
























# HCM Signalized Intersection Capacity Analysis

## 1: Woodruff Road & Roper Mountain Road

2035 PM Woodruff Improvements

7/6/2011























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	458	515	77	202	889	633	58	755	177	726	755	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0	6.0	6.0	6.0	6.0	5.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Flt Protected	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3371		1719	3438	1538	1719	3438	1538	3335	3438	1538
Satd. Flow (perm)	278	3371		532	3438	1538	608	3438	1538	3335	3438	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	509	572	86	224	988	703	64	839	197	807	839	117
RTOR Reduction (vph)	0	12	0	0	0	300	0	0	132	0	0	64
Lane Group Flow (vph)	509	646	0	224	988	403	64	839	65	807	839	53
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Prot		Perm
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4			8		8	2		2			6
Actuated Green, G (s)	43.0	27.4		33.6	22.0	22.0	22.0	22.0	22.0	18.0	45.0	45.0
Effective Green, g (s)	43.0	27.4		33.6	22.0	22.0	22.0	22.0	22.0	18.0	45.0	45.0
Actuated g/C Ratio	0.43	0.27		0.34	0.22	0.22	0.22	0.22	0.22	0.18	0.45	0.45
Clearance Time (s)	4.0	6.0		4.0	6.0	6.0	6.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	4.3	5.5		4.3	5.5	5.5	4.9	4.9	4.9	4.3	4.9	4.9
Lane Grp Cap (vph)	365	924		316	756	338	134	756	338	600	1547	692
v/s Ratio Prot	c0.24	0.19		0.08	0.29			c0.24		c0.24	0.24	
v/s Ratio Perm	c0.36			0.16		0.26	0.11		0.04			0.03
v/c Ratio	1.39	0.70		0.71	1.31	1.19	0.48	1.11	0.19	1.34	0.54	0.08
Uniform Delay, d1	28.1	32.6		25.6	39.0	39.0	34.0	39.0	31.8	41.0	20.0	15.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	0.77	0.58	0.22
Incremental Delay, d2	193.5	3.2		7.9	147.6	112.6	11.7	67.1	1.3	156.3	0.1	0.0
Delay (s)	221.6	35.8		33.5	186.6	151.6	45.7	106.1	33.0	187.9	11.8	3.4
Level of Service	F	D		C	F	F	D	F	C	F	B	A
Approach Delay (s)		116.9			155.8			89.5			91.8	
Approach LOS		F			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay		116.9			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.26										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			15.0				
Intersection Capacity Utilization		109.0%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 2: Woodruff Road & Costco Driveway

2035 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	21	1239	137	305	1811	65	151	6	324	59	4	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5		6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Flt Protected	1.00	0.99		1.00	1.00	0.85	1.00	0.85		1.00	1.00	0.85
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	3387		1719	3438	1538	1719	1543		1719	1810	1538
Satd. Flow (perm)	81	3387		303	3438	1538	1366	1543		629	1810	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	1377	152	339	2012	72	168	7	360	66	4	53
RTOR Reduction (vph)	0	7	0	0	0	14	0	99	0	0	0	16
Lane Group Flow (vph)	23	1522	0	339	2012	58	168	268	0	66	4	37
Turn Type	pm+pt			Perm		Perm	Perm			Perm		pm+ov
Protected Phases	5	2			6			8			4	5
Permitted Phases	2			6		6	8			4		4
Actuated Green, G (s)	95.5	95.5		82.6	82.6	82.6	11.5	11.5		11.5	11.5	17.9
Effective Green, g (s)	95.5	95.5		82.6	82.6	82.6	11.5	11.5		11.5	11.5	17.9
Actuated g/C Ratio	0.80	0.80		0.69	0.69	0.69	0.10	0.10		0.10	0.10	0.15
Clearance Time (s)	6.5	6.5		6.5	6.5	6.5	6.5	6.5		6.5	6.5	6.5
Vehicle Extension (s)	4.3	5.5		5.5	5.5	5.5	5.5	5.5		5.5	5.5	4.3
Lane Grp Cap (vph)	152	2695		209	2366	1059	131	148		60	173	313
v/s Ratio Prot	0.01	c0.45			0.59			c0.17			0.00	0.01
v/s Ratio Perm	0.11			c1.12		0.04	0.12			0.10		0.02
v/c Ratio	0.15	0.56		1.62	0.85	0.06	1.28	1.81		1.10	0.02	0.12
Uniform Delay, d1	16.0	4.5		18.7	14.1	6.1	54.2	54.2		54.2	49.2	44.2
Progression Factor	1.00	1.00		0.53	0.42	0.29	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.7	0.9		297.5	3.4	0.1	172.9	388.9		146.4	0.1	0.3
Delay (s)	16.7	5.4		307.4	9.4	1.9	227.2	443.2		200.7	49.3	44.5
Level of Service	B	A		F	A	A	F	F		F	D	D
Approach Delay (s)		5.6			50.9			375.3			128.4	
Approach LOS		A			D			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			75.2			HCM Level of Service			E			
HCM Volume to Capacity ratio			1.60									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			19.5			
Intersection Capacity Utilization			112.3%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 3: Green Heron Road & Woodruff Road

2035 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	35	2	97	20	4	135	113	2125	18	4	1656	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	6.3	6.3		6.3	6.3	6.3
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	0.95	1.00
Frt		0.90			1.00	0.85	1.00	1.00		1.00	1.00	0.85
Flt Protected		0.99			0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1611			1736	1538	1719	3434		1719	3438	1538
Flt Permitted		0.90			0.42	1.00	0.10	1.00		0.04	1.00	1.00
Satd. Flow (perm)		1473			767	1538	177	3434		74	3438	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	39	2	108	22	4	150	126	2361	20	4	1840	4
RTOR Reduction (vph)	0	19	0	0	0	48	0	1	0	0	0	1
Lane Group Flow (vph)	0	130	0	0	26	102	126	2380	0	4	1840	3
Turn Type	Perm			Perm		Perm	Perm			Perm		Perm
Protected Phases		8			4			2			6	
Permitted Phases	8			4		4	2			6		6
Actuated Green, G (s)		11.0			11.0	11.0	97.7	97.7		97.7	97.7	97.7
Effective Green, g (s)		11.0			11.0	11.0	97.7	97.7		97.7	97.7	97.7
Actuated g/C Ratio		0.09			0.09	0.09	0.81	0.81		0.81	0.81	0.81
Clearance Time (s)		5.0			5.0	5.0	6.3	6.3		6.3	6.3	6.3
Vehicle Extension (s)		4.3			4.3	4.3	5.5	5.5		5.5	5.5	5.5
Lane Grp Cap (vph)		135			70	141	144	2796		60	2799	1252
v/s Ratio Prot								0.69			0.54	
v/s Ratio Perm		c0.09			0.03	0.07	c0.71			0.05		0.00
v/c Ratio		0.96			0.37	0.72	0.88	0.85		0.07	0.66	0.00
Uniform Delay, d1		54.3			51.2	53.0	7.2	6.8		2.2	4.5	2.1
Progression Factor		1.00			1.00	1.00	0.97	0.95		1.99	2.62	1.92
Incremental Delay, d2		66.0			5.2	18.3	42.1	3.0		0.2	0.1	0.0
Delay (s)		120.3			56.4	71.3	49.1	9.4		4.5	11.8	4.0
Level of Service		F			E	E	D	A		A	B	A
Approach Delay (s)		120.3			69.1			11.4			11.8	
Approach LOS		F			E			B			B	
<b>Intersection Summary</b>												
HCM Average Control Delay		17.2										
HCM Volume to Capacity ratio		0.88										
Actuated Cycle Length (s)		120.0										
Intersection Capacity Utilization		113.7%										
Analysis Period (min)		15										
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 4: Woodruff Industrial Lane & Woodruff Road

2035 PM Woodruff Improvements

7/6/2011


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	232	52	427	313	47	45	85	2037	120	346	1387	374
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		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.93		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1568		1719	1676		1719	3409		1719	3328	
Flt Permitted	0.59	1.00		0.22	1.00		0.07	1.00		0.07	1.00	
Satd. Flow (perm)	1064	1568		402	1676		132	3409		121	3328	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	258	58	474	348	52	50	94	2263	133	384	1541	416
RTOR Reduction (vph)	0	68	0	0	29	0	0	4	0	0	21	0
Lane Group Flow (vph)	258	464	0	348	73	0	94	2392	0	384	1937	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)	34.0	21.0		28.0	18.0		60.0	55.0		70.0	60.0	
Effective Green, g (s)	34.0	21.0		28.0	18.0		60.0	55.0		70.0	60.0	
Actuated g/C Ratio	0.28	0.18		0.23	0.15		0.50	0.46		0.58	0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.3	4.3		4.3	4.3		4.3	5.5		4.3	5.5	
Lane Grp Cap (vph)	372	274		204	251		132	1562		204	1664	
v/s Ratio Prot	0.08	c0.30		c0.14	0.04		0.03	0.70		c0.16	0.58	
v/s Ratio Perm	0.12			0.26			0.33			c0.95		
v/c Ratio	0.69	1.69		1.71	0.29		0.71	1.53		1.88	1.16	
Uniform Delay, d1	36.8	49.5		43.3	45.3		27.3	32.5		38.2	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.17	0.83		0.92	0.98	
Incremental Delay, d2	6.2	327.9		337.7	1.0		9.7	240.8		408.1	78.1	
Delay (s)	43.0	377.4		381.0	46.4		41.6	267.8		443.3	107.6	
Level of Service	D	F		F	D		D	F		F	F	
Approach Delay (s)		268.2			305.1			259.2			162.6	
Approach LOS		F			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay		226.5			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.88										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			24.0				
Intersection Capacity Utilization		145.7%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 5: I-85 SB Ramps & Woodruff Road

