



Appendix D

Existing 2010 Synchro Intersection LOS Reports

**SR 21 Corridor Study
Phase I Final Report**

Existing
2010
AM Peak Hour

HCM Signalized Intersection Capacity Analysis

1: SR 30 & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	10	1150	40	10	0	90	530	20	20	2210	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0	7.0	7.0		7.0	6.4	6.4	7.0	6.4	6.4
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1836	1599	1719	1881		1736	3252	1538	1687	3539	1524
Flt Permitted		0.87	1.00	0.73	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1650	1599	1319	1881		1736	3252	1538	1687	3539	1524
Peak-hour factor, PHF	0.80	0.56	0.62	0.83	0.50	0.92	0.85	0.80	0.66	0.94	0.97	0.67
Adj. Flow (vph)	25	18	1855	48	20	0	106	662	30	21	2278	60
RTOR Reduction (vph)	0	0	61	0	0	0	0	0	11	0	0	21
Lane Group Flow (vph)	0	43	1794	48	20	0	106	662	19	21	2278	39
Heavy Vehicles (%)	1%	0%	1%	5%	1%	0%	4%	11%	5%	7%	2%	6%
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)		64.0	64.0	64.0	64.0		5.0	42.6	42.6	3.0	40.6	40.6
Effective Green, g (s)		64.0	64.0	64.0	64.0		5.0	42.6	42.6	3.0	40.6	40.6
Actuated g/C Ratio		0.49	0.49	0.49	0.49		0.04	0.33	0.33	0.02	0.31	0.31
Clearance Time (s)		7.0	7.0	7.0	7.0		7.0	6.4	6.4	7.0	6.4	6.4
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)		812	787	649	926		67	1066	504	39	1105	476
v/s Ratio Prot					0.01		c0.06	0.20		0.01	c0.64	
v/s Ratio Perm		0.03	c1.12	0.04					0.01			0.03
v/c Ratio		0.05	2.28	0.07	0.02		1.58	0.62	0.04	0.54	2.06	0.08
Uniform Delay, d1		17.2	33.0	17.4	16.9		62.5	36.9	29.7	62.8	44.7	31.6
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		0.0	579.9	0.0	0.0		321.4	2.7	0.1	13.5	480.8	0.3
Delay (s)		17.2	612.9	17.4	16.9		383.9	39.6	29.9	76.4	525.5	31.9
Level of Service		B	F	B	B		F	D	C	E	F	C
Approach Delay (s)		599.4			17.3			85.0			509.0	
Approach LOS		F			B			F			F	
Intersection Summary												
HCM Average Control Delay			469.9			HCM Level of Service			F			
HCM Volume to Capacity ratio			2.17									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			20.4			
Intersection Capacity Utilization			156.0%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: SR 21 & I-95 Southbound Ramps

10/25/2010

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		 			 						 	
Volume (vph)	60	520	0	0	1850	1370	0	0	0	50	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0	6.0				8.3	8.3	8.3
Lane Util. Factor	1.00	0.95			0.95	1.00				0.95	0.95	1.00
Flt	1.00	1.00			1.00	0.85				1.00	1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)	1308	3374			3505	1599				1225	1225	1568
Flt Permitted	0.95	1.00			1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)	1308	3374			3505	1599				1225	1225	1568
Peak-hour factor, PHF	0.81	0.79	0.92	0.92	0.71	0.92	0.92	0.92	0.92	0.81	0.50	0.59
Adj. Flow (vph)	74	658	0	0	2606	1489	0	0	0	62	0	119
RTOR Reduction (vph)	0	0	0	0	0	152	0	0	0	0	0	111
Lane Group Flow (vph)	74	658	0	0	2606	1337	0	0	0	31	31	8
Heavy Vehicles (%)	38%	7%	2%	2%	3%	1%	2%	2%	2%	40%	50%	3%
Turn Type	Prot				Perm				Perm			
Protected Phases	1	6			2						8	
Permitted Phases						2				8		8
Actuated Green, G (s)	13.7	121.3			101.6	101.6				9.8	9.8	9.8
Effective Green, g (s)	13.7	121.3			101.6	101.6				9.8	9.8	9.8
Actuated g/C Ratio	0.09	0.83			0.70	0.70				0.07	0.07	0.07
Clearance Time (s)	6.0	6.0			6.0	6.0				8.3	8.3	8.3
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	123	2815			2449	1117				83	83	106
v/s Ratio Prot	c0.06	0.20			0.74							
v/s Ratio Perm						c0.84				c0.03	0.03	0.01
v/c Ratio	0.60	0.23			1.06	1.20				0.37	0.37	0.08
Uniform Delay, d1	63.2	2.5			21.9	21.9				64.9	64.9	63.6
Progression Factor	1.00	1.00			1.00	1.00				1.00	1.00	1.00
Incremental Delay, d2	8.0	0.2			38.1	97.7				2.8	2.8	0.3
Delay (s)	71.3	2.7			60.0	119.6				67.7	67.7	63.9
Level of Service	E	A			E	F				E	E	E
Approach Delay (s)		9.6			81.7			0.0			65.2	
Approach LOS		A			F			A			E	
Intersection Summary												
HCM Average Control Delay			70.5				HCM Level of Service			E		
HCM Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			145.4				Sum of lost time (s)			20.3		
Intersection Capacity Utilization			115.1%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: SR 21 & I-95 Northbound Ramps

