
























# HCM Signalized Intersection Capacity Analysis

## 1: Woodruff Road & Roper Mountain Road

2015 PM Woodruff Improvements

7/6/2011























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	284	320	47	125	633	393	36	469	110	451	469	65
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
Frt	1.00	0.98		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	3372		1719	3438	1538	1719	3438	1538	3335	3438	1538
Flt Permitted	0.14	1.00		0.51	1.00	1.00	0.46	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	259	3372		927	3438	1538	831	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)	316	356	52	139	703	437	40	521	122	501	521	72
RTOR Reduction (vph)	0	12	0	0	0	306	0	0	97	0	0	41
Lane Group Flow (vph)	316	396	0	139	703	131	40	521	25	501	521	31
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)	45.2	31.2		34.0	24.0	24.0	20.2	20.2	20.2	17.6	42.8	42.8
Effective Green, g (s)	45.2	31.2		34.0	24.0	24.0	20.2	20.2	20.2	17.6	42.8	42.8
Actuated g/C Ratio	0.45	0.31		0.34	0.24	0.24	0.20	0.20	0.20	0.18	0.43	0.43
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)	368	1052		394	825	369	168	694	311	587	1471	658
v/s Ratio Prot	c0.15	0.12		0.04	0.20			c0.15		c0.15	0.15	
v/s Ratio Perm	c0.24			0.08		0.08	0.05		0.02			0.02
v/c Ratio	0.86	0.38		0.35	0.85	0.35	0.24	0.75	0.08	0.85	0.35	0.05
Uniform Delay, d1	24.6	26.8		23.7	36.3	31.6	33.4	37.5	32.4	39.9	19.3	16.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	0.64	0.56	0.57
Incremental Delay, d2	18.6	0.6		0.9	9.5	1.4	3.3	7.3	0.5	9.9	0.5	0.1
Delay (s)	43.2	27.4		24.6	45.8	33.0	36.8	44.9	32.9	35.3	11.3	9.5
Level of Service	D	C		C	D	C	D	D	C	D	B	A
Approach Delay (s)		34.3			39.1			42.2			22.2	
Approach LOS		C			D			D			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			33.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			15.0			
Intersection Capacity Utilization			76.6%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 2: Woodruff Road & Costco Driveway

2015 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	13	769	85	189	1125	40	93	4	201	37	2	30
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
Frt	1.00	0.99		1.00	1.00	0.85	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		0.95	1.00	1.00
Satd. Flow (prot)	1719	3387		1719	3438	1538	1719	1543		1719	1810	1538
Flt Permitted	0.16	1.00		0.30	1.00	1.00	0.76	1.00		0.27	1.00	1.00
Satd. Flow (perm)	298	3387		546	3438	1538	1369	1543		488	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)	14	854	94	210	1250	44	103	4	223	41	2	33
RTOR Reduction (vph)	0	6	0	0	0	12	0	195	0	0	0	27
Lane Group Flow (vph)	14	942	0	210	1250	32	103	32	0	41	2	6
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)	91.7	91.7		80.4	80.4	80.4	15.3	15.3		15.3	15.3	20.1
Effective Green, g (s)	91.7	91.7		80.4	80.4	80.4	15.3	15.3		15.3	15.3	20.1
Actuated g/C Ratio	0.76	0.76		0.67	0.67	0.67	0.13	0.13		0.13	0.13	0.17
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)	285	2588		366	2303	1030	175	197		62	231	341
v/s Ratio Prot	0.00	c0.28			0.36			0.02			0.00	0.00
v/s Ratio Perm	0.04			c0.38		0.02	0.08			c0.08		0.00
v/c Ratio	0.05	0.36		0.57	0.54	0.03	0.59	0.16		0.66	0.01	0.02
Uniform Delay, d1	5.6	4.6		10.6	10.3	6.7	49.4	46.7		49.9	45.7	41.7
Progression Factor	1.00	1.00		0.59	0.48	0.18	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4		6.2	0.9	0.1	8.5	1.0		32.4	0.0	0.0
Delay (s)	5.7	5.0		12.5	5.8	1.3	57.9	47.6		82.2	45.8	41.7
Level of Service	A	A		B	A	A	E	D		F	D	D
Approach Delay (s)		5.0			6.6			50.8			63.7	
Approach LOS		A			A			D			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			12.7			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				19.5		
Intersection Capacity Utilization			91.0%			ICU Level of Service				E		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 3: Green Heron Road & Woodruff Road