2035 PM Woodruff Improvements

7/6/2011












																		
Movement	WBL2	WBL	WBR	SEL	SET	SER	NWL	NWT	NWR	NEL	NER							
Lane Configurations																		
Volume (vph)	541	0	340	0	2366	411	1007	1767	0	0	0							
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900							
Total Lost time (s)	5.0		5.0		6.3	6.3	6.5	6.1										
Lane Util. Factor	0.97		0.88		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)	3335		2707		3438	1538	1719	3438										
Flt Permitted	0.95		1.00		1.00	1.00	0.07	1.00										
Satd. Flow (perm)	3335		2707		3438	1538	118	3438										
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90							
Adj. Flow (vph)	601	0	378	0	2629	457	1119	1963	0	0	0							
RTOR Reduction (vph)	0	0	68	0	0	109	0	0	0	0	0							
Lane Group Flow (vph)	601	0	310	0	2629	348	1119	1963	0	0	0							
Turn Type	custom		custom		Perm		pm+pt											
Protected Phases					2		1		6									
Permitted Phases	4		4		2		6											
Actuated Green, G (s)	11.0		11.0		54.7		97.9		97.9									
Effective Green, g (s)	11.0		11.0		54.7		97.9		97.9									
Actuated g/C Ratio	0.09		0.09		0.46		0.82		0.82									
Clearance Time (s)	5.0		5.0		6.3		6.5		6.1									
Vehicle Extension (s)	4.3		4.3		4.3		4.3		4.3									
Lane Grp Cap (vph)	306		248		1567		701		583		2805							
v/s Ratio Prot					0.76		c0.58		0.57									
v/s Ratio Perm	c0.18		0.11				0.23		c0.98									
v/c Ratio	1.96		1.25		1.68		0.50		1.92		0.70							
Uniform Delay, d1	54.5		54.5		32.6		23.0		37.4		4.7							
Progression Factor	1.00		1.00		0.52		0.28		1.01		0.78							
Incremental Delay, d2	445.5		141.2		305.2		0.2		414.3		0.1							
Delay (s)	500.0		195.7		322.3		6.6		452.0		3.8							
Level of Service	F		F		F		A		F		A							
Approach Delay (s)			382.5		275.6				166.5		0.0							
Approach LOS			F		F				F		A							
<b>Intersection Summary</b>																		
HCM Average Control Delay			243.2		HCM Level of Service		F											
HCM Volume to Capacity ratio			1.86															
Actuated Cycle Length (s)			120.0		Sum of lost time (s)		11.5											
Intersection Capacity Utilization			150.3%		ICU Level of Service		H											
Analysis Period (min)			15															
c Critical Lane Group																		

# HCM Signalized Intersection Capacity Analysis

## 6: I-85 NB Ramps & Woodruff Road

2035 PM Woodruff Improvements

7/6/2011

						
Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	753	823	1359	1548	0	2021
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.6	5.6	6.5	6.5		6.5
Lane Util. Factor	0.97	0.88	0.95	1.00		0.95
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3335	2707	3438	1538		3438
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	3335	2707	3438	1538		3438
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	837	914	1510	1720	0	2246
RTOR Reduction (vph)	0	268	0	505	0	0
Lane Group Flow (vph)	837	646	1510	1215	0	2246
Turn Type		Prot		Perm		
Protected Phases	3	3	2			2 4
Permitted Phases				2		
Actuated Green, G (s)	24.4	24.4	64.5	64.5		83.5
Effective Green, g (s)	24.4	24.4	64.5	64.5		76.5
Actuated g/C Ratio	0.20	0.20	0.54	0.54		0.64
Clearance Time (s)	5.6	5.6	6.5	6.5		
Vehicle Extension (s)	4.3	4.3	4.3	4.3		
Lane Grp Cap (vph)	678	550	1848	827		2192
v/s Ratio Prot	c0.25	0.24	0.44			c0.65
v/s Ratio Perm				c0.79		
v/c Ratio	1.23	1.17	0.82	1.47		1.02
Uniform Delay, d1	47.8	47.8	22.9	27.8		21.8
Progression Factor	1.00	1.00	1.00	4.96		0.93
Incremental Delay, d2	118.0	96.1	0.4	212.0		13.6
Delay (s)	165.8	143.9	23.2	349.7		33.9
Level of Service	F	F	C	F		C
Approach Delay (s)	154.4		197.1			33.9
Approach LOS	F		F			C
<b>Intersection Summary</b>						
HCM Average Control Delay			136.0		HCM Level of Service	F
HCM Volume to Capacity ratio			1.35			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	18.6
Intersection Capacity Utilization			101.3%		ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						










# HCM Signalized Intersection Capacity Analysis

## 7: Carolina Point Pkwy & Woodruff Road

2035 PM Woodruff Improvements

7/6/2011



























Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	 		 			 
Volume (vph)	324	119	2035	147	30	3362
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	6.5	6.5	6.5	6.5
Lane Util. Factor	0.97	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)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.04	1.00
Satd. Flow (perm)	3335	1538	3438	1538	81	3438
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	360	132	2261	163	33	3736
RTOR Reduction (vph)	0	20	0	33	0	0
Lane Group Flow (vph)	360	112	2261	130	33	3736
Turn Type	Perm		Perm		Perm	
Protected Phases	4		2 3 6			2 3 6
Permitted Phases	4	4		2 3 6	2 3 6	
Actuated Green, G (s)	12.0	12.0	95.4	95.4	95.4	95.4
Effective Green, g (s)	12.0	12.0	95.4	95.4	95.4	95.4
Actuated g/C Ratio	0.10	0.10	0.80	0.80	0.80	0.80
Clearance Time (s)	7.0	7.0				
Vehicle Extension (s)	4.3	4.3				
Lane Grp Cap (vph)	334	154	2733	1223	64	2733
v/s Ratio Prot	c0.11		0.66			c1.09
v/s Ratio Perm		0.07		0.08	0.41	
v/c Ratio	1.08	0.73	0.83	0.11	0.52	1.37
Uniform Delay, d1	54.0	52.4	7.4	2.8	4.3	12.3
Progression Factor	1.00	1.00	0.42	0.47	0.97	1.29
Incremental Delay, d2	71.6	17.4	0.9	0.0	1.0	165.4
Delay (s)	125.6	69.8	4.0	1.3	5.1	181.2
Level of Service	F	E	A	A	A	F
Approach Delay (s)	110.6		3.8			179.7
Approach LOS	F		A			F
Intersection Summary						
HCM Average Control Delay			110.8	HCM Level of Service		F
HCM Volume to Capacity ratio			1.35			
Actuated Cycle Length (s)			120.0	Sum of lost time (s)		13.5
Intersection Capacity Utilization			113.4%	ICU Level of Service		H
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 8: Woodruff Road & Market Point Drive

2035 PM Woodruff Improvements

7/6/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	742	1260	152	109	2612	233	239	42	107	336	42	541
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1	5.8	6.1	6.1	6.1	5.8	5.8	6.1	5.8	5.8	5.8
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	1.00	1.00	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)	3335	3438	1538	1719	3438	1538	1719	1810	1538	3335	3438	1538
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)	3335	3438	1538	1719	3438	1538	1719	1810	1538	3335	3438	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	824	1400	169	121	2902	259	266	47	119	373	47	601
RTOR Reduction (vph)	0	0	62	0	0	56	0	0	23	0	0	201
Lane Group Flow (vph)	824	1400	107	121	2902	203	266	47	96	373	47	400
Turn Type	Prot	pm+ov		Prot	Perm		Prot	pm+ov		Prot	Perm	
Protected Phases	5	2	3	1	6	3		8	1	7	4	
Permitted Phases	2					6		8		4		
Actuated Green, G (s)	15.9	62.8	73.0	12.0	58.9	58.9	10.2	6.8	18.8	14.6	11.2	11.2
Effective Green, g (s)	15.9	62.8	73.0	12.0	58.9	58.9	10.2	6.8	18.8	14.6	11.2	11.2
Actuated g/C Ratio	0.13	0.52	0.61	0.10	0.49	0.49	0.08	0.06	0.16	0.12	0.09	0.09
Clearance Time (s)	6.1	6.1	5.8	6.1	6.1	6.1	5.8	5.8	6.1	5.8	5.8	5.8
Vehicle Extension (s)	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Lane Grp Cap (vph)	442	1799	936	172	1687	755	146	103	241	406	321	144
v/s Ratio Prot	c0.25	0.41	0.01	0.07	c0.84	c0.15		0.03	0.04	0.11	0.01	
v/s Ratio Perm	0.06					0.13		0.02		c0.26		
v/c Ratio	1.86	0.78	0.11	0.70	1.72	0.27	1.82	0.46	0.40	0.92	0.15	2.78
Uniform Delay, d1	52.0	23.0	9.9	52.3	30.6	17.9	54.9	54.8	45.5	52.1	50.0	54.4
Progression Factor	1.21	0.94	1.62	0.66	0.41	0.19	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	393.5	1.8	0.0	1.3	324.3	0.1	395.4	5.0	1.7	25.9	0.3	818.2
Delay (s)	456.6	23.5	16.1	35.7	336.8	3.4	450.3	59.8	47.2	78.1	50.3	872.6
Level of Service	F	C	B	D	F	A	F	E	D	E	D	F
Approach Delay (s)	172.1		299.4		296.8		544.5					
Approach LOS	F		F		F		F					
Intersection Summary												
HCM Average Control Delay			291.6		HCM Level of Service			F				
HCM Volume to Capacity ratio			1.88									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)			23.8				
Intersection Capacity Utilization			133.7%		ICU Level of Service			H				
Analysis Period (min)			15									
c Critical Lane Group												



