10/25/2010

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↑↑	↑	↑	↑↑		↑	↑	↑			
Volume (vph)	0	340	70	230	1670	0	240	0	90	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.4	6.4	5.5	6.4		8.8	8.8	8.8			
Lane Util. Factor		0.95	1.00	1.00	0.95		0.95	0.95	1.00			
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (prot)		3085	1272	1770	3505		1618	1618	1380			
Flt Permitted		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		3085	1272	1770	3505		1618	1618	1380			
Peak-hour factor, PHF	0.92	0.79	0.74	0.83	0.75	0.92	0.85	0.50	0.74	0.92	0.92	0.92
Adj. Flow (vph)	0	430	95	277	2227	0	282	0	122	0	0	0
RTOR Reduction (vph)	0	0	43	0	0	0	0	0	8	0	0	0
Lane Group Flow (vph)	0	430	52	277	2227	0	141	141	114	0	0	0
Heavy Vehicles (%)	2%	17%	27%	2%	3%	2%	6%	1%	17%	2%	2%	2%
Turn Type		Perm		Prot			Split		Perm			
Protected Phases		6		5	2		4	4				
Permitted Phases		6							4			
Actuated Green, G (s)		82.1	82.1	29.0	116.6		18.9	18.9	18.9			
Effective Green, g (s)		82.1	82.1	29.0	116.6		18.9	18.9	18.9			
Actuated g/C Ratio		0.54	0.54	0.19	0.77		0.13	0.13	0.13			
Clearance Time (s)		6.4	6.4	5.5	6.4		8.8	8.8	8.8			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		1681	693	341	2712		203	203	173			
v/s Ratio Prot		0.14		0.16	c0.64		c0.09	0.09				
v/s Ratio Perm			0.04						0.08			
v/c Ratio		0.26	0.07	0.81	0.82		0.69	0.69	0.66			
Uniform Delay, d1		18.1	16.3	58.2	10.6		63.1	63.1	62.8			
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00			
Incremental Delay, d2		0.4	0.2	13.7	2.9		9.9	9.9	8.8			
Delay (s)		18.5	16.5	71.9	13.5		73.0	73.0	71.6			
Level of Service		B	B	E	B		E	E	E			
Approach Delay (s)		18.1			20.0			72.6			0.0	
Approach LOS		B			B			E			A	
Intersection Summary												
HCM Average Control Delay		25.9		HCM Level of Service					C			
HCM Volume to Capacity ratio		0.80										
Actuated Cycle Length (s)		150.7		Sum of lost time (s)					15.2			
Intersection Capacity Utilization		115.1%		ICU Level of Service					H			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: O'Leary Road & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	0	20	30	0	20	20	340	70	60	1560	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.8	6.8		6.8	6.8	6.7	6.0	6.0	6.7	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	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)		1172	1599		1492	1442	1228	3195	1599	1671	3471	1357
Flt Permitted		0.73	1.00		0.72	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		899	1599		1127	1442	1228	3195	1599	1671	3471	1357
Peak-hour factor, PHF	0.84	0.50	0.50	0.70	0.50	0.50	0.63	0.88	0.76	0.72	0.85	0.90
Adj. Flow (vph)	60	0	40	43	0	40	32	386	92	83	1835	156
RTOR Reduction (vph)	0	0	36	0	0	36	0	0	26	0	0	31
Lane Group Flow (vph)	0	60	4	0	43	4	32	386	66	83	1835	125
Heavy Vehicles (%)	54%	1%	1%	21%	50%	12%	47%	13%	1%	8%	4%	19%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)		17.6	17.6		17.6	17.6	8.4	128.9	128.9	14.0	134.5	134.5
Effective Green, g (s)		17.6	17.6		17.6	17.6	8.4	128.9	128.9	14.0	134.5	134.5
Actuated g/C Ratio		0.10	0.10		0.10	0.10	0.05	0.72	0.72	0.08	0.75	0.75
Clearance Time (s)		6.8	6.8		6.8	6.8	6.7	6.0	6.0	6.7	6.0	6.0
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)		88	156		110	141	57	2288	1145	130	2594	1014
v/s Ratio Prot							0.03	0.12		c0.05	c0.53	
v/s Ratio Perm		c0.07	0.00		0.04	0.00			0.04			0.09
v/c Ratio		0.68	0.03		0.39	0.03	0.56	0.17	0.06	0.64	0.71	0.12
Uniform Delay, d1		78.5	73.4		76.2	73.5	84.0	8.3	7.6	80.5	12.2	6.3
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		19.6	0.1		2.3	0.1	12.0	0.2	0.1	9.9	1.7	0.2
Delay (s)		98.1	73.5		78.5	73.5	96.0	8.4	7.7	90.4	13.9	6.6
Level of Service		F	E		E	E	F	A	A	F	B	A
Approach Delay (s)		88.3			76.1			13.8			16.4	
Approach LOS		F			E			B			B	
Intersection Summary												
HCM Average Control Delay		20.3										
HCM Volume to Capacity ratio		0.72										
Actuated Cycle Length (s)		180.0										
Intersection Capacity Utilization		76.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

5: Hendley Road & SR 21

10/25/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	150	10	410	1610	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.66	0.81	0.58	0.83	0.85	0.50
Hourly flow rate (vph)	30	185	17	494	1894	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					803	
pX, platoon unblocked	0.68	0.68	0.68			
vC, conflicting volume	2176	947	1894			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1795	0	1384			
tC, single (s)	6.9	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	33	75	95			
cM capacity (veh/h)	45	744	339			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	215	17	247	247	1263	631
Volume Left	30	17	0	0	0	0
Volume Right	185	0	0	0	0	0
cSH	320	339	1700	1700	1700	1700
Volume to Capacity	0.67	0.05	0.15	0.15	0.74	0.37
Queue Length 95th (ft)	114	4	0	0	0	0
Control Delay (s)	35.6	16.2	0.0	0.0	0.0	0.0
Lane LOS	E	C				
Approach Delay (s)	35.6	0.5			0.0	
Approach LOS	E					
Intersection Summary						
Average Delay		3.0				
Intersection Capacity Utilization		60.5%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

6: International Trade Parkway & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	10	0	10	0	410	20	30	1730	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.5	5.5		5.5	5.5	6.1	5.5	
Lane Util. Factor					1.00	1.00		0.95	1.00	1.00	0.95	
Frt					1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected					0.95	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1081	1077		3223	950	1687	3438	
Flt Permitted					0.95	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)					1081	1077		3223	950	1687	3438	
Peak-hour factor, PHF	0.50	0.92	0.50	0.50	0.50	0.50	0.50	0.85	0.52	0.50	0.86	0.50
Adj. Flow (vph)	0	0	0	20	0	20	0	482	38	60	2012	0
RTOR Reduction (vph)	0	0	0	0	0	19	0	0	8	0	0	0
Lane Group Flow (vph)	0	0	0	0	20	1	0	482	30	60	2012	0
Heavy Vehicles (%)	1%	1%	1%	67%	1%	50%	50%	12%	70%	7%	5%	1%
Turn Type	Split			Split		Perm	Perm		Perm	Prot		
Protected Phases	4	4		8	8			6		5	2	
Permitted Phases						8	6		6			
Actuated Green, G (s)					6.7	6.7		125.4	125.4	9.5	141.0	
Effective Green, g (s)					6.7	6.7		125.4	125.4	9.5	141.0	
Actuated g/C Ratio					0.04	0.04		0.79	0.79	0.06	0.89	
Clearance Time (s)					5.5	5.5		5.5	5.5	6.1	5.5	
Vehicle Extension (s)					3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					46	45		2547	751	101	3055	
v/s Ratio Prot					c0.02			0.15		0.04	c0.59	
v/s Ratio Perm						0.00			0.03			
v/c Ratio					0.43	0.02		0.19	0.04	0.59	0.66	
Uniform Delay, d1					74.2	72.8		4.1	3.6	72.7	2.4	
Progression Factor					1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2					6.5	0.2		0.2	0.1	9.0	1.1	
Delay (s)					80.6	73.0		4.3	3.7	81.8	3.5	
Level of Service					F	E		A	A	F	A	
Approach Delay (s)		0.0			76.8			4.2			5.8	
Approach LOS		A			E			A			A	
Intersection Summary												
HCM Average Control Delay			6.5		HCM Level of Service					A		
HCM Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			158.7		Sum of lost time (s)					11.0		
Intersection Capacity Utilization			60.3%		ICU Level of Service					B		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Jimmy DeLoach Parkway & SR 21