2015 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	21	1	60	12	2	84	70	1347	11	2	971	2
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)		1609			1734	1538	1719	3434		1719	3438	1538
Flt Permitted		0.91			0.64	1.00	0.26	1.00		0.15	1.00	1.00
Satd. Flow (perm)		1481			1150	1538	463	3434		279	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)	23	1	67	13	2	93	78	1497	12	2	1079	2
RTOR Reduction (vph)	0	62	0	0	0	86	0	0	0	0	0	0
Lane Group Flow (vph)	0	29	0	0	15	7	78	1509	0	2	1079	2
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)		9.5			9.5	9.5	99.2	99.2		99.2	99.2	99.2
Effective Green, g (s)		9.5			9.5	9.5	99.2	99.2		99.2	99.2	99.2
Actuated g/C Ratio		0.08			0.08	0.08	0.83	0.83		0.83	0.83	0.83
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)		117			91	122	383	2839		231	2842	1271
v/s Ratio Prot								c0.44			0.31	
v/s Ratio Perm		c0.02			0.01	0.00	0.17			0.01		0.00
v/c Ratio		0.25			0.16	0.06	0.20	0.53		0.01	0.38	0.00
Uniform Delay, d1		51.9			51.5	51.1	2.2	3.2		1.8	2.6	1.8
Progression Factor		1.00			1.00	1.00	0.93	0.93		0.48	0.35	0.43
Incremental Delay, d2		1.8			1.4	0.3	1.2	0.7		0.1	0.3	0.0
Delay (s)		53.7			52.9	51.4	3.2	3.7		0.9	1.2	0.8
Level of Service		D			D	D	A	A		A	A	A
Approach Delay (s)		53.7			51.7			3.6			1.2	
Approach LOS		D			D			A			A	
<b>Intersection Summary</b>												
HCM Average Control Delay		6.1			HCM Level of Service			A				
HCM Volume to Capacity ratio		0.51										
Actuated Cycle Length (s)		120.0			Sum of lost time (s)			11.3				
Intersection Capacity Utilization		79.2%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 4: Woodruff Industrial Lane & Woodruff Road

2015 PM Woodruff Improvements

7/6/2011


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	146	33	272	199	29	28	53	1291	75	219	800	236
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	3410		1719	3321	
Flt Permitted	0.72	1.00		0.25	1.00		0.19	1.00		0.07	1.00	
Satd. Flow (perm)	1296	1568		452	1676		348	3410		119	3321	
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	37	302	221	32	31	59	1434	83	243	889	262
RTOR Reduction (vph)	0	134	0	0	27	0	0	3	0	0	21	0
Lane Group Flow (vph)	162	205	0	221	36	0	59	1514	0	243	1130	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)	24.0	14.0		28.0	16.0		60.1	55.0		76.0	64.9	
Effective Green, g (s)	24.0	14.0		28.0	16.0		60.1	55.0		76.0	64.9	
Actuated g/C Ratio	0.20	0.12		0.23	0.13		0.50	0.46		0.63	0.54	
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)	294	183		232	223		233	1563		275	1796	
v/s Ratio Prot	0.05	c0.13		c0.10	0.02		0.01	c0.44		c0.11	0.34	
v/s Ratio Perm	0.06			0.13			0.12			0.45		
v/c Ratio	0.55	1.12		0.95	0.16		0.25	0.97		0.88	0.63	
Uniform Delay, d1	42.4	53.0		42.4	46.1		16.2	31.7		37.8	19.2	
Progression Factor	1.00	1.00		1.00	1.00		0.84	0.86		0.68	0.86	
Incremental Delay, d2	3.0	102.0		46.1	0.5		0.8	14.9		26.0	1.6	
Delay (s)	45.4	155.0		88.5	46.6		14.3	42.3		51.5	18.1	
Level of Service	D	F		F	D		B	D		D	B	
Approach Delay (s)		119.6			79.2			41.3			23.9	
Approach LOS		F			E			D			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			48.1			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.98									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				24.0		
Intersection Capacity Utilization			99.8%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011












