffic Study - University Baptist Church Charter School

James,

I assume this is for me.

BlackBerry Device for:
Richard Garcia, P.E.
Richard Garcia & Associates Inc.
13117 NW 107th Avenue, Suite 4
Hialeah Gardens, FL 33018
PH: 305-595-7505
FAX: 305-675-6474

From: "Kay, James" <jkay@coralgables.com>
Date: Fri, 4 Jun 2010 15:29:42 -0400
To: Richard Garcia<rgarcia@rgatraffic.com>
Cc: Pino, Ernesto<epino@coralgables.com>; Zabalo, Esther<ezabalo@coralgables.com>; Hickman, Lina<lhickman@coralgables.com>
Subject: Traffic Study - University Baptist Church Charter School

Dear Mr. Perez,

This Department has received your traffic study on behalf of the University Baptist Church. We note that the study included two scenarios for City Improvements on Segovia Street as requested. One scenario provides for traffic impacts and levels of service for a raised landscaped median throughout the length of Segovia Street and without the Charter School Project in place; and the other provides for traffic impacts and levels of service with the raised landscaped median and with the Charter School Project in place. However, in order to explain traffic issues to the general public and provide information on as many levels as possible, it would be extremely useful to address the impacts of traffic and levels of service with no median on Segovia Street between Valencia Avenue and Bird Road and with the Charter School Project in place. Since you are familiar with the data collected for the project, we would appreciate receiving a statement or narrative from you that you are comfortable with regarding traffic impacts and levels of services, if possible, without a median installed on Segovia Street and with the Charter School in place. This document could then be included as an attachment to the study.

Regards,

James J. Kay, P.E.

Engineering Division Supervisor

Public Works Department

City of Coral Gables

2800 SW 72 Avenue, Bldg #6

Miami, Florida 33155

305-460-5069 (p.)

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jkay@coralgables.com

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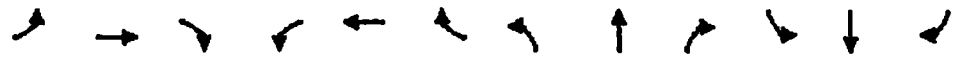
mail address released in response to a public records request, do not send electronic mail to this entity. Instead, contact t

Lane Group	EBT	WBT	NBL		SBL	
Lane Group Flow (vph)	274	146	23		5	
v/c Ratio	0.78	0.35	0.04	0.37	0.01	0.30
Control Delay	37.1	20.4	5.3	7.1	5.0	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.1	20.4	5.3	7.1	5.0	5.7
Queue Length 50th (ft)	81	40	3	68	1	43
Queue Length 95th (ft)	#160	76	10	104	4	72
Internal Link Dist (ft)	451	565		333		252
Turn Bay Length (ft)			140		150	
Base Capacity (vph)	385	459	623	1151	548	1129
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	0.71	0.32	0.04	0.37	0.01	0.30

Intersection Summary

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	111	72	47	10	106	7	19	353	1	4	217	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.97			0.99		1.00	1.00		1.00	0.97	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1769			1841		1770	1862		1770	1799	
Flt Permitted		0.80			0.97		0.54	1.00		0.48	1.00	
Satd. Flow (perm)		1452			1791		1008	1862		886	1799	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	132	86	56	12	126	8	23	420	1	5	258	77
RTOR Reduction (vph)	0	16	0	0	4	0	0	0	0	0	17	0
Lane Group Flow (vph)	0	258	0	0	142	0	23	421	0	5	318	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.5			13.5		36.5	36.5		36.5	36.5	
Effective Green, g (s)		13.5			13.5		36.5	36.5		36.5	36.5	
Actuated g/C Ratio		0.23			0.23		0.62	0.62		0.62	0.62	
Clearance Time (s)		5.0			5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		332			410		624	1152		548	1113	
v/s Ratio Prot								c0.23			0.18	
v/s Ratio Perm		c0.18			0.08		0.02			0.01		
v/c Ratio		0.78			0.35		0.04	0.37		0.01	0.29	
Uniform Delay, d1		21.3			19.1		4.4	5.5		4.3	5.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		10.8			0.5		0.1	0.9		0.0	0.6	
Delay (s)		32.2			19.6		4.5	6.4		4.3	5.9	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		32.2			19.6			6.3			5.8	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑			↑	
Volume (veh/h)	29	146	54	2	63	41	42	304	1	52	171	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	34	170	63	2	73	48	49	353	1	60	199	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											413	
pX, platoon unblocked												
vC, conflicting volume	855	772	199	919	772	354	199			355		
vC1, stage 1 conf vol	320	320		452	452							
vC2, stage 2 conf vol	535	452		467	320							
vCu, unblocked vol	855	772	199	919	772	354	199			355		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	62	93	99	84	93	96			95		
cM capacity (veh/h)	334	445	842	295	463	690	1374			1204		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	266	123	49	355	60	199
Volume Left	34	2	49	0	60	0
Volume Right	63	48	0	1	0	0
cSH	478	524	1374	1700	1204	1700
Volume to Capacity	0.56	0.24	0.04	0.21	0.05	0.12
Queue Length 95th (ft)	84	23	3	0	4	0
Control Delay (s)	21.6	14.0	7.7	0.0	8.1	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	21.6	14.0	0.9		1.9	
Approach LOS	C	B				