10/25/2010

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations	 			 			 
Volume (vph)	210	10	0	420	230	20	1610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		7.5	7.5	6.5	7.5
Lane Util. Factor	0.97	1.00		0.95	1.00	1.00	0.95
Flt	1.00	0.85		1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		1.00	1.00	0.95	1.00
Satd. Flow (prot)	2894	1380		3059	1392	1492	3438
Flt Permitted	0.95	1.00		1.00	1.00	0.95	1.00
Satd. Flow (perm)	2894	1380		3059	1392	1492	3438
Peak-hour factor, PHF	0.80	0.60	0.92	0.85	0.84	0.58	0.92
Adj. Flow (vph)	262	17	0	494	274	34	1750
RTOR Reduction (vph)	0	14	0	0	131	0	0
Lane Group Flow (vph)	262	3	0	494	143	34	1750
Heavy Vehicles (%)	21%	17%	2%	18%	16%	21%	5%
Turn Type	Perm		Prot		Perm	Prot	
Protected Phases	4		5	2		1	6
Permitted Phases		4			2		
Actuated Green, G (s)	13.8	13.8		43.5	43.5	4.3	54.3
Effective Green, g (s)	13.8	13.8		43.5	43.5	4.3	54.3
Actuated g/C Ratio	0.17	0.17		0.52	0.52	0.05	0.65
Clearance Time (s)	8.0	8.0		7.5	7.5	6.5	7.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	478	228		1592	724	77	2233
v/s Ratio Prot	c0.09			0.16		0.02	c0.51
v/s Ratio Perm		0.00			0.10		
v/c Ratio	0.55	0.01		0.31	0.20	0.44	0.78
Uniform Delay, d1	32.0	29.2		11.5	10.7	38.5	10.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.0		0.1	0.1	4.0	1.9
Delay (s)	33.3	29.2		11.6	10.8	42.5	12.3
Level of Service	C	C		B	B	D	B
Approach Delay (s)	33.1			11.3			12.9
Approach LOS	C			B			B
Intersection Summary							
HCM Average Control Delay		14.5		HCM Level of Service		B	
HCM Volume to Capacity ratio		0.74					
Actuated Cycle Length (s)		83.6		Sum of lost time (s)		15.5	
Intersection Capacity Utilization		64.1%		ICU Level of Service		C	
Analysis Period (min)		15					
c Critical Lane Group							

HCM Signalized Intersection Capacity Analysis

8: Bonnybridge Road (SR 30) & SR 21

10/25/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	100	50	600	100	130	1690
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.5	6.5	5.0	6.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1583	1404	3034	1509	1736	3471
Flt Permitted	0.95	1.00	1.00	1.00	0.31	1.00
Satd. Flow (perm)	1583	1404	3034	1509	574	3471
Peak-hour factor, PHF	0.73	0.53	0.92	0.76	0.74	0.96
Adj. Flow (vph)	137	94	652	132	176	1760
RTOR Reduction (vph)	0	75	0	74	0	0
Lane Group Flow (vph)	137	19	652	58	176	1760
Heavy Vehicles (%)	14%	15%	19%	7%	4%	4%
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		6		5	2
Permitted Phases		8		6	2	
Actuated Green, G (s)	16.2	16.2	34.9	34.9	50.2	50.2
Effective Green, g (s)	16.2	16.2	34.9	34.9	50.2	50.2
Actuated g/C Ratio	0.21	0.21	0.44	0.44	0.64	0.64
Clearance Time (s)	6.0	6.0	6.5	6.5	5.0	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	325	288	1342	667	517	2208
v/s Ratio Prot	c0.09		0.21		0.04	c0.51
v/s Ratio Perm		0.01		0.04	0.17	
v/c Ratio	0.42	0.07	0.49	0.09	0.34	0.80
Uniform Delay, d1	27.3	25.3	15.6	12.8	6.5	10.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.1	0.3	0.1	0.4	2.1
Delay (s)	28.2	25.4	15.9	12.8	6.9	12.7
Level of Service	C	C	B	B	A	B
Approach Delay (s)	27.0		15.4			12.1
Approach LOS	C		B			B

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	78.9	Sum of lost time (s)	12.5
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: Gulfstream Road & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩		↩	↩	↩	↕	↩	↩	↕	↩
Volume (vph)	50	10	70	50	10	60	160	590	70	290	1330	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1670	1380		1786	1583	1703	3195	1599	1787	3406	1482
Flt Permitted		0.96	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1670	1380		1786	1583	1703	3195	1599	1787	3406	1482
Peak-hour factor, PHF	0.65	0.92	0.65	0.77	0.92	0.81	0.80	0.92	0.65	0.78	0.92	0.80
Adj. Flow (vph)	77	11	108	65	11	74	200	641	108	372	1446	212
RTOR Reduction (vph)	0	0	99	0	0	68	0	0	44	0	0	61
Lane Group Flow (vph)	0	88	9	0	76	6	200	641	64	372	1446	151
Heavy Vehicles (%)	10%	2%	17%	2%	2%	2%	6%	13%	1%	1%	6%	9%
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3			4			2			6
Actuated Green, G (s)		13.4	13.4		12.0	12.0	23.2	62.6	62.6	37.1	76.5	76.5
Effective Green, g (s)		13.4	13.4		12.0	12.0	23.2	62.6	62.6	37.1	76.5	76.5
Actuated g/C Ratio		0.09	0.09		0.08	0.08	0.15	0.41	0.41	0.24	0.50	0.50
Clearance Time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
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)		146	121		140	124	258	1306	654	433	1702	741
v/s Ratio Prot		c0.05			c0.04		0.12	0.20		c0.21	c0.42	
v/s Ratio Perm			0.01			0.00			0.04			0.10
v/c Ratio		0.60	0.08		0.54	0.05	0.78	0.49	0.10	0.86	0.85	0.20
Uniform Delay, d1		67.3	64.2		67.9	65.3	62.4	33.5	27.9	55.5	33.3	21.3
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		6.8	0.3		4.2	0.2	13.5	0.3	0.1	15.5	4.2	0.1
Delay (s)		74.1	64.5		72.2	65.4	76.0	33.8	27.9	71.0	37.5	21.5
Level of Service		E	E		E	E	E	C	C	E	D	C
Approach Delay (s)		68.8			68.8			42.0			42.0	
Approach LOS		E			E			D			D	
Intersection Summary												
HCM Average Control Delay			44.8				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			153.1				Sum of lost time (s)			28.0		
Intersection Capacity Utilization			73.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Grange Road & SR 21

10/25/2010

								
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT	
Lane Configurations								
Volume (veh/h)	30	20	0	800	60	130	1320	
Sign Control	Stop			Free			Free	
Grade	0%			0%			0%	
Peak Hour Factor	0.50	0.67	0.92	0.87	0.76	0.67	0.99	
Hourly flow rate (vph)	60	30	0	920	79	194	1333	
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None			None	
Median storage (veh)								
Upstream signal (ft)								
pX, platoon unblocked			0.00					
vC, conflicting volume	1974	460	0			998		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	1974	460	0			998		
tC, single (s)	7.8	8.4	0.0			4.5		
tC, 2 stage (s)								
tF (s)	4.0	4.0	0.0			2.4		
p0 queue free %	0	92	0			67		
cM capacity (veh/h)	21	389	0			585		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	90	460	460	79	0	194	667	667
Volume Left	60	0	0	0	0	194	0	0
Volume Right	30	0	0	79	0	0	0	0
cSH	30	1700	1700	1700	1700	585	1700	1700
Volume to Capacity	2.99	0.27	0.27	0.05	0.00	0.33	0.39	0.39
Queue Length 95th (ft)	266	0	0	0	0	36	0	0
Control Delay (s)	1173.5	0.0	0.0	0.0	0.0	14.2	0.0	0.0
Lane LOS	F					B		
Approach Delay (s)	1173.5	0.0				1.8		
Approach LOS	F							
Intersection Summary								
Average Delay		41.4						
Intersection Capacity Utilization		53.2%		ICU Level of Service		A		
Analysis Period (min)		15						