																		
Movement	WBL2	WBL	WBR	SEL	SET	SER	NWL	NWT	NWR	NEL	NER							
Lane Configurations																		
Volume (vph)	336	0	205	0	1490	272	653	1051	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	120	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)	373	0	228	0	1656	302	726	1168	0	0	0							
RTOR Reduction (vph)	0	0	207	0	0	114	0	0	0	0	0							
Lane Group Flow (vph)	373	0	21	0	1656	188	726	1168	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		53.7		53.7		97.9		97.9							
Effective Green, g (s)	11.0		11.0		53.7		53.7		97.9		97.9							
Actuated g/C Ratio	0.09		0.09		0.45		0.45		0.82		0.82							
Clearance Time (s)	5.0		5.0		6.3		6.3		6.5		6.1							
Vehicle Extension (s)	4.3		4.3		4.3		4.3		4.3		4.3							
Lane Grp Cap (vph)	306		248		1539		688		598		2805							
v/s Ratio Prot					0.48		c0.38		0.34									
v/s Ratio Perm	c0.11		0.01				0.12		c0.61									
v/c Ratio	1.22		0.08		1.08		0.27		1.21		0.42							
Uniform Delay, d1	54.5		49.9		33.1		20.9		36.9		3.1							
Progression Factor	1.00		1.00		0.54		0.15		0.99		2.13							
Incremental Delay, d2	124.5		0.2		38.5		0.3		108.0		0.4							
Delay (s)	179.0		50.1		56.6		3.5		144.6		6.9							
Level of Service	F		D		E		A		F		A							
Approach Delay (s)			130.1		48.4				59.7		0.0							
Approach LOS			F		D				E		A							
<b>Intersection Summary</b>																		
HCM Average Control Delay			64.2		HCM Level of Service		E											
HCM Volume to Capacity ratio			1.18															
Actuated Cycle Length (s)			120.0		Sum of lost time (s)		11.5											
Intersection Capacity Utilization			100.6%		ICU Level of Service		G											
Analysis Period (min)			15															
c Critical Lane Group																		

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011

						
Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	500	582	839	987	0	1204
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)	556	647	932	1097	0	1338
RTOR Reduction (vph)	0	357	0	495	0	0
Lane Group Flow (vph)	556	290	932	602	0	1338
Turn Type		Prot		Perm		
Protected Phases	3	3	2			2 4
Permitted Phases				2		
Actuated Green, G (s)	24.4	24.4	65.5	65.5		83.5
Effective Green, g (s)	24.4	24.4	65.5	65.5		76.5
Actuated g/C Ratio	0.20	0.20	0.55	0.55		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	1877	839		2192
v/s Ratio Prot	c0.17	0.11	0.27			c0.39
v/s Ratio Perm				c0.39		
v/c Ratio	0.82	0.53	0.50	0.72		0.61
Uniform Delay, d1	45.7	42.7	17.0	20.3		12.9
Progression Factor	1.00	1.00	2.12	15.14		1.39
Incremental Delay, d2	8.4	1.4	0.1	0.5		0.3
Delay (s)	54.1	44.0	36.1	308.2		18.3
Level of Service	D	D	D	F		B
Approach Delay (s)	48.7		183.3			18.3
Approach LOS	D		F			B
<b>Intersection Summary</b>						
HCM Average Control Delay			99.5		HCM Level of Service	F
HCM Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	18.6
Intersection Capacity Utilization			66.5%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 7: Carolina Point Pkwy & Woodruff Road