Intersection Summary				
Average Delay	7.9			
Intersection Capacity Utilization	48.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	163	72	134	10	106	7	104	338	1	4	172	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.95			0.99		1.00	1.00		1.00	0.93	
Flt Protected		0.98			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1733			1841		1770	1862		1770	1732	
Flt Permitted		0.82			0.96		0.49	1.00		0.48	1.00	
Satd. Flow (perm)		1447			1770		921	1862		896	1732	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	194	86	160	12	126	8	124	402	1	5	205	181
RTOR Reduction (vph)	0	35	0	0	4	0	0	0	0	0	54	0
Lane Group Flow (vph)	0	405	0	0	142	0	124	403	0	5	332	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.0			15.0		35.0	35.0		35.0	35.0	
Effective Green, g (s)		15.0			15.0		35.0	35.0		35.0	35.0	
Actuated g/C Ratio		0.25			0.25		0.59	0.59		0.59	0.59	
Clearance Time (s)		5.0			5.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		368			450		546	1105		532	1027	
v/s Ratio Prot								c0.22			0.19	
v/s Ratio Perm		c0.28			0.08		0.13			0.01		
v/c Ratio		1.10			0.32		0.23	0.36		0.01	0.32	
Uniform Delay, d1		22.0			17.8		5.6	6.2		4.9	6.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		76.7			0.4		1.0	0.9		0.0	0.8	
Delay (s)		98.7			18.2		6.6	7.2		4.9	6.9	
Level of Service		F			B		A	A		A	A	
Approach Delay (s)		98.7			18.2			7.0			6.9	
Approach LOS		F			B			A			A	

Intersection Summary			
HCM Average Control Delay	34.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBL		SBL	
Lane Group Flow (vph)	440	146	124		5	
v/c Ratio	1.09	0.32	0.23	0.36	0.01	0.36
Control Delay	95.9	19.6	7.0	7.4	5.0	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	95.9	19.6	7.0	7.4	5.0	5.0
Queue Length 50th (ft)	~169	41	18	65	1	37
Queue Length 95th (ft)	#293	76	37	99	4	66
Internal Link Dist (ft)	451	565		333		252
Turn Bay Length (ft)			155		150	
Base Capacity (vph)	403	454	546	1105	532	1081
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	1.09	0.32	0.23	0.36	0.01	0.36

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 Unsignalized Intersection Capacity Analysis — Somerset UBC (PK-8)

3: Riviera Dr & Segovia St — PROPOSED AM PEAK HOUR VOLUMES SCENARIO B w/o L.S.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	14	103	15	2	20	84	5	346	1	95	215	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	16	120	17	2	23	98	6	402	1	110	250	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											413	
pX, platoon unblocked												
vC, conflicting volume	994	886	250	963	885	403	250			403		
vC1, stage 1 conf vol	471	471		415	415							
vC2, stage 2 conf vol	523	415		548	471							
vCu, unblocked vol	994	886	250	963	885	403	250			403		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	70	98	99	95	85	100			90		
cM capacity (veh/h)	299	403	789	319	432	648	1316			1155		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	153	123	6	403	110	250
Volume Left	16	2	6	0	110	0
Volume Right	17	98	0	1	0	0
cSH	411	581	1316	1700	1155	1700
Volume to Capacity	0.37	0.21	0.00	0.24	0.10	0.15
Queue Length 95th (ft)	43	20	0	0	8	0
Control Delay (s)	18.9	12.8	7.7	0.0	8.4	0.0
Lane LOS	C	B	A		A	
Approach Delay (s)	18.9	12.8	0.1		2.6	
Approach LOS	C	B				

Intersection Summary				
Average Delay	5.2			
Intersection Capacity Utilization	47.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	163	72	134	10	106	7	104	338	1	4	172	152
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.99			1.00			0.93	
Flt Protected		0.98			1.00			0.99			1.00	
Satd. Flow (prot)		1733			1841			3497			3291	
Flt Permitted		0.82			0.96			0.78			0.95	
Satd. Flow (perm)		1451			1770			2774			3130	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	190	84	156	12	123	8	121	393	1	5	200	177
RTOR Reduction (vph)	0	35	0	0	4	0	0	0	0	0	72	0
Lane Group Flow (vph)	0	395	0	0	139	0	0	515	0	0	310	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.0			15.0			35.0			35.0	
Effective Green, g (s)		15.0			15.0			35.0			35.0	
Actuated g/C Ratio		0.25			0.25			0.59			0.59	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		369			450			1646			1857	
v/s Ratio Prot												
v/s Ratio Perm		c0.27			0.08			c0.19			0.10	
v/c Ratio		1.07			0.31			0.31			0.17	
Uniform Delay, d1		22.0			17.8			6.0			5.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		66.8			0.4			0.5			0.2	
Delay (s)		88.8			18.2			6.5			5.6	
Level of Service		F			B			A			A	
Approach Delay (s)		88.8			18.2			6.5			5.6	
Approach LOS		F			B			A			A	