HCM Signalized Intersection Capacity Analysis

11: Bourne Avenue (SR 307) & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	150	190	30	110	50	230	720	30	100	1070	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.5	8.0	8.0	8.5	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1195	2256	1455	1530	2270	902	1752	3374	1538	2036	3471	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1195	2256	1455	1530	2270	902	1752	3374	1538	2036	3471	1442
Peak-hour factor, PHF	0.82	0.77	0.88	0.78	0.65	0.83	0.79	0.81	0.67	0.83	0.88	0.72
Adj. Flow (vph)	110	195	216	38	169	60	291	889	45	120	1216	250
RTOR Reduction (vph)	0	0	123	0	0	53	0	0	16	0	0	125
Lane Group Flow (vph)	110	195	93	38	169	7	291	889	29	120	1216	125
Heavy Vehicles (%)	51%	60%	11%	18%	59%	79%	3%	7%	5%	72%	4%	12%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	23.4	38.4	38.4	8.1	23.1	23.1	39.7	101.7	101.7	17.4	79.4	79.4
Effective Green, g (s)	23.4	38.4	38.4	8.1	23.1	23.1	39.7	101.7	101.7	17.4	79.4	79.4
Actuated g/C Ratio	0.12	0.19	0.19	0.04	0.12	0.12	0.20	0.51	0.51	0.09	0.40	0.40
Clearance Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.5	8.0	8.0	8.5	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	141	437	282	63	265	105	351	1732	790	179	1391	578
v/s Ratio Prot	c0.09	0.09		0.02	c0.07		c0.17	0.26		0.06	c0.35	
v/s Ratio Perm			0.06			0.01			0.02			0.09
v/c Ratio	0.78	0.45	0.33	0.60	0.64	0.07	0.83	0.51	0.04	0.67	0.87	0.22
Uniform Delay, d1	84.9	70.5	68.8	93.4	83.5	77.9	75.9	31.8	23.9	87.6	54.7	38.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.8	0.7	0.7	15.2	5.0	0.3	14.8	0.3	0.0	9.5	6.4	0.2
Delay (s)	108.7	71.2	69.4	108.6	88.5	78.2	90.8	32.1	23.9	97.0	61.1	39.1
Level of Service	F	E	E	F	F	E	F	C	C	F	E	D
Approach Delay (s)		78.4			89.0			45.7			60.4	
Approach LOS		E			F			D			E	
Intersection Summary												
HCM Average Control Delay			60.1				HCM Level of Service			E		
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			198.1				Sum of lost time (s)			32.5		
Intersection Capacity Utilization			87.7%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: SR 21 & Brampton Road

10/25/2010

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	60	1580	0	0	1330	30	0	0	0	50	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.5			6.5					6.5		6.5
Lane Util. Factor	1.00	0.91			0.91					1.00		1.00
Frt	1.00	1.00			1.00					1.00		0.85
Flt Protected	0.95	1.00			1.00					0.95		1.00
Satd. Flow (prot)	1805	4893			4920					1736		1357
Flt Permitted	0.09	1.00			1.00					0.95		1.00
Satd. Flow (perm)	176	4893			4920					1736		1357
Peak-hour factor, PHF	0.76	0.88	0.92	0.92	0.91	0.80	0.50	0.92	0.50	0.83	0.92	0.93
Adj. Flow (vph)	79	1795	0	0	1462	38	0	0	0	60	0	54
RTOR Reduction (vph)	0	0	0	0	2	0	0	0	0	0	0	36
Lane Group Flow (vph)	79	1795	0	0	1498	0	0	0	0	60	0	18
Heavy Vehicles (%)	0%	6%	2%	2%	5%	6%	0%	0%	0%	4%	2%	19%
Turn Type	pm+pt						Split		Perm	custom		custom
Protected Phases	1	6			2		8	8				
Permitted Phases	6								8	4		4
Actuated Green, G (s)	70.0	70.0			58.8					42.0		42.0
Effective Green, g (s)	70.0	70.0			58.8					42.0		42.0
Actuated g/C Ratio	0.56	0.56			0.47					0.34		0.34
Clearance Time (s)	4.5	6.5			6.5					6.5		6.5
Vehicle Extension (s)	3.0	5.0			5.0					3.0		3.0
Lane Grp Cap (vph)	186	2740			2314					583		456
v/s Ratio Prot	0.02	c0.37			0.30							
v/s Ratio Perm	0.21									c0.03		0.01
v/c Ratio	0.42	0.66			0.65					0.10		0.04
Uniform Delay, d1	16.6	19.1			25.2					28.5		27.9
Progression Factor	1.00	1.00			0.64					1.00		1.00
Incremental Delay, d2	1.6	1.2			1.2					0.1		0.0
Delay (s)	18.2	20.3			17.3					28.6		28.0
Level of Service	B	C			B					C		C
Approach Delay (s)		20.3			17.3			0.0			28.3	
Approach LOS		C			B			A			C	
Intersection Summary												
HCM Average Control Delay		19.2			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.45										
Actuated Cycle Length (s)		125.0			Sum of lost time (s)			13.0				
Intersection Capacity Utilization		46.4%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: SR 21 & Minus Avenue

10/25/2010

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	30	1400	70	40	1220	30	120	20	50	30	20	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	16	12
Total Lost time (s)	6.5	6.5		6.5	6.5			7.0			7.0	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.96			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1687	4801		1719	4858			1704			1979	
Flt Permitted	0.95	1.00		0.95	1.00			0.78			0.79	
Satd. Flow (perm)	1687	4801		1719	4858			1364			1602	
Peak-hour factor, PHF	0.52	0.89	0.78	0.77	0.91	0.73	0.77	0.50	0.68	0.78	0.69	0.65
Adj. Flow (vph)	58	1573	90	52	1341	41	156	40	74	38	29	31
RTOR Reduction (vph)	0	4	0	0	2	0	0	12	0	0	15	0
Lane Group Flow (vph)	58	1659	0	52	1380	0	0	258	0	0	83	0
Heavy Vehicles (%)	7%	7%	10%	5%	6%	16%	3%	1%	9%	1%	5%	1%
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	1	6		5	2			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	7.9	69.2		7.6	68.9			28.2			28.2	
Effective Green, g (s)	7.9	69.2		7.6	68.9			28.2			28.2	
Actuated g/C Ratio	0.06	0.55		0.06	0.55			0.23			0.23	
Clearance Time (s)	6.5	6.5		6.5	6.5			7.0			7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	107	2658		105	2678			308			361	
v/s Ratio Prot	c0.03	c0.35		0.03	0.28							
v/s Ratio Perm								c0.19			0.05	
v/c Ratio	0.54	0.62		0.50	0.52			0.84			0.23	
Uniform Delay, d1	56.8	19.0		56.8	17.6			46.2			39.5	
Progression Factor	1.39	0.45		1.00	1.00			1.00			1.00	
Incremental Delay, d2	4.3	0.9		3.6	0.7			17.8			0.3	
Delay (s)	83.4	9.5		60.5	18.3			64.0			39.9	
Level of Service	F	A		E	B			E			D	
Approach Delay (s)		12.0			19.8			64.0			39.9	
Approach LOS		B			B			E			D	
Intersection Summary												
HCM Average Control Delay			19.9			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)			13.5			
Intersection Capacity Utilization			60.9%			ICU Level of Service			B			
Analysis Period (min)			15									
c Critical Lane Group												