2015 PM Woodruff Improvements

7/6/2011



























Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations	↰↱	↱	↰↱	↱	↰	↰↱
Volume (vph)	207	73	1328	93	18	2052
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	0.16	1.00
Satd. Flow (perm)	3335	1538	3438	1538	283	3438
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	230	81	1476	103	20	2280
RTOR Reduction (vph)	0	74	0	20	0	0
Lane Group Flow (vph)	230	7	1476	83	20	2280
Turn Type		Prot		Perm	Perm	
Protected Phases	4	4	2 3 6			2 3 6
Permitted Phases	4			2 3 6	2 3 6	
Actuated Green, G (s)	11.0	11.0	96.4	96.4	96.4	96.4
Effective Green, g (s)	11.0	11.0	96.4	96.4	96.4	96.4
Actuated g/C Ratio	0.09	0.09	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)	306	141	2762	1236	227	2762
v/s Ratio Prot	c0.07	0.00	0.43			c0.66
v/s Ratio Perm				0.05	0.07	
v/c Ratio	0.75	0.05	0.53	0.07	0.09	0.83
Uniform Delay, d1	53.2	49.7	4.1	2.5	2.5	6.9
Progression Factor	1.00	1.00	0.41	0.12	0.93	1.40
Incremental Delay, d2	10.9	0.2	0.2	0.0	0.0	0.2
Delay (s)	64.1	50.0	1.9	0.3	2.3	9.9
Level of Service	E	D	A	A	A	A
Approach Delay (s)	60.4		1.8			9.8
Approach LOS	E		A			A
<b>Intersection Summary</b>						
HCM Average Control Delay			10.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.82			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	13.5
Intersection Capacity Utilization			73.9%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 8: Woodruff Road & Market Point Drive

2015 PM Woodruff Improvements

7/6/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	420	925	56	76	1648	163	130	29	75	236	29	292
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)	467	1028	62	84	1831	181	144	32	83	262	32	324
RTOR Reduction (vph)	0	0	24	0	0	62	0	0	63	0	0	218
Lane Group Flow (vph)	467	1028	38	84	1831	119	144	32	20	262	32	106
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)	16.1	63.6	73.6	12.6	60.1	60.1	10.0	7.6	20.2	12.4	10.0	10.0
Effective Green, g (s)	16.1	63.6	73.6	12.6	60.1	60.1	10.0	7.6	20.2	12.4	10.0	10.0
Actuated g/C Ratio	0.13	0.53	0.61	0.10	0.50	0.50	0.08	0.06	0.17	0.10	0.08	0.08
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)	447	1822	943	180	1722	770	143	115	259	345	287	128
v/s Ratio Prot	c0.14	0.30	0.00	0.05	c0.53		c0.08	0.02	0.01	0.08	0.01	
v/s Ratio Perm			0.02			0.08			0.00			c0.07
v/c Ratio	1.04	0.56	0.04	0.47	1.06	0.15	1.01	0.28	0.08	0.76	0.11	0.83
Uniform Delay, d1	51.9	18.9	9.2	50.5	29.9	16.2	55.0	53.6	42.0	52.3	50.9	54.1
Progression Factor	1.33	0.41	0.04	0.65	0.40	0.18	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	51.6	1.1	0.0	1.3	34.7	0.2	77.1	2.1	0.2	10.1	0.3	35.5
Delay (s)	120.7	8.8	0.4	34.3	46.7	3.1	132.1	55.7	42.2	62.5	51.2	89.6
Level of Service	F	A	A	C	D	A	F	E	D	E	D	F
Approach Delay (s)		42.0			42.4			93.9			76.1	
Approach LOS		D			D			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			49.8			HCM Level of Service				D		
HCM Volume to Capacity ratio			0.97									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			86.4%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												



