# HCM Signalized Intersection Capacity Analysis

## 9: Woodruff Road & Garlington Road

2035 PM Woodruff Improvements

7/6/2011


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	259	1184	260	238	2315	234	379	214	169	478	395	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.2	6.1	6.1	5.2	6.1	6.1	5.2	5.2		5.2	5.2	4.0
Lane Util. Factor	0.97	0.95	1.00	1.00	0.95	1.00	0.97	1.00		0.97	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	3335	3438	1538	1719	3438	1538	3335	1690		3335	1810	1538
Flt Permitted	0.95	1.00	1.00	0.07	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3335	3438	1538	127	3438	1538	3335	1690		3335	1810	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	288	1316	289	264	2572	260	421	238	188	531	439	289
RTOR Reduction (vph)	0	0	140	0	0	63	0	24	0	0	0	0
Lane Group Flow (vph)	288	1316	149	264	2572	197	421	402	0	531	439	289
Turn Type	Prot		Perm	pm+pt		Perm	Prot			Prot		Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6						Free
Actuated Green, G (s)	7.8	51.7	51.7	71.9	58.9	58.9	9.8	18.8		12.8	21.8	120.0
Effective Green, g (s)	7.8	51.7	51.7	71.9	58.9	58.9	9.8	18.8		12.8	21.8	120.0
Actuated g/C Ratio	0.06	0.43	0.43	0.60	0.49	0.49	0.08	0.16		0.11	0.18	1.00
Clearance Time (s)	5.2	6.1	6.1	5.2	6.1	6.1	5.2	5.2		5.2	5.2	
Vehicle Extension (s)	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3		4.3	4.3	
Lane Grp Cap (vph)	217	1481	663	275	1687	755	272	265		356	329	1538
v/s Ratio Prot	c0.09	0.38		0.12	c0.75		0.13	c0.24		c0.16	c0.24	
v/s Ratio Perm			0.10	0.45		0.13						0.19
v/c Ratio	1.33	0.89	0.22	0.96	1.52	0.26	1.55	1.52		1.49	1.33	0.19
Uniform Delay, d1	56.1	31.5	21.5	37.8	30.6	17.8	55.1	50.6		53.6	49.1	0.0
Progression Factor	1.11	0.74	0.85	1.22	0.59	0.26	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	165.1	5.2	0.5	23.1	237.2	0.3	264.0	251.7		235.6	169.8	0.3
Delay (s)	227.1	28.6	18.8	69.0	255.1	5.0	319.1	302.3		289.2	218.9	0.3
Level of Service	F	C	B	E	F	A	F	F		F	F	A
Approach Delay (s)		57.3			218.2			310.7			198.4	
Approach LOS		E			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			182.8			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.59									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			26.9			
Intersection Capacity Utilization			124.7%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 10: Woodruff Road & I-385 SB Ramps

2035 PM Woodruff Improvements

7/6/2011



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1209	622	261	2060	0	0	0	0	1187	0	727
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.6		6.6	6.6					5.7		4.0
Lane Util. Factor		0.95		1.00	0.95					0.97		1.00
Frt		0.95		1.00	1.00					1.00		0.85
Flt Protected		1.00		0.95	1.00					0.95		1.00
Satd. Flow (prot)		3263		1719	3438					3335		1538
Flt Permitted		1.00		0.06	1.00					0.95		1.00
Satd. Flow (perm)		3263		113	3438					3335		1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	1343	691	290	2289	0	0	0	0	1319	0	808
RTOR Reduction (vph)	0	55	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1979	0	290	2289	0	0	0	0	1319	0	808
Turn Type				pm+pt						Prot		Free
Protected Phases		2		1	6					4		
Permitted Phases				6								Free
Actuated Green, G (s)		57.4		74.4	74.4					33.3		120.0
Effective Green, g (s)		57.4		74.4	74.4					33.3		120.0
Actuated g/C Ratio		0.48		0.62	0.62					0.28		1.00
Clearance Time (s)		6.6		6.6	6.6					5.7		
Vehicle Extension (s)		4.3		4.3	4.3					4.3		
Lane Grp Cap (vph)		1561		209	2132					925		1538
v/s Ratio Prot		0.61		0.12	c0.67					c0.40		
v/s Ratio Perm				c0.74								0.53
v/c Ratio		1.27		1.39	1.07					1.43		0.53
Uniform Delay, d1		31.3		39.6	22.8					43.4		0.0
Progression Factor		1.31		1.47	0.71					1.00		1.00
Incremental Delay, d2		121.1		177.1	34.2					197.9		1.3
Delay (s)		162.0		235.3	50.4					241.3		1.3
Level of Service		F		F	D					F		A
Approach Delay (s)		162.0			71.2			0.0			150.1	
Approach LOS		F			E			A			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			123.5			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.36									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				12.3		
Intersection Capacity Utilization			192.2%			ICU Level of Service				H		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 11: Woodruff Road & I-385 NB Ramps

2035 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	686	1710	0	0	1559	963	762	0	361	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.1	6.1			6.1	6.1	5.0		5.0			
Lane Util. Factor	1.00	0.95			0.95	1.00	1.00		1.00			
Frt	1.00	1.00			1.00	0.85	1.00		0.85			
Flt Protected	0.95	1.00			1.00	1.00	0.95		1.00			
Satd. Flow (prot)	1719	3438			3438	1538	1719		1538			
Flt Permitted	0.08	1.00			1.00	1.00	0.95		1.00			
Satd. Flow (perm)	139	3438			3438	1538	1719		1538			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	762	1900	0	0	1732	1070	847	0	401	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	383	0	0	14	0	0	0
Lane Group Flow (vph)	762	1900	0	0	1732	687	847	0	387	0	0	0
Turn Type	pm+pt				Perm		Prot	custom				
Protected Phases	5	2			6		8					
Permitted Phases	2					6			8			
Actuated Green, G (s)	76.9	76.9			45.9	45.9	32.0		32.0			
Effective Green, g (s)	76.9	76.9			45.9	45.9	32.0		32.0			
Actuated g/C Ratio	0.64	0.64			0.38	0.38	0.27		0.27			
Clearance Time (s)	6.1	6.1			6.1	6.1	5.0		5.0			
Vehicle Extension (s)	4.3	4.3			4.3	4.3	4.3		4.3			
Lane Grp Cap (vph)	417	2203			1315	588	458		410			
v/s Ratio Prot	c0.38	0.55			0.50		c0.49					
v/s Ratio Perm	c0.79					0.45			0.25			
v/c Ratio	1.83	0.86			1.32	1.17	1.85		0.94			
Uniform Delay, d1	39.2	17.3			37.1	37.1	44.0		43.1			
Progression Factor	0.86	1.22			0.77	0.57	1.00		1.00			
Incremental Delay, d2	373.2	0.5			143.2	77.7	390.6		30.8			
Delay (s)	406.9	21.5			171.9	98.8	434.6		73.9			
Level of Service	F	C			F	F	F		E			
Approach Delay (s)		131.8			144.0		318.7				0.0	
Approach LOS		F			F		F				A	
<b>Intersection Summary</b>												
HCM Average Control Delay		171.6			HCM Level of Service		F					
HCM Volume to Capacity ratio		1.78										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)		11.1					
Intersection Capacity Utilization		192.2%			ICU Level of Service		H					
Analysis Period (min)		15										
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 12: Woodruff Road & Commercial Drive

2035 PM Woodruff Improvements

7/6/2011



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	1767	64	15	2066	78	296	28	15	134	18	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.3	5.5		5.5	5.5		5.3	5.4		5.4	5.4	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	3420		1719	3419		1719	1713		1719	1566	
Flt Permitted	0.06	1.00		0.06	1.00		0.25	1.00		0.73	1.00	
Satd. Flow (perm)	105	3420		114	3419		455	1713		1313	1566	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	267	1963	71	17	2296	87	329	31	17	149	20	178
RTOR Reduction (vph)	0	2	0	0	2	0	0	13	0	0	131	0
Lane Group Flow (vph)	267	2032	0	17	2381	0	329	35	0	149	67	0
Turn Type	pm+pt			Perm			pm+pt			Perm		
Protected Phases	5	2			6		3	8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	79.5	79.5		63.5	63.5		29.6	29.6		10.6	10.6	
Effective Green, g (s)	79.5	79.5		63.5	63.5		29.6	29.6		10.6	10.6	
Actuated g/C Ratio	0.66	0.66		0.53	0.53		0.25	0.25		0.09	0.09	
Clearance Time (s)	5.3	5.5		5.5	5.5		5.3	5.4		5.4	5.4	
Vehicle Extension (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	
Lane Grp Cap (vph)	213	2266		60	1809		257	423		116	138	
v/s Ratio Prot	c0.11	0.59			c0.70		c0.15	0.02			0.04	
v/s Ratio Perm	0.72			0.15			c0.17			0.11		
v/c Ratio	1.25	0.90		0.28	1.32		1.28	0.08		1.28	0.48	
Uniform Delay, d1	41.1	16.8		15.6	28.2		42.2	34.8		54.7	52.1	
Progression Factor	1.37	0.50		0.78	0.69		1.00	1.00		1.00	1.00	
Incremental Delay, d2	130.6	2.9		3.8	143.5		152.5	0.1		178.3	4.2	
Delay (s)	186.8	11.4		16.1	163.0		194.7	34.9		233.0	56.3	
Level of Service	F	B		B	F		F	C		F	E	
Approach Delay (s)		31.7			162.0			174.3			132.2	
Approach LOS		C			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay		105.7			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.28										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			16.1				
Intersection Capacity Utilization		118.0%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 13: Woodruff Road & Smith Hines Road

2035 PM Woodruff Improvements

7/6/2011




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1812	89	86	1904	2	240	2	190	7	2	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3		6.0	6.0			5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.94			0.92	
Flt Protected	0.95	1.00		0.95	1.00			0.97			0.99	
Satd. Flow (prot)	1719	3414		1719	3438			1656			1632	
Flt Permitted	0.05	1.00		0.05	1.00			0.81			0.90	
Satd. Flow (perm)	85	3414		85	3438			1383			1493	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	2013	99	96	2116	2	267	2	211	8	2	17
RTOR Reduction (vph)	0	3	0	0	0	0	0	18	0	0	14	0
Lane Group Flow (vph)	17	2109	0	96	2118	0	0	462	0	0	13	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	2			6			8			4		
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	84.7	84.7		85.0	85.0			24.0			24.0	
Effective Green, g (s)	84.7	84.7		85.0	85.0			24.0			24.0	
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.20			0.20	
Clearance Time (s)	6.3	6.3		6.0	6.0			5.0			5.0	
Vehicle Extension (s)	4.3	4.3		4.3	4.3			4.3			4.3	
Lane Grp Cap (vph)	60	2410		60	2435			277			299	
v/s Ratio Prot	0.62			0.62								
v/s Ratio Perm	0.20			c1.13				c0.33			0.01	
v/c Ratio	0.28	0.88		1.60	0.87			1.67			0.04	
Uniform Delay, d1	6.5	13.6		17.5	13.3			48.0			38.7	
Progression Factor	0.08	0.06		0.49	0.37			1.00			1.00	
Incremental Delay, d2	4.5	1.9		277.0	0.4			315.3			0.1	
Delay (s)	5.0	2.8		285.5	5.4			363.3			38.8	
Level of Service	A	A		F	A			F			D	
Approach Delay (s)	2.8			17.6				363.3			38.8	
Approach LOS	A			B				F			D	
Intersection Summary												
HCM Average Control Delay			45.4	HCM Level of Service			D					
HCM Volume to Capacity ratio			1.61									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)			11.0					
Intersection Capacity Utilization			112.3%	ICU Level of Service			H					
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 14: Woodruff Road & Walmart Driveway