Intersection Summary			
HCM Average Control Delay	31.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT		
Lane Group Flow (vph)	430	143		
v/c Ratio	1.06	0.32	0.31	0.20
Control Delay	87.1	19.6	6.6	3.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	87.1	19.6	6.6	3.1
Queue Length 50th (ft)	~161	40	41	14
Queue Length 95th (ft)	#295	77	61	27
Internal Link Dist (ft)	451	565	235	157
Turn Bay Length (ft)				
Base Capacity (vph)	404	453	1647	1929
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.06	0.32	0.31	0.20

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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	146	54	2	63	41	42	304	1	52	171	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	22	160	59	2	69	45	46	334	1	57	188	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											413	
pX, platoon unblocked												
vC, conflicting volume	642	730	95	775	730	168	189			335		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	642	730	95	775	730	168	189			335		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	50	94	99	78	95	97			95		
cM capacity (veh/h)	267	320	944	155	320	847	1382			1221		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	242	116	213	168	151	95
Volume Left	22	2	46	0	57	0
Volume Right	59	45	0	1	0	1
cSH	374	411	1382	1700	1221	1700
Volume to Capacity	0.65	0.28	0.03	0.10	0.05	0.06
Queue Length 95th (ft)	109	29	3	0	4	0
Control Delay (s)	30.6	17.2	1.9	0.0	3.3	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	30.6	17.2	1.1		2.0	
Approach LOS	D	C				

Intersection Summary				
Average Delay	10.5			
Intersection Capacity Utilization	44.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	146	54	2	20	41	42	304	1	52	171	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	23	170	63	2	23	48	49	353	1	60	199	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											413	
pX, platoon unblocked												
vC, conflicting volume	653	772	99	820	772	177	199			355		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	653	772	99	820	772	177	199			355		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	44	93	98	92	94	96			95		
cM capacity (veh/h)	293	301	937	130	301	835	1371			1201		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	256	73	226	178	160	99
Volume Left	23	2	49	0	60	0
Volume Right	63	48	0	1	0	0
cSH	360	481	1371	1700	1201	1700
Volume to Capacity	0.71	0.15	0.04	0.10	0.05	0.06
Queue Length 95th (ft)	131	13	3	0	4	0
Control Delay (s)	36.1	13.8	1.9	0.0	3.4	0.0
Lane LOS	E	B	A		A	
Approach Delay (s)	36.1	13.8	1.1		2.1	
Approach LOS	E	B				

Intersection Summary			
Average Delay	11.3		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBT		
Lane Group Flow (vph)	131	146		
v/c Ratio	0.46	0.48	0.20	0.15
Control Delay	19.1	26.1	4.2	3.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	19.1	26.1	4.2	3.2
Queue Length 50th (ft)	26	46	24	13
Queue Length 95th (ft)	57	79	44	28
Internal Link Dist (ft)	451	565	235	157
Turn Bay Length (ft)				
Base Capacity (vph)	409	458	2243	2234
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.32	0.32	0.20	0.15

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕↕			↕↕	
Volume (vph)	41	27	42	10	106	7	19	353	1	4	217	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.95			0.99			1.00			0.97	
Flt Protected		0.98			1.00			1.00			1.00	
Satd. Flow (prot)		1734			1841			3529			3416	
Flt Permitted		0.83			0.97			0.93			0.95	
Satd. Flow (perm)		1465			1784			3299			3251	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	49	32	50	12	126	8	23	420	1	5	258	77
RTOR Reduction (vph)	0	42	0	0	4	0	0	0	0	0	25	0
Lane Group Flow (vph)	0	89	0	0	142	0	0	444	0	0	315	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		9.9			9.9			40.1			40.1	
Effective Green, g (s)		9.9			9.9			40.1			40.1	
Actuated g/C Ratio		0.17			0.17			0.68			0.68	
Clearance Time (s)		5.0			5.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		246			299			2242			2210	
v/s Ratio Prot												
v/s Ratio Perm		0.06			c0.08			c0.13			0.10	
v/c Ratio		0.36			0.47			0.20			0.14	
Uniform Delay, d1		21.8			22.2			3.5			3.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.9			1.2			0.2			0.1	
Delay (s)		22.7			23.4			3.7			3.5	
Level of Service		C			C			A			A	
Approach Delay (s)		22.7			23.4			3.7			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group