Existing
2010
PM Peak Hour

HCM Signalized Intersection Capacity Analysis

1: SR 30 & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	50	200	70	130	40	270	1980	180	50	860	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0	7.0	7.0		7.0	6.4	6.4	7.0	6.4	6.4
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1808	1583	1752	1810		1752	3505	1583	1770	3438	1583
Flt Permitted		0.55	1.00	0.56	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1012	1583	1040	1810		1752	3505	1583	1770	3438	1583
Peak-hour factor, PHF	0.76	0.65	0.87	0.64	0.90	0.81	0.81	0.92	0.83	0.84	0.85	0.75
Adj. Flow (vph)	79	77	230	109	144	49	333	2152	217	60	1012	67
RTOR Reduction (vph)	0	0	190	0	10	0	0	0	25	0	0	37
Lane Group Flow (vph)	0	156	40	109	183	0	333	2152	192	60	1012	30
Heavy Vehicles (%)	4%	1%	2%	3%	1%	1%	3%	3%	2%	2%	5%	2%
Turn Type	Perm		Perm	Perm			Prot		Perm	Prot		Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8					6			2
Actuated Green, G (s)		22.4	22.4	22.4	22.4		28.3	79.1	79.1	8.1	58.9	58.9
Effective Green, g (s)		22.4	22.4	22.4	22.4		28.3	79.1	79.1	8.1	58.9	58.9
Actuated g/C Ratio		0.17	0.17	0.17	0.17		0.22	0.61	0.61	0.06	0.45	0.45
Clearance Time (s)		7.0	7.0	7.0	7.0		7.0	6.4	6.4	7.0	6.4	6.4
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)		174	273	179	312		381	2133	963	110	1558	717
v/s Ratio Prot					0.10		c0.19	c0.61		0.03	0.29	
v/s Ratio Perm		c0.15	0.03	0.10					0.12			0.02
v/c Ratio		0.90	0.15	0.61	0.59		0.87	1.01	0.20	0.55	0.65	0.04
Uniform Delay, d1		52.7	45.7	49.7	49.5		49.1	25.5	11.3	59.2	27.6	19.8
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		39.8	0.2	5.8	2.8		19.4	21.7	0.5	5.4	2.1	0.1
Delay (s)		92.5	45.9	55.5	52.3		68.5	47.1	11.8	64.6	29.7	19.9
Level of Service		F	D	E	D		E	D	B	E	C	B
Approach Delay (s)		64.7			53.5			46.9			30.9	
Approach LOS		E			D			D			C	
Intersection Summary												
HCM Average Control Delay			44.9			HCM Level of Service				D		
HCM Volume to Capacity ratio			1.01									
Actuated Cycle Length (s)			130.0			Sum of lost time (s)			20.4			
Intersection Capacity Utilization			97.7%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: SR 21 & I-95 Southbound Ramps

10/25/2010

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		 			 						 	
Volume (vph)	90	2220	0	0	540	620	0	0	0	100	0	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0	6.0				8.3	8.3	8.3
Lane Util. Factor	1.00	0.95			0.95	1.00				0.95	0.95	1.00
Frt	1.00	1.00			1.00	0.85				1.00	1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)	1337	3539			3438	1583				1234	1234	1553
Flt Permitted	0.95	1.00			1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)	1337	3539			3438	1583				1234	1234	1553
Peak-hour factor, PHF	0.89	0.97	0.92	0.92	0.92	0.88	0.92	0.92	0.92	0.85	0.50	0.83
Adj. Flow (vph)	101	2289	0	0	587	705	0	0	0	118	0	253
RTOR Reduction (vph)	0	0	0	0	0	312	0	0	0	0	0	7
Lane Group Flow (vph)	101	2289	0	0	587	393	0	0	0	59	59	246
Heavy Vehicles (%)	35%	2%	2%	2%	5%	2%	2%	2%	2%	39%	50%	4%
Turn Type	Prot				Perm					Perm		Perm
Protected Phases	1	6			2						8	
Permitted Phases						2				8		8
Actuated Green, G (s)	16.3	103.4			81.1	81.1				27.7	27.7	27.7
Effective Green, g (s)	16.3	103.4			81.1	81.1				27.7	27.7	27.7
Actuated g/C Ratio	0.11	0.71			0.56	0.56				0.19	0.19	0.19
Clearance Time (s)	6.0	6.0			6.0	6.0				8.3	8.3	8.3
Vehicle Extension (s)	3.0	3.0			3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	150	2517			1918	883				235	235	296
v/s Ratio Prot	0.08	c0.65			0.17							
v/s Ratio Perm						0.25				0.05	0.05	c0.16
v/c Ratio	0.67	0.91			0.31	0.45				0.25	0.25	0.83
Uniform Delay, d1	62.0	17.2			17.1	18.9				50.0	50.0	56.6
Progression Factor	1.00	1.00			1.00	1.00				1.00	1.00	1.00
Incremental Delay, d2	11.3	6.2			0.4	1.6				0.6	0.6	17.6
Delay (s)	73.3	23.4			17.6	20.5				50.6	50.6	74.2
Level of Service	E	C			B	C				D	D	E
Approach Delay (s)		25.5			19.2			0.0			66.7	
Approach LOS		C			B			A			E	
Intersection Summary												
HCM Average Control Delay			27.3		HCM Level of Service					C		
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			145.4		Sum of lost time (s)					14.3		
Intersection Capacity Utilization			123.1%		ICU Level of Service					H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

3: SR 21 & I-95 Northbound Ramps

10/25/2010

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	0	1010	110	80	560	0	1300	0	190	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.4	6.4	5.5	6.4		8.8	8.8	8.8			
Lane Util. Factor		0.95	1.00	1.00	0.95		0.95	0.95	1.00			
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85			
Flt Protected		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (prot)		3374	1205	1687	3312		1681	1681	1357			
Flt Permitted		1.00	1.00	0.95	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		3374	1205	1687	3312		1681	1681	1357			
Peak-hour factor, PHF	0.92	0.89	0.83	0.68	0.93	0.92	0.92	0.50	0.81	0.92	0.92	0.92
Adj. Flow (vph)	0	1135	133	118	602	0	1413	0	235	0	0	0
RTOR Reduction (vph)	0	0	75	0	0	0	0	0	110	0	0	0
Lane Group Flow (vph)	0	1135	58	118	602	0	706	707	125	0	0	0
Heavy Vehicles (%)	2%	7%	34%	7%	9%	2%	2%	1%	19%	2%	2%	2%
Turn Type		Perm		Prot			Split		Perm			
Protected Phases		6		5	2		4	4				
Permitted Phases		6							4			
Actuated Green, G (s)		65.6	65.6	15.9	87.0		48.5	48.5	48.5			
Effective Green, g (s)		65.6	65.6	15.9	87.0		48.5	48.5	48.5			
Actuated g/C Ratio		0.44	0.44	0.11	0.58		0.32	0.32	0.32			
Clearance Time (s)		6.4	6.4	5.5	6.4		8.8	8.8	8.8			
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		1469	525	178	1912		541	541	437			
v/s Ratio Prot		c0.34		c0.07	0.18		0.42	c0.42				
v/s Ratio Perm			0.05						0.09			
v/c Ratio		0.77	0.11	0.66	0.31		1.30	1.31	0.29			
Uniform Delay, d1		36.2	25.2	64.8	16.5		51.1	51.1	38.2			
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00			
Incremental Delay, d2		4.0	0.4	8.9	0.4		150.2	151.0	0.4			
Delay (s)		40.2	25.7	73.8	16.9		201.3	202.1	38.5			
Level of Service		D	C	E	B		F	F	D			
Approach Delay (s)		38.7			26.2			178.5			0.0	
Approach LOS		D			C			F			A	
Intersection Summary												
HCM Average Control Delay			99.6			HCM Level of Service			F			
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			150.7			Sum of lost time (s)			20.7			
Intersection Capacity Utilization			123.1%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