2035 PM Woodruff Improvements

7/6/2011























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	2216	195	32	3306	61	530	10	8	56	2	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3		6.3	6.3		5.0	5.0			5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.93			0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1719	3396		1719	3429		1719	1687			1651	
Flt Permitted	0.06	1.00		0.06	1.00		0.67	1.00			0.85	
Satd. Flow (perm)	100	3396		110	3429		1203	1687			1436	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	36	2462	217	36	3673	68	589	11	9	62	2	59
RTOR Reduction (vph)	0	6	0	0	1	0	0	4	0	0	28	0
Lane Group Flow (vph)	36	2673	0	36	3740	0	589	16	0	0	95	0
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	75.7	75.7		65.8	65.8		33.0	33.0			33.0	
Effective Green, g (s)	75.7	75.7		65.8	65.8		33.0	33.0			33.0	
Actuated g/C Ratio	0.63	0.63		0.55	0.55		0.28	0.28			0.28	
Clearance Time (s)	6.3	6.3		6.3	6.3		5.0	5.0			5.0	
Vehicle Extension (s)	4.3	4.3		4.3	4.3		4.3	4.3			4.3	
Lane Grp Cap (vph)	112	2142		60	1880		331	464			395	
v/s Ratio Prot	0.01	c0.79			c1.09			0.01				
v/s Ratio Perm	0.19			0.33			c0.49				0.07	
v/c Ratio	0.32	1.25		0.60	1.99		1.78	0.04			0.24	
Uniform Delay, d1	28.1	22.1		18.2	27.1		43.5	31.8			33.8	
Progression Factor	1.24	0.94		1.10	1.09		1.00	1.00			1.00	
Incremental Delay, d2	1.6	114.2		19.8	446.2		362.8	0.0			0.5	
Delay (s)	36.4	135.0		39.8	475.6		406.3	31.9			34.3	
Level of Service	D	F		D	F		F	C			C	
Approach Delay (s)		133.7			471.5			394.0			34.3	
Approach LOS		F			F			F			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			330.5			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.94									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			17.6			
Intersection Capacity Utilization			138.8%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 15: Woodruff Road & Verdin Road

2035 PM Woodruff Improvements

7/6/2011




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	144	2702	61	90	1748	105	363	292	179	77	311	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3		6.3	6.3		5.2	5.0	5.0	5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1719	3427		1719	3409		1719	1810	1538	1719	1692	
Flt Permitted	0.06	1.00		0.06	1.00		0.15	1.00	1.00	0.56	1.00	
Satd. Flow (perm)	102	3427		102	3409		276	1810	1538	1021	1692	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	160	3002	68	100	1942	117	403	324	199	86	346	266
RTOR Reduction (vph)	0	1	0	0	4	0	0	0	1	0	11	0
Lane Group Flow (vph)	160	3069	0	100	2055	0	403	324	198	86	601	0
Turn Type	Perm			Perm			pm+pt			Perm	Perm	
Protected Phases	2			6			3		8		4	
Permitted Phases	2			6			8			8	4	
Actuated Green, G (s)	70.7	70.7		70.7	70.7		38.0	38.0	38.0	20.8	20.8	
Effective Green, g (s)	70.7	70.7		70.7	70.7		38.0	38.0	38.0	20.8	20.8	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.32	0.32	0.32	0.17	0.17	
Clearance Time (s)	6.3	6.3		6.3	6.3		5.2	5.0	5.0	5.2	5.2	
Vehicle Extension (s)	4.3	4.3		4.3	4.3		4.3	4.3	4.3	4.3	4.3	
Lane Grp Cap (vph)	60	2019		60	2008		229	573	487	177	293	
v/s Ratio Prot	0.90			0.60			c0.17	0.18		c0.36		
v/s Ratio Perm	c1.56			0.98			0.38		0.13	0.08		
v/c Ratio	2.67	1.52		1.67	1.02		1.76	0.57	0.41	0.49	2.05	
Uniform Delay, d1	24.6	24.6		24.6	24.6		35.8	34.1	32.2	44.8	49.6	
Progression Factor	0.35	0.34		0.67	0.66		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	764.6	234.8		306.6	13.4		359.2	1.7	0.9	3.3	485.1	
Delay (s)	773.3	243.3		323.1	29.6		395.0	35.8	33.0	48.1	534.7	
Level of Service	F	F		F	C		F	D	C	D	F	
Approach Delay (s)	269.5			43.2			191.6			474.8		
Approach LOS	F			D			F			F		
Intersection Summary												
HCM Average Control Delay			210.0		HCM Level of Service			F				
HCM Volume to Capacity ratio			2.44									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)			16.7				
Intersection Capacity Utilization			171.7%		ICU Level of Service			H				
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 16: Woodruff Road & Butler Road

2035 PM Woodruff Improvements

7/6/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	2394	167	528	1677	26	264	28	652	443	552	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.3		6.3	6.3			5.0	6.3	5.0	5.0	
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00	1.00	1.00	
Frt		0.99		1.00	1.00			1.00	0.85	1.00	0.97	
Flt Protected		1.00		0.95	1.00			0.96	1.00	0.95	1.00	
Satd. Flow (prot)		3403		1719	3430			1731	1538	1719	1753	
Flt Permitted		0.73		0.06	1.00			0.11	1.00	0.35	1.00	
Satd. Flow (perm)		2501		117	3430			191	1538	640	1753	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	32	2660	186	587	1863	29	293	31	724	492	613	160
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	0	0	8	0
Lane Group Flow (vph)	0	2874	0	587	1891	0	0	324	724	492	765	0
Turn Type	Perm			pm+pt			Perm		pm+ov		Perm	
Protected Phases		2		1	6			8	1		4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)		55.7		72.7	72.7			36.0	46.7	36.0	36.0	
Effective Green, g (s)		55.7		72.7	72.7			36.0	46.7	36.0	36.0	
Actuated g/C Ratio		0.46		0.61	0.61			0.30	0.39	0.30	0.30	
Clearance Time (s)		6.3		6.3	6.3			5.0	6.3	5.0	5.0	
Vehicle Extension (s)		4.3		4.3	4.3			4.3	4.3	4.3	4.3	
Lane Grp Cap (vph)		1161		214	2078			57	599	192	526	
v/s Ratio Prot				c0.24	0.55				0.11		0.44	
v/s Ratio Perm		1.15		c1.42				c1.69	0.36	0.77		
v/c Ratio		2.48		2.74	0.91			5.68	1.21	2.56	1.45	
Uniform Delay, d1		32.1		39.3	20.8			42.0	36.6	42.0	42.0	
Progression Factor		1.21		1.00	1.07			1.00	1.00	1.00	1.00	
Incremental Delay, d2		664.1		785.5	0.8			2145.5	108.9	718.2	215.1	
Delay (s)		702.9		824.9	23.0			2187.5	145.6	760.2	257.1	
Level of Service		F		F	C			F	F	F	F	
Approach Delay (s)		702.9			212.9			776.9			452.8	
Approach LOS		F			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			513.4			HCM Level of Service				F		
HCM Volume to Capacity ratio			3.62									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			11.3			
Intersection Capacity Utilization			192.3%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												





















# HCM Signalized Intersection Capacity Analysis

## 17: Woodruff Road & Bell Road

2035 PM Woodruff Improvements

7/6/2011
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	3418	156	53	2464	16	209	2	58	21	2	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2			5.4			5.4	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.97			0.89	
Flt Protected	0.95	1.00		0.95	1.00			0.96			0.99	
Satd. Flow (prot)	1719	3416		1719	3435			1691			1600	
Flt Permitted	0.05	1.00		0.05	1.00			0.62			0.95	
Satd. Flow (perm)	82	3416		82	3435			1081			1532	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	107	3798	173	59	2738	18	232	2	64	23	2	98
RTOR Reduction (vph)	0	3	0	0	0	0	0	1	0	0	5	0
Lane Group Flow (vph)	107	3968	0	59	2756	0	0	297	0	0	118	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	2			6			8			4		
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	87.8	87.8		87.8	87.8			20.6			20.6	
Effective Green, g (s)	87.8	87.8		87.8	87.8			20.6			20.6	
Actuated g/C Ratio	0.73	0.73		0.73	0.73			0.17			0.17	
Clearance Time (s)	6.2	6.2		6.2	6.2			5.4			5.4	
Vehicle Extension (s)	4.3	4.3		4.3	4.3			4.3			4.3	
Lane Grp Cap (vph)	60	2499		60	2513			186			263	
v/s Ratio Prot	1.16			0.80								
v/s Ratio Perm	c1.30			0.72				c0.27			0.08	
v/c Ratio	1.78	1.59		0.98	1.10			1.60			0.45	
Uniform Delay, d1	16.1	16.1		15.4	16.1			49.7			44.6	
Progression Factor	0.52	0.50		0.89	0.97			1.00			1.00	
Incremental Delay, d2	358.5	264.8		94.7	48.8			292.7			1.9	
Delay (s)	366.9	272.9		108.4	64.3			342.4			46.5	
Level of Service	F	F		F	E			F			D	
Approach Delay (s)	275.3			65.3				342.4			46.5	
Approach LOS	F			E				F			D	
Intersection Summary												
HCM Average Control Delay	193.4			HCM Level of Service			F					
HCM Volume to Capacity ratio	1.75											
Actuated Cycle Length (s)	120.0			Sum of lost time (s)			11.6					
Intersection Capacity Utilization	131.0%			ICU Level of Service			H					
Analysis Period (min)	15											
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 18: Woodruff Road & SC 14