# HCM Signalized Intersection Capacity Analysis

## 9: Woodruff Road & Garlington Road

2015 PM Woodruff Improvements

7/6/2011


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	182	872	182	168	1439	164	266	150	119	336	277	182
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	0.17	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	3335	3438	1538	304	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)	202	969	202	187	1599	182	296	167	132	373	308	202
RTOR Reduction (vph)	0	0	113	0	0	72	0	23	0	0	0	0
Lane Group Flow (vph)	202	969	89	187	1599	110	296	276	0	373	308	202
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)	8.0	52.8	52.8	69.0	56.9	56.9	11.6	19.4		14.0	21.8	120.0
Effective Green, g (s)	8.0	52.8	52.8	69.0	56.9	56.9	11.6	19.4		14.0	21.8	120.0
Actuated g/C Ratio	0.07	0.44	0.44	0.58	0.47	0.47	0.10	0.16		0.12	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)	222	1513	677	317	1630	729	322	273		389	329	1538
v/s Ratio Prot	c0.06	0.28		0.06	c0.47		0.09	0.16		c0.11	c0.17	
v/s Ratio Perm			0.06	0.28		0.07						c0.13
v/c Ratio	0.91	0.64	0.13	0.59	0.98	0.15	0.92	1.01		0.96	0.94	0.13
Uniform Delay, d1	55.6	26.2	20.0	16.0	31.0	17.9	53.7	50.3		52.7	48.4	0.0
Progression Factor	1.09	0.70	0.88	1.75	0.74	1.10	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	32.4	1.7	0.3	2.9	16.1	0.4	30.6	56.8		35.0	33.6	0.2
Delay (s)	93.1	20.0	17.9	31.0	39.1	20.0	84.3	107.1		87.7	82.1	0.2
Level of Service	F	C	B	C	D	C	F	F		F	F	A
Approach Delay (s)		30.5			36.6			95.8			65.7	
Approach LOS		C			D			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			47.5				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			16.5		
Intersection Capacity Utilization			87.8%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	889	438	183	1348	0	0	0	0	696	0	423
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)		3268		1719	3438					3335		1538
Flt Permitted		1.00		0.06	1.00					0.95		1.00
Satd. Flow (perm)		3268		112	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	988	487	203	1498	0	0	0	0	773	0	470
RTOR Reduction (vph)	0	50	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1425	0	203	1498	0	0	0	0	773	0	470
Turn Type				pm+pt						Prot		Free
Protected Phases		2		1	6					4		
Permitted Phases				6								Free
Actuated Green, G (s)		58.3		77.6	77.6					30.1		120.0
Effective Green, g (s)		58.3		77.6	77.6					30.1		120.0
Actuated g/C Ratio		0.49		0.65	0.65					0.25		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)		1588		243	2223					837		1538
v/s Ratio Prot		c0.44		0.09	c0.44					c0.23		
v/s Ratio Perm				0.45								0.31
v/c Ratio		0.90		0.84	0.67					0.92		0.31
Uniform Delay, d1		28.1		35.5	13.3					43.8		0.0
Progression Factor		0.62		1.29	0.11					1.00		1.00
Incremental Delay, d2		5.6		2.6	0.2					15.9		0.5
Delay (s)		23.1		48.3	1.6					59.8		0.5
Level of Service		C		D	A					E		A
Approach Delay (s)		23.1			7.2			0.0			37.4	
Approach LOS		C			A			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			21.0			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)				18.9		
Intersection Capacity Utilization			110.9%			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

2015 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	482	1103	0	0	995	649	536	0	253	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	0.09	1.00			1.00	1.00	0.95		1.00			
Satd. Flow (perm)	167	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)	536	1226	0	0	1106	721	596	0	281	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	409	0	0	49	0	0	0
Lane Group Flow (vph)	536	1226	0	0	1106	312	596	0	232	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)	71.9	71.9			37.3	37.3	37.0		37.0			
Effective Green, g (s)	71.9	71.9			37.3	37.3	37.0		37.0			
Actuated g/C Ratio	0.60	0.60			0.31	0.31	0.31		0.31			
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)	469	2060			1069	478	530		474			
v/s Ratio Prot	c0.27	0.36			0.32		c0.35					
v/s Ratio Perm	c0.41					0.20			0.15			
v/c Ratio	1.14	0.60			1.03	0.65	1.12		0.49			
Uniform Delay, d1	37.5	15.0			41.4	35.8	41.5		33.8			
Progression Factor	1.04	1.03			0.71	0.65	1.00		1.00			
Incremental Delay, d2	74.8	0.5			29.1	3.5	78.1		1.3			
Delay (s)	113.9	16.0			58.4	26.8	119.6		35.1			
Level of Service	F	B			E	C	F		D			
Approach Delay (s)		45.7			45.9			92.5			0.0	
Approach LOS		D			D			F			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			55.0			HCM Level of Service			D			
HCM Volume to Capacity ratio			1.10									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			11.1			
Intersection Capacity Utilization			110.9%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 12: Woodruff Road & Commercial Drive