4: O'Leary Road & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	90	0	60	40	0	50	30	980	50	50	590	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.8	6.8		6.8	6.8	6.7	6.0	6.0	6.7	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	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)		1188	1392		1583	1346	1157	2215	1524	1504	3343	1129
Flt Permitted		0.72	1.00		0.60	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		900	1392		998	1346	1157	2215	1524	1504	3343	1129
Peak-hour factor, PHF	0.79	0.50	0.72	0.70	0.50	0.78	0.78	0.88	0.69	0.55	0.91	0.86
Adj. Flow (vph)	114	0	83	57	0	64	38	1114	72	91	648	128
RTOR Reduction (vph)	0	0	70	0	0	54	0	0	16	0	0	40
Lane Group Flow (vph)	0	114	13	0	57	10	38	1114	56	91	648	88
Heavy Vehicles (%)	52%	50%	16%	14%	50%	20%	56%	63%	6%	20%	8%	43%
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4		4	8		8			6			2
Actuated Green, G (s)		28.0	28.0		28.0	28.0	9.4	116.9	116.9	15.6	123.1	123.1
Effective Green, g (s)		28.0	28.0		28.0	28.0	9.4	116.9	116.9	15.6	123.1	123.1
Actuated g/C Ratio		0.16	0.16		0.16	0.16	0.05	0.65	0.65	0.09	0.68	0.68
Clearance Time (s)		6.8	6.8		6.8	6.8	6.7	6.0	6.0	6.7	6.0	6.0
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)		140	217		155	209	60	1439	990	130	2286	772
v/s Ratio Prot							0.03	c0.50		c0.06	c0.19	
v/s Ratio Perm		c0.13	0.01		0.06	0.01			0.04			0.08
v/c Ratio		0.81	0.06		0.37	0.05	0.63	0.77	0.06	0.70	0.28	0.11
Uniform Delay, d1		73.5	64.8		68.1	64.7	83.6	22.2	11.5	79.9	11.2	9.7
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		29.1	0.1		1.5	0.1	19.8	4.1	0.1	15.2	0.3	0.3
Delay (s)		102.6	64.9		69.6	64.8	103.4	26.4	11.6	95.1	11.5	10.0
Level of Service		F	E		E	E	F	C	B	F	B	B
Approach Delay (s)		86.7			67.0			27.9			20.0	
Approach LOS		F			E			C			C	
Intersection Summary												
HCM Average Control Delay		31.8										
HCM Volume to Capacity ratio		0.80										
Actuated Cycle Length (s)		180.0										
Intersection Capacity Utilization		60.1%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

5: Hendley Road & SR 21

10/25/2010



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	40	310	1050	590	100
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.87	0.90	0.93	0.90	0.65
Hourly flow rate (vph)	20	46	344	1129	656	154
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		3				
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					803	
pX, platoon unblocked	0.93	0.93	0.93			
vC, conflicting volume	1986	405	809			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1911	213	648			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	42	94	61			
cM capacity (veh/h)	34	741	876			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	66	344	565	565	437	372
Volume Left	20	344	0	0	0	0
Volume Right	46	0	0	0	0	154
cSH	113	876	1700	1700	1700	1700
Volume to Capacity	0.58	0.39	0.33	0.33	0.26	0.22
Queue Length 95th (ft)	71	47	0	0	0	0
Control Delay (s)	70.0	11.7	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	70.0	2.7			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			50.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

6: International Trade Parkway & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	60	0	50	0	1310	20	20	610	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.5	5.5		5.5	5.5	6.1	5.5	
Lane Util. Factor					1.00	1.00		0.95	1.00	1.00	0.95	
Frt					1.00	0.85		1.00	0.85	1.00	1.00	
Flt Protected					0.95	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1467	1417		3282	991	1280	3112	
Flt Permitted					0.95	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)					1467	1417		3282	991	1280	3112	
Peak-hour factor, PHF	0.50	0.92	0.50	0.50	0.50	0.50	0.50	0.93	0.62	0.53	0.85	0.50
Adj. Flow (vph)	0	0	0	120	0	100	0	1409	32	38	718	0
RTOR Reduction (vph)	0	0	0	0	0	96	0	0	6	0	0	0
Lane Group Flow (vph)	0	0	0	0	120	4	0	1409	26	38	718	0
Heavy Vehicles (%)	1%	1%	1%	23%	1%	14%	1%	10%	63%	41%	16%	1%
Turn Type	Split			Split		Perm	Perm		Perm	Prot		
Protected Phases	4	4		8	8			6		5	2	
Permitted Phases						8	6		6			
Actuated Green, G (s)					6.5	6.5		126.7	126.7	8.9	141.7	
Effective Green, g (s)					6.5	6.5		126.7	126.7	8.9	141.7	
Actuated g/C Ratio					0.04	0.04		0.80	0.80	0.06	0.89	
Clearance Time (s)					5.5	5.5		5.5	5.5	6.1	5.5	
Vehicle Extension (s)					3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					60	58		2612	789	72	2770	
v/s Ratio Prot					c0.08			c0.43		c0.03	0.23	
v/s Ratio Perm						0.00			0.03			
v/c Ratio					2.00	0.07		0.54	0.03	0.53	0.26	
Uniform Delay, d1					76.3	73.4		5.8	3.4	73.1	1.3	
Progression Factor					1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2					503.6	0.5		0.8	0.1	6.8	0.2	
Delay (s)					580.0	74.0		6.6	3.5	79.9	1.5	
Level of Service					F	E		A	A	E	A	
Approach Delay (s)		0.0			350.0			6.5			5.4	
Approach LOS		A			F			A			A	
Intersection Summary												
HCM Average Control Delay			37.5				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			159.2				Sum of lost time (s)		17.1			
Intersection Capacity Utilization			48.7%				ICU Level of Service		A			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