2035 PM Woodruff Improvements

7/6/2011
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	223	1837	517	142	1214	105	264	393	77	288	586	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	5.0	6.3	6.3		5.0	5.0	6.3	5.0	5.0	6.3
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3438	1538	1719	3397		1719	1810	1538	1719	1810	1538
Flt Permitted	0.08	1.00	1.00	0.09	1.00		0.15	1.00	1.00	0.15	1.00	1.00
Satd. Flow (perm)	146	3438	1538	155	3397		278	1810	1538	268	1810	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	248	2041	574	158	1349	117	293	437	86	320	651	186
RTOR Reduction (vph)	0	0	22	0	5	0	0	0	11	0	0	16
Lane Group Flow (vph)	248	2041	552	158	1461	0	293	437	75	320	651	170
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	5	2	3	1	6		3	8	1	7	4	5
Permitted Phases	2		2	6			8		8	4		4
Actuated Green, G (s)	60.4	49.7	62.7	54.4	46.7		39.0	26.0	33.7	41.0	27.0	37.7
Effective Green, g (s)	60.4	49.7	62.7	54.4	46.7		39.0	26.0	33.7	41.0	27.0	37.7
Actuated g/C Ratio	0.50	0.41	0.52	0.45	0.39		0.32	0.22	0.28	0.34	0.22	0.31
Clearance Time (s)	6.3	6.3	5.0	6.3	6.3		5.0	5.0	6.3	5.0	5.0	6.3
Vehicle Extension (s)	4.3	4.3	4.3	4.3	4.3		4.3	4.3	4.3	4.3	4.3	4.3
Lane Grp Cap (vph)	214	1424	804	171	1322		246	392	432	261	407	483
v/s Ratio Prot	c0.10	c0.59	0.07	0.06	0.43		0.13	0.24	0.01	c0.14	c0.36	0.03
v/s Ratio Perm	0.48		0.28	0.36			0.26		0.04	0.28		0.08
v/c Ratio	1.16	1.43	0.69	0.92	1.10		1.19	1.11	0.17	1.23	1.60	0.35
Uniform Delay, d1	35.8	35.1	21.3	28.6	36.6		34.9	47.0	32.6	33.4	46.5	31.7
Progression Factor	1.11	0.59	1.02	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	76.6	195.4	0.3	47.9	58.7		118.9	80.3	0.3	130.8	281.1	0.7
Delay (s)	116.3	215.9	21.9	76.5	95.3		153.9	127.3	32.9	164.2	327.6	32.4
Level of Service	F	F	C	E	F		F	F	C	F	F	C
Approach Delay (s)		168.4			93.5			126.9			235.0	
Approach LOS		F			F			F			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			156.3			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.41									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			17.6			
Intersection Capacity Utilization			122.9%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 19: E Parkins Mill Road & US 276

2035 PM Woodruff Improvements

7/6/2011

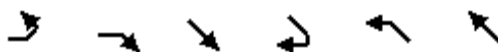
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	146	162	90	137	98	112	210	1553	266	115	1940	316
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0	6.0	4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. Factor	1.00	0.95		0.97	1.00	1.00	1.00	0.91	1.00	0.97	0.91	1.00
Frt	1.00	0.95		1.00	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	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	3254		3335	1810	1538	1719	4940	1538	3335	4940	1538
Flt Permitted	0.67	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1213	3254		3335	1810	1538	1719	4940	1538	3335	4940	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	162	180	100	152	109	124	233	1726	296	128	2156	351
RTOR Reduction (vph)	0	72	0	0	0	113	0	0	126	0	0	105
Lane Group Flow (vph)	162	208	0	152	109	11	233	1726	170	128	2156	246
Turn Type	pm+pt			Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8					4			6			2
Actuated Green, G (s)	16.0	9.0		7.0	9.0	9.0	17.1	60.6	60.6	7.8	51.3	51.3
Effective Green, g (s)	16.0	9.0		7.0	9.0	9.0	17.1	60.6	60.6	7.8	51.3	51.3
Actuated g/C Ratio	0.15	0.09		0.07	0.09	0.09	0.16	0.57	0.57	0.07	0.49	0.49
Clearance Time (s)	4.0	6.0		4.0	6.0	6.0	4.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	4.3	4.9		4.3	4.9	4.9	4.3	4.9	4.9	4.3	4.9	4.9
Lane Grp Cap (vph)	218	278		221	155	131	279	2840	884	247	2404	749
v/s Ratio Prot	c0.05	c0.06		0.05	0.06		c0.14	0.35		0.04	c0.44	
v/s Ratio Perm	0.06					0.01			0.11			0.16
v/c Ratio	0.74	0.75		0.69	0.70	0.08	0.84	0.61	0.19	0.52	0.90	0.33
Uniform Delay, d1	42.0	47.1		48.1	46.9	44.4	42.8	14.6	10.7	47.0	24.6	16.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.1	12.3		9.7	16.4	0.5	20.1	0.5	0.2	2.8	5.2	0.5
Delay (s)	56.1	59.4		57.8	63.3	44.9	62.9	15.2	10.9	49.8	29.8	17.1
Level of Service	E	E		E	E	D	E	B	B	D	C	B
Approach Delay (s)		58.2			55.2			19.5			29.1	
Approach LOS		E			E			B			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			29.3			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			105.4			Sum of lost time (s)			21.0			
Intersection Capacity Utilization			79.9%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 20: Duvall Drive & US 276

2035 PM Woodruff Improvements

7/6/2011



























Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	520	205	1668	499	190	1509
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.3		6.3	6.3
Lane Util. Factor	1.00	1.00	0.91		1.00	0.91
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1719	1538	4769		1719	4940
Flt Permitted	0.95	1.00	1.00		0.10	1.00
Satd. Flow (perm)	1719	1538	4769		178	4940
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	578	228	1853	554	211	1677
RTOR Reduction (vph)	0	15	83	0	0	0
Lane Group Flow (vph)	578	213	2324	0	211	1677
Turn Type	Perm				Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	12.0	12.0	40.7		40.7	40.7
Effective Green, g (s)	12.0	12.0	40.7		40.7	40.7
Actuated g/C Ratio	0.18	0.18	0.63		0.63	0.63
Clearance Time (s)	6.0	6.0	6.3		6.3	6.3
Vehicle Extension (s)	4.9	4.9	4.9		4.9	4.9
Lane Grp Cap (vph)	317	284	2986		111	3093
v/s Ratio Prot	c0.34		0.49			0.34
v/s Ratio Perm		0.14			c1.19	
v/c Ratio	1.82	0.75	0.78		1.90	0.54
Uniform Delay, d1	26.5	25.1	8.9		12.1	6.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	382.7	12.1	1.5		437.1	0.3
Delay (s)	409.2	37.2	10.4		449.3	7.2
Level of Service	F	D	B		F	A
Approach Delay (s)	303.9		10.4			56.6
Approach LOS	F		B			E
<b>Intersection Summary</b>						
HCM Average Control Delay			73.9		HCM Level of Service	E
HCM Volume to Capacity ratio			1.88			
Actuated Cycle Length (s)			65.0		Sum of lost time (s)	12.3
Intersection Capacity Utilization			101.0%		ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 23: US 276 & Millennium Blvd

2035 PM Woodruff Improvements

7/6/2011





















												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	126	2355	157	33	1711	14	118	71	92	84	28	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.5	6.5	4.5	6.5	6.5	6.0	6.0		6.0	6.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95		1.00	1.00	0.88
Flt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1719	3438	1538	1719	3438	1538	3335	3147		1719	1810	2707
Flt Permitted	0.05	1.00	1.00	0.04	1.00	1.00	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	99	3438	1538	79	3438	1538	3335	3147		1810	1810	2707
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	140	2617	174	37	1901	16	131	79	102	93	31	76
RTOR Reduction (vph)	0	0	36	0	0	5	0	77	0	0	0	44
Lane Group Flow (vph)	140	2617	138	37	1901	11	131	104	0	93	31	32
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			pm+pt		pm+ov
Protected Phases	5	2		1	6		3	8		7	4	5
Permitted Phases	2		2	6		6				4		4
Actuated Green, G (s)	102.1	94.1	94.1	96.0	91.3	91.3	8.0	6.0		10.0	4.0	12.0
Effective Green, g (s)	102.1	94.1	94.1	96.0	91.3	91.3	8.0	6.0		10.0	4.0	12.0
Actuated g/C Ratio	0.76	0.70	0.70	0.72	0.68	0.68	0.06	0.04		0.07	0.03	0.09
Clearance Time (s)	4.0	6.5	6.5	4.5	6.5	6.5	6.0	6.0		6.0	6.0	4.0
Vehicle Extension (s)	4.3	4.9	4.9	4.3	4.9	4.9	4.3	6.4		4.3	6.4	4.3
Lane Grp Cap (vph)	172	2418	1082	114	2346	1049	199	141		131	54	243
v/s Ratio Prot	c0.05	c0.76		0.01	0.55		c0.04	c0.03		0.03	0.02	0.01
v/s Ratio Perm	0.57		0.09	0.22		0.01				0.02		0.00
v/c Ratio	0.81	1.08	0.13	0.32	0.81	0.01	0.66	0.73		0.71	0.57	0.13
Uniform Delay, d1	33.5	19.9	6.5	34.5	15.1	6.8	61.6	63.1		60.5	64.1	56.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	26.4	45.1	0.1	2.6	2.5	0.0	8.9	24.8		17.9	28.0	0.4
Delay (s)	59.9	64.9	6.6	37.1	17.6	6.8	70.5	87.9		78.4	92.1	56.5
Level of Service	E	E	A	D	B	A	E	F		E	F	E
Approach Delay (s)		61.2			17.9			80.6			72.2	
Approach LOS		E			B			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			47.1			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			133.8			Sum of lost time (s)				14.0		
Intersection Capacity Utilization			98.8%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 24: Pelham Road & The Parkway