2015 PM Woodruff Improvements

7/6/2011



















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	169	1142	45	10	1323	55	209	19	10	94	12	112
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	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	3419		1719	3418		1719	1716		1719	1564	
Flt Permitted	0.06	1.00		0.20	1.00		0.33	1.00		0.74	1.00	
Satd. Flow (perm)	110	3419		354	3418		604	1716		1332	1564	
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)	188	1269	50	11	1470	61	232	21	11	104	13	124
RTOR Reduction (vph)	0	2	0	0	2	0	0	8	0	0	111	0
Lane Group Flow (vph)	188	1317	0	11	1529	0	232	24	0	104	26	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)	77.9	77.9		60.7	60.7		31.2	31.2		12.2	12.2	
Effective Green, g (s)	77.9	77.9		60.7	60.7		31.2	31.2		12.2	12.2	
Actuated g/C Ratio	0.65	0.65		0.51	0.51		0.26	0.26		0.10	0.10	
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)	231	2220		179	1729		284	446		135	159	
v/s Ratio Prot	c0.08	0.39			c0.45		c0.09	0.01			0.02	
v/s Ratio Perm	0.45			0.03			c0.12			0.08		
v/c Ratio	0.81	0.59		0.06	0.88		0.82	0.05		0.77	0.16	
Uniform Delay, d1	34.8	12.0		15.1	26.5		38.5	33.3		52.5	49.2	
Progression Factor	1.78	0.19		0.85	0.77		1.00	1.00		1.00	1.00	
Incremental Delay, d2	17.4	1.0		0.5	5.6		17.6	0.1		25.2	0.8	
Delay (s)	79.4	3.3		13.4	26.0		56.1	33.4		77.8	50.0	
Level of Service	E	A		B	C		E	C		E	D	
Approach Delay (s)		12.8			25.9			53.3			62.0	
Approach LOS		B			C			D			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			24.8			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			16.1			
Intersection Capacity Utilization			84.7%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 13: Woodruff Road & Smith Hines Road

2015 PM Woodruff Improvements

7/6/2011




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	1173	63	60	1209	1	169	1	133	5	1	10
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			0.98	
Satd. Flow (prot)	1719	3412		1719	3438			1656			1633	
Flt Permitted	0.15	1.00		0.14	1.00			0.82			0.90	
Satd. Flow (perm)	263	3412		251	3438			1390			1490	
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)	11	1303	70	67	1343	1	188	1	148	6	1	11
RTOR Reduction (vph)	0	3	0	0	0	0	0	26	0	0	8	0
Lane Group Flow (vph)	11	1370	0	67	1344	0	0	311	0	0	10	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	2			6			8			4		
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	76.7	76.7		77.0	77.0			32.0			32.0	
Effective Green, g (s)	76.7	76.7		77.0	77.0			32.0			32.0	
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.27			0.27	
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)	168	2181		161	2206			371			397	
v/s Ratio Prot	c0.40			0.39								
v/s Ratio Perm	0.04			0.27				c0.22			0.01	
v/c Ratio	0.07	0.63		0.42	0.61			0.84			0.03	
Uniform Delay, d1	8.2	13.1		10.5	12.6			41.6			32.5	
Progression Factor	0.13	0.12		0.56	0.56			1.00			1.00	
Incremental Delay, d2	0.6	1.1		0.7	0.1			16.2			0.0	
Delay (s)	1.7	2.7		6.6	7.2			57.8			32.5	
Level of Service	A	A		A	A			E			C	
Approach Delay (s)	2.7			7.1				57.8			32.5	
Approach LOS	A			A				E			C	
Intersection Summary												
HCM Average Control Delay			10.7	HCM Level of Service			B					
HCM Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)			11.3					
Intersection Capacity Utilization			83.3%	ICU Level of Service			E					
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 14: Woodruff Road & Walmart Driveway