7: Jimmy DeLoach Parkway & SR 21

10/25/2010

							
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations	 			 			 
Volume (vph)	220	20	0	1240	540	20	600
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0		7.5	7.5	6.5	7.5
Lane Util. Factor	0.97	1.00		0.95	1.00	1.00	0.95
Flt	1.00	0.85		1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00		1.00	1.00	0.95	1.00
Satd. Flow (prot)	2993	1429		3374	1417	1308	3282
Flt Permitted	0.95	1.00		1.00	1.00	0.95	1.00
Satd. Flow (perm)	2993	1429		3374	1417	1308	3282
Peak-hour factor, PHF	0.85	0.67	0.92	0.94	0.82	0.88	0.88
Adj. Flow (vph)	259	30	0	1319	659	23	682
RTOR Reduction (vph)	0	25	0	0	260	0	0
Lane Group Flow (vph)	259	5	0	1319	399	23	682
Heavy Vehicles (%)	17%	13%	2%	7%	14%	38%	10%
Turn Type	Perm		Prot		Perm		Prot
Protected Phases	4		5	2		1	6
Permitted Phases		4			2		
Actuated Green, G (s)	14.0	14.0		48.4	48.4	2.6	57.5
Effective Green, g (s)	14.0	14.0		48.4	48.4	2.6	57.5
Actuated g/C Ratio	0.16	0.16		0.56	0.56	0.03	0.66
Clearance Time (s)	8.0	8.0		7.5	7.5	6.5	7.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	482	230		1877	788	39	2169
v/s Ratio Prot	c0.09			c0.39		0.02	c0.21
v/s Ratio Perm		0.00			0.28		
v/c Ratio	0.54	0.02		0.70	0.51	0.59	0.31
Uniform Delay, d1	33.5	30.7		14.1	11.9	41.7	6.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.0		1.2	0.5	20.8	0.1
Delay (s)	34.7	30.8		15.3	12.4	62.4	6.4
Level of Service	C	C		B	B	E	A
Approach Delay (s)	34.3			14.3			8.2
Approach LOS	C			B			A
Intersection Summary							
HCM Average Control Delay			14.8		HCM Level of Service		B
HCM Volume to Capacity ratio			0.68				
Actuated Cycle Length (s)			87.0		Sum of lost time (s)		23.0
Intersection Capacity Utilization			53.9%		ICU Level of Service		A
Analysis Period (min)			15				
c Critical Lane Group							

HCM Signalized Intersection Capacity Analysis

8: Bonnybridge Road (SR 30) & SR 21

10/25/2010



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	130	90	1690	190	50	770
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.5	6.5	5.0	6.5
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1517	1313	3471	1380	1492	3059
Flt Permitted	0.95	1.00	1.00	1.00	0.06	1.00
Satd. Flow (perm)	1517	1313	3471	1380	96	3059
Peak-hour factor, PHF	0.79	0.87	0.98	0.93	0.93	0.88
Adj. Flow (vph)	165	103	1724	204	54	875
RTOR Reduction (vph)	0	85	0	53	0	0
Lane Group Flow (vph)	165	18	1724	151	54	875
Heavy Vehicles (%)	19%	23%	4%	17%	21%	18%
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		6		5	2
Permitted Phases		8		6	2	
Actuated Green, G (s)	17.8	17.8	60.4	60.4	72.7	72.7
Effective Green, g (s)	17.8	17.8	60.4	60.4	72.7	72.7
Actuated g/C Ratio	0.17	0.17	0.59	0.59	0.71	0.71
Clearance Time (s)	6.0	6.0	6.5	6.5	5.0	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	262	227	2035	809	167	2159
v/s Ratio Prot	c0.11		c0.50		0.02	c0.29
v/s Ratio Perm		0.01		0.11	0.21	
v/c Ratio	0.63	0.08	0.85	0.19	0.32	0.41
Uniform Delay, d1	39.5	35.7	17.5	9.9	15.3	6.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7	0.1	3.5	0.1	1.1	0.1
Delay (s)	44.2	35.9	21.0	10.0	16.4	6.4
Level of Service	D	D	C	B	B	A
Approach Delay (s)	41.0		19.8			7.0
Approach LOS	D		B			A

Intersection Summary

HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	103.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: Gulfstream Road & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	10	160	60	10	320	160	1410	90	130	720	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1639	1568		1788	1599	1626	3252	1568	1787	3167	1302
Flt Permitted		0.96	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1639	1568		1788	1599	1626	3252	1568	1787	3167	1302
Peak-hour factor, PHF	0.67	0.50	0.71	0.75	0.75	0.60	0.74	0.93	0.73	0.86	0.85	0.80
Adj. Flow (vph)	224	20	225	80	13	533	216	1516	123	151	847	62
RTOR Reduction (vph)	0	0	195	0	0	151	0	0	20	0	0	27
Lane Group Flow (vph)	0	244	30	0	93	382	216	1516	103	151	847	35
Heavy Vehicles (%)	10%	20%	3%	2%	1%	1%	11%	11%	3%	1%	14%	24%
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	3	3		4	4		5	2		1	6	
Permitted Phases			3			4			2			6
Actuated Green, G (s)		25.0	25.0		38.0	38.0	28.5	82.0	82.0	17.0	70.5	70.5
Effective Green, g (s)		25.0	25.0		38.0	38.0	28.5	82.0	82.0	17.0	70.5	70.5
Actuated g/C Ratio		0.13	0.13		0.20	0.20	0.15	0.43	0.43	0.09	0.37	0.37
Clearance Time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
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)		216	206		358	320	244	1403	677	160	1175	483
v/s Ratio Prot		c0.15			0.05		c0.13	c0.47		0.08	0.27	
v/s Ratio Perm			0.02			c0.24			0.07			0.03
v/c Ratio		1.13	0.14		0.26	1.19	0.89	1.08	0.15	0.94	0.72	0.07
Uniform Delay, d1		82.5	73.0		64.1	76.0	79.1	54.0	32.8	86.0	51.3	38.6
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		100.5	0.3		0.4	113.5	29.3	49.0	0.1	54.3	2.2	0.1
Delay (s)		183.0	73.3		64.5	189.5	108.5	103.0	32.9	140.3	53.5	38.7
Level of Service		F	E		E	F	F	F	C	F	D	D
Approach Delay (s)		130.4			170.9			99.0			65.0	
Approach LOS		F			F			F			E	
Intersection Summary												
HCM Average Control Delay			104.9				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.12									
Actuated Cycle Length (s)			190.0				Sum of lost time (s)			28.0		
Intersection Capacity Utilization			85.1%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

10: Grange Road & SR 21

10/25/2010

								
Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT	
Lane Configurations								
Volume (veh/h)	120	160	0	1500	50	70	870	
Sign Control	Stop			Free			Free	
Grade	0%			0%			0%	
Peak Hour Factor	0.74	0.69	0.92	0.74	0.75	0.71	0.92	
Hourly flow rate (vph)	162	232	0	2027	67	99	946	
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)								
Median type				None			None	
Median storage (veh)								
Upstream signal (ft)								
pX, platoon unblocked			0.00					
vC, conflicting volume	2697	1014	0			2094		
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	2697	1014	0			2094		
tC, single (s)	7.5	7.6	0.0			5.2		
tC, 2 stage (s)								
tF (s)	3.8	3.6	0.0			2.7		
p0 queue free %	0	0	0			24		
cM capacity (veh/h)	2	187	0			129		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3
Volume Total	394	1014	1014	67	0	99	473	473
Volume Left	162	0	0	0	0	99	0	0
Volume Right	232	0	0	67	0	0	0	0
cSH	6	1700	1700	1700	1700	129	1700	1700
Volume to Capacity	66.28	0.60	0.60	0.04	0.00	0.76	0.28	0.28
Queue Length 95th (ft)	Err	0	0	0	0	112	0	0
Control Delay (s)	Err	0.0	0.0	0.0	0.0	91.0	0.0	0.0
Lane LOS	F					F		
Approach Delay (s)	Err	0.0				8.6		
Approach LOS	F							
Intersection Summary								
Average Delay		1118.1						
Intersection Capacity Utilization		71.8%		ICU Level of Service			C	
Analysis Period (min)		15						