2035 PM Woodruff Improvements

7/6/2011

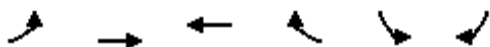
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	1117	877	0	1264	1009	0	0	0	395	643	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8		5.8	5.3				5.3	5.3	5.3
Lane Util. Factor	0.97	0.95	1.00		0.95	1.00				1.00	1.00	1.00
Frt	1.00	1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)	3335	3438	1538		3438	1538				1719	1810	1538
Flt Permitted	0.95	1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)	3335	3438	1538		3438	1538				1719	1810	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	267	1241	974	0	1404	1121	0	0	0	439	714	394
RTOR Reduction (vph)	0	0	34	0	0	3	0	0	0	0	0	122
Lane Group Flow (vph)	267	1241	940	0	1404	1118	0	0	0	439	714	272
Turn Type	Prot		Perm	Perm		custom				Perm		Perm
Protected Phases	5	2			6	4					4	
Permitted Phases			2	6		6				4		4
Actuated Green, G (s)	10.5	69.2	69.2		52.9	97.6				44.7	44.7	44.7
Effective Green, g (s)	10.5	69.2	69.2		52.9	97.6				44.7	44.7	44.7
Actuated g/C Ratio	0.08	0.55	0.55		0.42	0.78				0.36	0.36	0.36
Clearance Time (s)	5.8	5.8	5.8		5.8	5.3				5.3	5.3	5.3
Vehicle Extension (s)	4.3	4.3	4.3		4.3	4.3				4.3	4.3	4.3
Lane Grp Cap (vph)	280	1903	851		1455	1201				615	647	550
v/s Ratio Prot	0.08	0.36			0.41	0.33					c0.39	
v/s Ratio Perm			c0.61			0.39				0.26		0.18
v/c Ratio	0.95	0.65	1.10		0.96	0.93				0.71	1.10	0.49
Uniform Delay, d1	57.0	19.5	27.9		35.1	11.0				34.6	40.1	31.3
Progression Factor	1.00	1.00	1.00		0.74	0.81				1.00	1.00	1.00
Incremental Delay, d2	41.4	1.8	63.6		5.9	3.9				4.4	67.2	1.1
Delay (s)	98.4	21.2	91.5		31.8	12.8				39.0	107.3	32.4
Level of Service	F	C	F		C	B				D	F	C
Approach Delay (s)		57.1			23.4			0.0			68.9	
Approach LOS		E			C			A			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			46.9			HCM Level of Service				D		
HCM Volume to Capacity ratio			1.10									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)				11.1		
Intersection Capacity Utilization			137.2%			ICU Level of Service				H		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 25: Pelham Road & I-85 SB off ramp

2035 PM Woodruff Improvements

7/6/2011









Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑↑
Volume (vph)	0	1512	1816	0	681	457
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6	5.6		5.3	5.3
Lane Util. Factor		0.95	0.95		1.00	0.88
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3438	3438		1719	2707
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3438	3438		1719	2707
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	1680	2018	0	757	508
RTOR Reduction (vph)	0	0	0	0	0	5
Lane Group Flow (vph)	0	1680	2018	0	757	503
Turn Type					Perm	
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		65.4	65.4		48.7	48.7
Effective Green, g (s)		65.4	65.4		48.7	48.7
Actuated g/C Ratio		0.52	0.52		0.39	0.39
Clearance Time (s)		5.6	5.6		5.3	5.3
Vehicle Extension (s)		4.3	4.3		4.3	4.3
Lane Grp Cap (vph)		1799	1799		670	1055
v/s Ratio Prot		0.49	c0.59		c0.44	
v/s Ratio Perm						0.19
v/c Ratio		0.93	1.12		1.13	0.48
Uniform Delay, d1		27.8	29.8		38.1	28.6
Progression Factor		0.88	1.00		1.00	1.00
Incremental Delay, d2		8.2	57.7		76.3	0.5
Delay (s)		32.7	87.6		114.5	29.1
Level of Service		C	F		F	C
Approach Delay (s)		32.7	87.6		80.2	
Approach LOS		C	F		F	
<b>Intersection Summary</b>						
HCM Average Control Delay			67.1		HCM Level of Service	E
HCM Volume to Capacity ratio			1.13			
Actuated Cycle Length (s)			125.0		Sum of lost time (s)	10.9
Intersection Capacity Utilization			142.1%		ICU Level of Service	H
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 26: Pelham Road & I-85 NB off ramp

2035 PM Woodruff Improvements

7/6/2011

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↔	↔
Volume (vph)	812	0	0	815	1791	983
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8			5.8	5.0	5.0
Lane Util. Factor	0.95			0.95	0.97	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3438			3438	3335	1538
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3438			3438	3335	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	902	0	0	906	1990	1092
RTOR Reduction (vph)	0	0	0	0	0	4
Lane Group Flow (vph)	902	0	0	906	1990	1088
Turn Type					Perm	
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	33.2			33.2	81.0	81.0
Effective Green, g (s)	33.2			33.2	81.0	81.0
Actuated g/C Ratio	0.27			0.27	0.65	0.65
Clearance Time (s)	5.8			5.8	5.0	5.0
Vehicle Extension (s)	4.3			4.3	4.3	4.3
Lane Grp Cap (vph)	913			913	2161	997
v/s Ratio Prot	0.26			c0.26	0.60	
v/s Ratio Perm						c0.71
v/c Ratio	0.99			0.99	0.92	1.09
Uniform Delay, d1	45.7			45.8	19.2	22.0
Progression Factor	1.17			0.80	1.00	1.00
Incremental Delay, d2	11.9			18.5	7.2	56.9
Delay (s)	65.3			54.9	26.4	78.9
Level of Service	E			D	C	E
Approach Delay (s)	65.3			54.9	45.0	
Approach LOS	E			D	D	
<b>Intersection Summary</b>						
HCM Average Control Delay			50.6		HCM Level of Service	D
HCM Volume to Capacity ratio			1.06			
Actuated Cycle Length (s)			125.0		Sum of lost time (s)	10.8
Intersection Capacity Utilization			181.2%		ICU Level of Service	H
Analysis Period (min)			15			
c Critical Lane Group						






















# HCM Signalized Intersection Capacity Analysis

## 27: Pelham Road & Boland Court

2035 PM Woodruff Improvements

7/6/2011






















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	77	1169	549	368	1580	26	321	23	362	36	16	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	6.7		6.7	6.7			6.3	6.3		6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	
Frt	1.00	0.95		1.00	1.00			1.00	0.85		0.94	
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.98	
Satd. Flow (prot)	1719	3273		1719	3430			1729	1538		1671	
Flt Permitted	0.10	1.00		0.07	1.00			0.67	1.00		0.41	
Satd. Flow (perm)	174	3273		119	3430			1218	1538		695	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	86	1299	610	409	1756	29	357	26	402	40	18	44
RTOR Reduction (vph)	0	45	0	0	1	0	0	0	234	0	21	0
Lane Group Flow (vph)	86	1864	0	409	1784	0	0	383	168	0	81	0
Turn Type	Perm			pm+pt			Perm			Perm		Perm
Protected Phases	2			1		6	8			8		4
Permitted Phases	2			6			8			8		4
Actuated Green, G (s)	54.3	54.3		81.3	81.3			30.7	30.7		30.7	
Effective Green, g (s)	54.3	54.3		81.3	81.3			30.7	30.7		30.7	
Actuated g/C Ratio	0.43	0.43		0.65	0.65			0.25	0.25		0.25	
Clearance Time (s)	6.7	6.7		6.7	6.7			6.3	6.3		6.3	
Vehicle Extension (s)	4.9	4.9		4.3	4.9			4.3	4.3		4.3	
Lane Grp Cap (vph)	76	1422		337	2231			299	378		171	
v/s Ratio Prot	c0.57			c0.20		0.52						
v/s Ratio Perm	0.49			0.59				c0.31	0.11		0.12	
v/c Ratio	1.13	1.31		1.21	0.80			1.28	0.44		0.47	
Uniform Delay, d1	35.4	35.4		42.8	15.9			47.1	39.9		40.2	
Progression Factor	0.67	0.68		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	73.9	140.5		120.4	3.1			149.6	1.3		3.2	
Delay (s)	97.5	164.4		163.1	19.0			196.8	41.3		43.5	
Level of Service	F	F		F	B			F	D		D	
Approach Delay (s)	161.5			45.9				117.1			43.5	
Approach LOS	F			D				F			D	
Intersection Summary												
HCM Average Control Delay			102.3		HCM Level of Service				F			
HCM Volume to Capacity ratio			1.29									
Actuated Cycle Length (s)			125.0		Sum of lost time (s)				19.7			
Intersection Capacity Utilization			112.3%		ICU Level of Service				H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 28: Forsythia Dr & E Butler Road

2035 PM Woodruff Improvements

7/6/2011


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	0	6	48	0	139	9	947	23	111	1392	23
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	6.0		6.0	6.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frt		1.00	0.85		0.90		1.00	1.00		1.00	1.00	
Flt Protected		0.95	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1719	1538		1607		1719	3426		1719	3430	
Flt Permitted		0.76	1.00		0.91		0.25	1.00		0.25	1.00	
Satd. Flow (perm)		1381	1538		1477		450	3426		450	3430	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	19	0	7	53	0	154	10	1052	26	123	1547	26
RTOR Reduction (vph)	0	0	2	0	15	0	0	4	0	0	2	0
Lane Group Flow (vph)	0	19	5	0	192	0	10	1074	0	123	1571	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)		11.2	11.2		11.2		16.1	16.1		16.1	16.1	
Effective Green, g (s)		11.2	11.2		11.2		16.1	16.1		16.1	16.1	
Actuated g/C Ratio		0.28	0.28		0.28		0.41	0.41		0.41	0.41	
Clearance Time (s)		6.0	6.0		6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		4.3	4.3		4.3		4.3	4.3		4.3	4.3	
Lane Grp Cap (vph)		394	438		421		184	1404		184	1405	
v/s Ratio Prot								0.31			c0.46	
v/s Ratio Perm		0.01	0.00		c0.13		0.02			0.27		
v/c Ratio		0.05	0.01		0.46		0.05	0.77		0.67	1.12	
Uniform Delay, d1		10.2	10.1		11.5		7.0	10.0		9.4	11.6	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1	0.0		1.2		0.2	2.8		10.2	63.2	
Delay (s)		10.3	10.1		12.8		7.2	12.8		19.6	74.8	
Level of Service		B	B		B		A	B		B	E	
Approach Delay (s)		10.2			12.8			12.7			70.8	
Approach LOS		B			B			B			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			45.4			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			39.3			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			75.4%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 30: E Butler Road & I-385 SB Ramps

2035 PM Woodruff Improvements

7/6/2011





















												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	1026	105	545	931	0	578	0	589	0	0	0
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	6.0			
Lane Util. Factor		0.95		1.00	0.95			1.00	1.00			
Frt		0.99		1.00	1.00			1.00	0.85			
Flt Protected		1.00		0.95	1.00			0.95	1.00			
Satd. Flow (prot)		3390		1719	3438			1719	1538			
Flt Permitted		1.00		0.10	1.00			0.95	1.00			
Satd. Flow (perm)		3390		181	3438			1719	1538			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	1140	117	606	1034	0	642	0	654	0	0	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	76	0	0	0
Lane Group Flow (vph)	0	1250	0	606	1034	0	0	642	578	0	0	0
Turn Type				pm+pt			Perm		Perm			
Protected Phases				1	6			4				
Permitted Phases		2		6			4		4			
Actuated Green, G (s)		34.0		65.0	65.0			33.0	33.0			
Effective Green, g (s)		34.0		65.0	65.0			33.0	33.0			
Actuated g/C Ratio		0.31		0.59	0.59			0.30	0.30			
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0			
Vehicle Extension (s)		4.3		4.3	4.3			4.3	4.3			
Lane Grp Cap (vph)		1048		457	2032			516	461			
v/s Ratio Prot				c0.30	0.30							
v/s Ratio Perm		0.37		c0.48				0.37	c0.38			
v/c Ratio		1.19		1.33	0.51			1.24	1.25			
Uniform Delay, d1		38.0		33.9	13.2			38.5	38.5			
Progression Factor		1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2		96.3		161.3	0.3			125.5	131.4			
Delay (s)		134.3		195.2	13.5			164.0	169.9			
Level of Service		F		F	B			F	F			
Approach Delay (s)		134.3			80.6			166.9			0.0	
Approach LOS		F			F			F			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			123.4			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.26									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			108.9%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 31: E Butler Road & I-385 NB Ramps

2035 PM Woodruff Improvements

7/6/2011
























												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		 			 							
Volume (vph)	376	1228	0	0	1417	1062	0	0	0	59	0	309
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				6.0		6.0
Lane Util. Factor	1.00	0.95			0.95	1.00				1.00		1.00
Frt	1.00	1.00			1.00	0.85				1.00		0.85
Flt Protected	0.95	1.00			1.00	1.00				0.95		1.00
Satd. Flow (prot)	1719	3438			3438	1538				1719		1538
Flt Permitted	0.06	1.00			1.00	1.00				0.95		1.00
Satd. Flow (perm)	113	3438			3438	1538				1719		1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	418	1364	0	0	1574	1180	0	0	0	66	0	343
RTOR Reduction (vph)	0	0	0	0	0	260	0	0	0	0	0	82
Lane Group Flow (vph)	418	1364	0	0	1574	920	0	0	0	66	0	261
Turn Type	pm+pt				custom				custom			custom
Protected Phases	5	2										8
Permitted Phases	2				6	6				8		
Actuated Green, G (s)	82.0	82.0			58.0	58.0				16.0		16.0
Effective Green, g (s)	82.0	82.0			58.0	58.0				16.0		16.0
Actuated g/C Ratio	0.75	0.75			0.53	0.53				0.15		0.15
Clearance Time (s)	6.0	6.0			6.0	6.0				6.0		6.0
Vehicle Extension (s)	4.3	4.3			4.3	4.3				4.3		4.3
Lane Grp Cap (vph)	347	2563			1813	811				250		224
v/s Ratio Prot	c0.20	0.40										c0.17
v/s Ratio Perm	c0.70				0.46	0.60				0.04		
v/c Ratio	1.20	0.53			0.87	1.13				0.26		1.17
Uniform Delay, d1	37.1	5.9			22.7	26.0				41.8		47.0
Progression Factor	1.00	1.00			1.00	1.00				1.00		1.00
Incremental Delay, d2	116.3	0.3			5.0	75.7				0.9		111.9
Delay (s)	153.4	6.2			27.6	101.7				42.7		158.9
Level of Service	F	A			C	F				D		F
Approach Delay (s)		40.7			59.4			0.0			140.1	
Approach LOS		D			E			A			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			59.3		HCM Level of Service				E			
HCM Volume to Capacity ratio			1.16									
Actuated Cycle Length (s)			110.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			108.9%		ICU Level of Service				G			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 34: Frontage Road & Roper Mountain Road

2035 PM Woodruff Improvements

7/6/2011




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	20	590	954	80	88	280	1973	304	21	1530	40
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	6.0	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.85		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1719	1547		1633	1649	1538	1719	3438	1538	1719	3425	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.09	1.00	1.00	0.11	1.00	
Satd. Flow (perm)	1719	1547		1633	1649	1538	168	3438	1538	196	3425	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	44	22	656	1060	89	98	311	2192	338	23	1700	44
RTOR Reduction (vph)	0	122	0	0	0	22	0	0	116	0	2	0
Lane Group Flow (vph)	44	556	0	572	577	76	311	2192	222	23	1742	0
Turn Type	Split			Split		Perm	pm+pt			Perm	Perm	
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	14.0	14.0		17.0	17.0	17.0	51.0	51.0	51.0	37.0	37.0	
Effective Green, g (s)	14.0	14.0		17.0	17.0	17.0	51.0	51.0	51.0	37.0	37.0	
Actuated g/C Ratio	0.14	0.14		0.17	0.17	0.17	0.51	0.51	0.51	0.37	0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	4.9	4.9		4.9	4.9	4.9	4.3	4.9	4.9	4.9	4.9	
Lane Grp Cap (vph)	241	217		278	280	261	210	1753	784	73	1267	
v/s Ratio Prot	0.03	c0.36		c0.35	0.35		0.12	c0.64			0.51	
v/s Ratio Perm						0.05	c0.64		0.14	0.12		
v/c Ratio	0.18	2.56		2.06	2.06	0.29	1.48	1.25	0.28	0.32	1.37	
Uniform Delay, d1	38.0	43.0		41.5	41.5	36.2	27.0	24.5	14.0	22.5	31.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.14	1.01	1.10	1.00	1.00	
Incremental Delay, d2	0.7	716.1		488.2	489.5	1.2	218.8	113.2	0.1	11.0	173.8	
Delay (s)	38.7	759.1		529.7	531.0	37.5	249.5	137.9	15.5	33.4	205.3	
Level of Service	D	F		F	F	D	F	F	B	C	F	
Approach Delay (s)		715.2			491.6			135.5			203.1	
Approach LOS		F			F			F			F	
Intersection Summary												
HCM Average Control Delay			284.8	HCM Level of Service			F					
HCM Volume to Capacity ratio			1.75									
Actuated Cycle Length (s)			100.0	Sum of lost time (s)			18.0					
Intersection Capacity Utilization			161.5%	ICU Level of Service			H					
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 35: I-385 NB Ramps & Roper Mountain Road

2035 PM Woodruff Improvements

7/6/2011
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	687	0	757	536	1800	0	0	2281	793
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	6.0			6.0	6.0
Lane Util. Factor				0.95	0.95	0.88	0.97	0.95			0.95	1.00
Frt				1.00	1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)				1633	1633	2707	3335	3438			3438	1538
Flt Permitted				0.95	0.95	1.00	0.95	1.00			1.00	1.00
Satd. Flow (perm)				1633	1633	2707	3335	3438			3438	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	763	0	841	596	2000	0	0	2534	881
RTOR Reduction (vph)	0	0	0	0	0	33	0	0	0	0	0	262
Lane Group Flow (vph)	0	0	0	381	382	808	596	2000	0	0	2534	619
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)				18.0	18.0	18.0	12.0	70.0			52.0	52.0
Effective Green, g (s)				18.0	18.0	18.0	12.0	70.0			52.0	52.0
Actuated g/C Ratio				0.18	0.18	0.18	0.12	0.70			0.52	0.52
Clearance Time (s)				6.0	6.0	6.0	6.0	6.0			6.0	6.0
Vehicle Extension (s)				4.9	4.9	4.9	4.3	4.9			4.9	4.9
Lane Grp Cap (vph)				294	294	487	400	2407			1788	800
v/s Ratio Prot							c0.18	0.58			c0.74	
v/s Ratio Perm				0.23	0.23	c0.30						0.40
v/c Ratio				1.30	1.30	1.66	1.49	0.83			1.42	0.77
Uniform Delay, d1				41.0	41.0	41.0	44.0	10.8			24.0	19.3
Progression Factor				1.00	1.00	1.00	0.94	1.59			0.80	0.64
Incremental Delay, d2				156.0	157.4	305.8	221.7	0.3			188.1	0.7
Delay (s)				197.0	198.4	346.8	263.1	17.5			207.2	13.1
Level of Service				F	F	F	F	B			F	B
Approach Delay (s)		0.0			275.9			73.9			157.1	
Approach LOS		A			F			E			F	
<b>Intersection Summary</b>												
HCM Average Control Delay			153.8			HCM Level of Service				F		
HCM Volume to Capacity ratio			1.48									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			178.6%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 36: Roper Mountain Road & I-385 SB Ramps