HCM Signalized Intersection Capacity Analysis

11: Bourne Avenue (SR 307) & SR 21

10/25/2010

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	60	340	50	240	200	180	1210	30	60	800	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.5	8.0	8.0	8.5	8.0	8.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1467	2597	1509	1570	2329	1077	1656	3471	1442	2366	3312	1179
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1467	2597	1509	1570	2329	1077	1656	3471	1442	2366	3312	1179
Peak-hour factor, PHF	0.81	0.65	0.75	0.68	0.67	0.77	0.83	0.84	0.81	0.73	0.95	0.88
Adj. Flow (vph)	173	92	453	74	358	260	217	1440	37	82	842	148
RTOR Reduction (vph)	0	0	271	0	0	118	0	0	7	0	0	95
Lane Group Flow (vph)	173	92	182	74	358	142	217	1440	30	82	842	53
Heavy Vehicles (%)	23%	39%	7%	15%	55%	50%	9%	4%	12%	48%	9%	37%
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	30.2	53.3	53.3	15.5	38.6	38.6	33.9	97.7	97.7	11.0	74.8	74.8
Effective Green, g (s)	30.2	53.3	53.3	15.5	38.6	38.6	33.9	97.7	97.7	11.0	74.8	74.8
Actuated g/C Ratio	0.14	0.25	0.25	0.07	0.18	0.18	0.16	0.47	0.47	0.05	0.36	0.36
Clearance Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.5	8.0	8.0	8.5	8.0	8.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	211	659	383	116	428	198	267	1615	671	124	1180	420
v/s Ratio Prot	c0.12	0.04		0.05	c0.15		c0.13	c0.41		0.03	0.25	
v/s Ratio Perm			0.12			0.13			0.02			0.04
v/c Ratio	0.82	0.14	0.48	0.64	0.84	0.72	0.81	0.89	0.04	0.66	0.71	0.13
Uniform Delay, d1	87.3	60.6	66.5	94.5	82.7	80.5	85.0	51.3	30.7	97.7	58.4	45.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	21.4	0.1	0.9	11.0	13.3	11.6	17.0	6.7	0.0	12.5	2.1	0.1
Delay (s)	108.6	60.7	67.4	105.5	95.9	92.1	101.9	58.0	30.7	110.1	60.4	45.7
Level of Service	F	E	E	F	F	F	F	E	C	F	E	D
Approach Delay (s)		76.5			95.5			63.0			62.2	
Approach LOS		E			F			E			E	
Intersection Summary												
HCM Average Control Delay			70.5			HCM Level of Service				E		
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			210.0			Sum of lost time (s)			32.5			
Intersection Capacity Utilization			86.6%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

12: SR 21 & Brampton Road

10/25/2010

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	10	1350	0	0	1630	20	0	0	0	80	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	6.5			6.5					6.5		6.5
Lane Util. Factor	1.00	0.91			0.91					1.00		1.00
Frt	1.00	1.00			1.00					1.00		0.85
Flt Protected	0.95	1.00			1.00					0.95		1.00
Satd. Flow (prot)	1399	4893			5013					1752		1417
Flt Permitted	0.06	1.00			1.00					0.95		1.00
Satd. Flow (perm)	85	4893			5013					1752		1417
Peak-hour factor, PHF	0.50	0.96	0.92	0.92	0.89	0.53	0.92	0.92	0.92	0.82	0.92	0.71
Adj. Flow (vph)	20	1406	0	0	1831	38	0	0	0	98	0	85
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	0	58
Lane Group Flow (vph)	20	1406	0	0	1868	0	0	0	0	98	0	27
Heavy Vehicles (%)	29%	6%	2%	2%	3%	11%	0%	0%	0%	3%	2%	14%
Turn Type	pm+pt						Split		Perm	custom		custom
Protected Phases	1	6			2		8	8				
Permitted Phases	6								8	4		4
Actuated Green, G (s)	72.5	72.5			65.2					39.5		39.5
Effective Green, g (s)	72.5	72.5			65.2					39.5		39.5
Actuated g/C Ratio	0.58	0.58			0.52					0.32		0.32
Clearance Time (s)	4.5	6.5			6.5					6.5		6.5
Vehicle Extension (s)	3.0	5.0			5.0					3.0		3.0
Lane Grp Cap (vph)	79	2838			2615					554		448
v/s Ratio Prot	0.01	c0.29			c0.37							
v/s Ratio Perm	0.14									c0.06		0.02
v/c Ratio	0.25	0.50			0.71					0.18		0.06
Uniform Delay, d1	16.7	15.5			22.8					31.0		29.8
Progression Factor	1.00	1.00			0.50					1.00		1.00
Incremental Delay, d2	1.7	0.6			1.3					0.2		0.1
Delay (s)	18.3	16.1			12.7					31.1		29.9
Level of Service	B	B			B					C		C
Approach Delay (s)		16.1			12.7			0.0			30.5	
Approach LOS		B			B			A			C	
Intersection Summary												
HCM Average Control Delay			15.1		HCM Level of Service					B		
HCM Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			125.0		Sum of lost time (s)					19.5		
Intersection Capacity Utilization			49.4%		ICU Level of Service					A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

13: SR 21 & Minus Avenue

10/25/2010

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	50	1350	90	50	1420	80	130	30	30	70	30	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	16	12
Total Lost time (s)	6.5	6.5		6.5	6.5			7.0			7.0	
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.98			0.95	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.98	
Satd. Flow (prot)	1736	4854		1671	4999			1747			1906	
Flt Permitted	0.95	1.00		0.95	1.00			0.61			0.79	
Satd. Flow (perm)	1736	4854		1671	4999			1093			1539	
Peak-hour factor, PHF	0.80	0.93	0.73	0.67	0.86	0.87	0.88	0.85	0.75	0.71	0.66	0.82
Adj. Flow (vph)	62	1452	123	75	1651	92	148	35	40	99	45	98
RTOR Reduction (vph)	0	6	0	0	4	0	0	7	0	0	22	0
Lane Group Flow (vph)	62	1569	0	75	1739	0	0	216	0	0	220	0
Heavy Vehicles (%)	4%	6%	1%	8%	3%	2%	2%	1%	7%	4%	1%	7%
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	1	6		5	2			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	8.0	67.1		9.3	68.4			28.6			28.6	
Effective Green, g (s)	8.0	67.1		9.3	68.4			28.6			28.6	
Actuated g/C Ratio	0.06	0.54		0.07	0.55			0.23			0.23	
Clearance Time (s)	6.5	6.5		6.5	6.5			7.0			7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	111	2606		124	2735			250			352	
v/s Ratio Prot	0.04	0.32		c0.04	c0.35							
v/s Ratio Perm								c0.20			0.14	
v/c Ratio	0.56	0.60		0.60	0.64			0.86			0.63	
Uniform Delay, d1	56.8	19.8		56.1	19.7			46.3			43.4	
Progression Factor	1.09	0.68		1.00	1.00			1.00			1.00	
Incremental Delay, d2	5.5	1.0		8.1	1.1			25.2			3.5	
Delay (s)	67.5	14.3		64.1	20.8			71.5			46.8	
Level of Service	E	B		E	C			E			D	
Approach Delay (s)		16.4			22.6			71.5			46.8	
Approach LOS		B			C			E			D	
Intersection Summary												
HCM Average Control Delay			24.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)			13.5			
Intersection Capacity Utilization			67.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												