2035 PM Woodruff Improvements

7/6/2011





















												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		  			 				 			
Volume (vph)	0	1627	1068	1825	1143	0	709	0	533	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	5.8	6.4		6.1	6.1	6.1			
Lane Util. Factor		0.91	1.00	1.00	0.95		0.95	0.95	0.88			
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)		4940	1538	1719	3438		1633	1633	2707			
Flt Permitted		1.00	1.00	0.09	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		4940	1538	161	3438		1633	1633	2707			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	1808	1187	2028	1270	0	788	0	592	0	0	0
RTOR Reduction (vph)	0	0	172	0	0	0	0	0	192	0	0	0
Lane Group Flow (vph)	0	1808	1015	2028	1270	0	394	394	400	0	0	0
Turn Type		Perm		pm+pt			Perm		Perm			
Protected Phases		2		1	6			4				
Permitted Phases			2	6			4		4			
Actuated Green, G (s)		38.6	38.6	77.2	76.6		10.9	10.9	10.9			
Effective Green, g (s)		38.6	38.6	77.2	76.6		10.9	10.9	10.9			
Actuated g/C Ratio		0.39	0.39	0.77	0.77		0.11	0.11	0.11			
Clearance Time (s)		6.4	6.4	5.8	6.4		6.1	6.1	6.1			
Vehicle Extension (s)		4.9	4.9	4.3	4.9		4.9	4.9	4.9			
Lane Grp Cap (vph)		1907	594	626	2634		178	178	295			
v/s Ratio Prot		0.37		c1.04	0.37							
v/s Ratio Perm			0.66	c1.46			c0.24	0.24	0.15			
v/c Ratio		0.95	1.71	3.24	0.48		2.21	2.21	1.36			
Uniform Delay, d1		29.7	30.7	26.8	4.3		44.5	44.5	44.5			
Progression Factor		0.66	0.60	1.30	1.14		1.00	1.00	1.00			
Incremental Delay, d2		1.5	319.7	1008.2	0.1		563.9	563.9	181.4			
Delay (s)		21.0	338.0	1043.1	5.0		608.5	608.5	225.9			
Level of Service		C	F	F	A		F	F	F			
Approach Delay (s)		146.6			643.4			444.4			0.0	
Approach LOS		F			F			F			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			413.7			HCM Level of Service			F			
HCM Volume to Capacity ratio			3.03									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			11.9			
Intersection Capacity Utilization			178.6%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 37: Roper Mountain Road & Congaree Road

2035 PM Woodruff Improvements

7/6/2011

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	167	1677	2	10	1061	605	1006	2	519	6	2	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	6.4			6.4	6.4	6.1	6.1			6.1	6.1
Lane Util. Factor	1.00	0.91			0.95	1.00	1.00	1.00			1.00	1.00
Frt	1.00	1.00			1.00	0.85	1.00	0.85			1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00	0.95	1.00			0.96	1.00
Satd. Flow (prot)	1719	4939			3437	1538	1719	1539			1742	1538
Flt Permitted	0.10	1.00			0.89	1.00	0.75	1.00			0.78	1.00
Satd. Flow (perm)	184	4939			3072	1538	1360	1539			1418	1538
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	186	1863	2	11	1179	672	1118	2	577	7	2	13
RTOR Reduction (vph)	0	0	0	0	0	425	0	72	0	0	0	2
Lane Group Flow (vph)	186	1865	0	0	1190	247	1118	507	0	0	9	11
Turn Type	pm+pt		Perm		Perm		Perm		Perm		Perm	
Protected Phases	5	2			6			4			8	
Permitted Phases	2			6		6	4			8		8
Actuated Green, G (s)	43.6	43.6			33.6	33.6	43.9	43.9			43.9	43.9
Effective Green, g (s)	43.6	43.6			33.6	33.6	43.9	43.9			43.9	43.9
Actuated g/C Ratio	0.44	0.44			0.34	0.34	0.44	0.44			0.44	0.44
Clearance Time (s)	5.8	6.4			6.4	6.4	6.1	6.1			6.1	6.1
Vehicle Extension (s)	4.3	4.9			4.9	4.9	4.9	4.9			4.9	4.9
Lane Grp Cap (vph)	145	2153			1032	517	597	676			623	675
v/s Ratio Prot	0.05	c0.38						0.33				
v/s Ratio Perm	c0.51				0.39	0.16	c0.82				0.01	0.01
v/c Ratio	1.28	0.87			1.15	0.48	1.87	0.75			0.01	0.02
Uniform Delay, d1	28.2	25.6			33.2	26.3	28.1	23.5			15.8	15.9
Progression Factor	0.91	0.93			0.70	0.46	1.00	1.00			1.00	1.00
Incremental Delay, d2	132.1	0.5			76.9	2.2	399.1	5.4			0.0	0.0
Delay (s)	157.9	24.3			100.3	14.3	427.1	28.9			15.9	15.9
Level of Service	F	C			F	B	F	C			B	B
Approach Delay (s)		36.4			69.3			291.2			15.9	
Approach LOS		D			E			F			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			124.0									F
HCM Volume to Capacity ratio			1.54									
Actuated Cycle Length (s)			100.0								12.5	
Intersection Capacity Utilization			140.2%									H
Analysis Period (min)			15									
c Critical Lane Group												














# HCM Unsignalized Intersection Capacity Analysis

## 21: Frontage Rd & US 276

2035 PM Woodruff Improvements

7/6/2011










						
Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	69	160	50	2770	2206	71
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	77	178	56	3078	2451	79
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					1009	
pX, platoon unblocked	0.56	0.56	0.56			
vC, conflicting volume	4141	1265	2530			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5026	0	2165			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	71	58			
cM capacity (veh/h)	0	605	131			
Direction, Lane #	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2
Volume Total	254	56	1539	1539	1634	896
Volume Left	77	56	0	0	0	0
Volume Right	178	0	0	0	0	79
cSH	0	131	1700	1700	1700	1700
Volume to Capacity	712.03	0.42	0.91	0.91	0.96	0.53
Queue Length 95th (ft)	Err	46	0	0	0	0
Control Delay (s)	Err	51.1	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	0.9			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay		430.4				
Intersection Capacity Utilization		96.9%		ICU Level of Service		F
Analysis Period (min)		15				

# HCM Unsignalized Intersection Capacity Analysis

## 22: US 276 & St Josephs Dr

2035 PM Woodruff Improvements

7/6/2011












						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	2290	549	113	1784	493	348
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	2544	610	126	1982	548	387
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				861		
pX, platoon unblocked					0.53	
vC, conflicting volume			3154		4092	1577
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			3154		5053	1577
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			0		0	0
cM capacity (veh/h)			92		0	95
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	
Volume Total	1696	1458	786	1321	934	
Volume Left	0	0	126	0	548	
Volume Right	0	610	0	0	387	
cSH	1700	1700	92	1700	0	
Volume to Capacity	1.00	0.86	1.36	0.78	Err	
Queue Length 95th (ft)	0	0	231	0	Err	
Control Delay (s)	0.0	0.0	298.8	0.0	Err	
Lane LOS			F		F	
Approach Delay (s)	0.0		111.5		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			Err			
Intersection Capacity Utilization			189.5%		ICU Level of Service	H
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 29: Rothwell Dr & E Butler Road

2035 PM Woodruff Improvements

7/6/2011











						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	30	8	2	1101	1518	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	33	9	2	1223	1687	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		5				
Median type				TWLTL	TWLTL	
Median storage (veh)				2	2	
Upstream signal (ft)				1175	377	
pX, platoon unblocked	0.87	0.82	0.82			
vC, conflicting volume	2304	844	1689			
vC1, stage 1 conf vol	1688					
vC2, stage 2 conf vol	616					
vCu, unblocked vol	1285	382	1408			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)	5.9					
tF (s)	3.5	3.3	2.2			
p0 queue free %	78	98	99			
cM capacity (veh/h)	150	500	383			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	42	2	612	612	1124	564
Volume Left	33	2	0	0	0	0
Volume Right	9	0	0	0	0	2
cSH	190	383	1700	1700	1700	1700
Volume to Capacity	0.22	0.01	0.36	0.36	0.66	0.33
Queue Length 95th (ft)	20	0	0	0	0	0
Control Delay (s)	30.7	14.4	0.0	0.0	0.0	0.0
Lane LOS	D	B				
Approach Delay (s)	30.7	0.0			0.0	
Approach LOS	D					
Intersection Summary						
Average Delay		0.4				
Intersection Capacity Utilization		52.0%		ICU Level of Service		A
Analysis Period (min)		15				

# HCM Unsignalized Intersection Capacity Analysis

## 32: New Commerce Ct & E Butler Road

2035 PM Woodruff Improvements




















7/6/2011

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	80	91	1531	6	80	2399
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	89	101	1701	7	89	2666
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)			369			
pX, platoon unblocked	0.83	0.83			0.83	
vC, conflicting volume	3215	854			1708	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3260	402			1436	
tC, single (s)	6.9	7.0			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	79			76	
cM capacity (veh/h)	4	487			375	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	190	1134	574	89	1333	1333
Volume Left	89	0	0	89	0	0
Volume Right	101	0	7	0	0	0
cSH	9	1700	1700	375	1700	1700
Volume to Capacity	21.69	0.67	0.34	0.24	0.78	0.78
Queue Length 95th (ft)	Err	0	0	23	0	0
Control Delay (s)	Err	0.0	0.0	17.6	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	Err	0.0		0.6		
Approach LOS	F					
Intersection Summary						
Average Delay		408.7				
Intersection Capacity Utilization		83.0%		ICU Level of Service		E
Analysis Period (min)		15				

# HCM Unsignalized Intersection Capacity Analysis 33: E Butler Road & Brookfield Pkwy

2035 PM Woodruff Improvements

7/6/2011

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (veh/h)	23	1593	6	2	2187	14	3	0	267	25	0	6
Sign Control	Free				Free				Stop		Stop	
Grade	0%				0%				0%		0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	26	1770	7	2	2430	16	3	0	297	28	0	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)	939											
pX, platoon unblocked				0.83			0.83			0.83		
vC, conflicting volume	2446			1777			3385			4270		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2446			1518			3466			4538		
tC, single (s)	4.2			4.2			7.6			6.6		
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5			4.0		
p0 queue free %	86			99			0			100		
cM capacity (veh/h)	180			348			2			1		
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SE 1	SE 2	NW 1	NW 2			
Volume Total	26	1180	597	1217	1231	3	297	28	7			
Volume Left	26	0	0	2	0	3	0	28	0			
Volume Right	0	0	7	0	16	0	297	0	7			
cSH	180	1700	1700	348	1700	2	167	0	458			
Volume to Capacity	0.14	0.69	0.35	0.01	0.72	1.94	1.78	Err	0.01			
Queue Length 95th (ft)	12	0	0	0	0	31	535	Err	1			
Control Delay (s)	28.3	0.0	0.0	0.4	0.0	3685.3	420.1	Err	13.0			
Lane LOS	D			A		F	F	F	B			
Approach Delay (s)	0.4			0.2		456.3		Err				
Approach LOS						F		F				
Intersection Summary												
Average Delay	Err											
Intersection Capacity Utilization	90.8%			ICU Level of Service						E		
Analysis Period (min)	15											