2015 PM Woodruff Improvements

7/6/2011























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	1558	137	22	2324	43	372	7	6	39	1	37
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			0.93	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1719	3396		1719	3429		1719	1683			1650	
Flt Permitted	0.05	1.00		0.06	1.00		0.71	1.00			0.86	
Satd. Flow (perm)	94	3396		110	3429		1280	1683			1456	
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)	24	1731	152	24	2582	48	413	8	7	43	1	41
RTOR Reduction (vph)	0	5	0	0	1	0	0	5	0	0	28	0
Lane Group Flow (vph)	24	1878	0	24	2629	0	413	10	0	0	57	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)	79.7	79.7		70.4	70.4		29.0	29.0			29.0	
Effective Green, g (s)	79.7	79.7		70.4	70.4		29.0	29.0			29.0	
Actuated g/C Ratio	0.66	0.66		0.59	0.59		0.24	0.24			0.24	
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)	103	2256		65	2012		309	407			352	
v/s Ratio Prot	0.01	c0.55			c0.77			0.01				
v/s Ratio Perm	0.15			0.22			c0.32				0.04	
v/c Ratio	0.23	0.83		0.37	1.31		1.34	0.02			0.16	
Uniform Delay, d1	29.2	15.1		13.1	24.8		45.5	34.7			35.9	
Progression Factor	1.22	0.83		0.84	0.74		1.00	1.00			1.00	
Incremental Delay, d2	1.6	3.4		12.5	140.9		171.8	0.0			0.3	
Delay (s)	37.1	15.9		23.5	159.4		217.3	34.7			36.3	
Level of Service	D	B		C	F		F	C			D	
Approach Delay (s)		16.1			158.2			210.9			36.3	
Approach LOS		B			F			F			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			107.2			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.33									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			17.6			
Intersection Capacity Utilization			102.3%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 15: Woodruff Road & Verdin Road

2015 PM Woodruff Improvements

7/6/2011




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	101	1900	43	63	1229	74	255	205	125	54	218	168
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	1691	
Flt Permitted	0.10	1.00		0.06	1.00		0.15	1.00	1.00	0.62	1.00	
Satd. Flow (perm)	180	3427		105	3409		266	1810	1538	1115	1691	
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)	112	2111	48	70	1366	82	283	228	139	60	242	187
RTOR Reduction (vph)	0	1	0	0	3	0	0	0	5	0	23	0
Lane Group Flow (vph)	112	2158	0	70	1445	0	283	228	134	60	406	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)	68.7	68.7		68.7	68.7		40.0	40.0	40.0	21.8	21.8	
Effective Green, g (s)	68.7	68.7		68.7	68.7		40.0	40.0	40.0	21.8	21.8	
Actuated g/C Ratio	0.57	0.57		0.57	0.57		0.33	0.33	0.33	0.18	0.18	
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)	103	1962		60	1952		244	603	513	203	307	
v/s Ratio Prot		0.63			0.42		c0.12	0.13			c0.24	
v/s Ratio Perm	0.62			c0.66			0.26		0.09	0.05		
v/c Ratio	1.09	1.10		1.17	0.74		1.16	0.38	0.26	0.30	1.32	
Uniform Delay, d1	25.6	25.6		25.6	19.0		34.3	30.5	29.2	42.5	49.1	
Progression Factor	0.67	0.67		1.28	1.29		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	103.0	51.6		122.8	1.0		107.7	0.6	0.4	1.3	166.2	
Delay (s)	120.1	68.9		155.7	25.6		141.9	31.1	29.6	43.7	215.3	
Level of Service	F	E		F	C		F	C	C	D	F	
Approach Delay (s)		71.4			31.6			79.1			194.3	
Approach LOS		E			C			E			F	
Intersection Summary												
HCM Average Control Delay			72.3	HCM Level of Service			E					
HCM Volume to Capacity ratio			1.20									
Actuated Cycle Length (s)			120.0	Sum of lost time (s)			16.7					
Intersection Capacity Utilization			133.5%	ICU Level of Service			H					
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 16: Woodruff Road & Butler Road

2015 PM Woodruff Improvements

7/6/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	1683	117	371	1179	18	186	19	458	311	388	101
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	1754	
Flt Permitted		0.92		0.07	1.00			0.15	1.00	0.53	1.00	
Satd. Flow (perm)		3124		132	3430			273	1538	955	1754	
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)	22	1870	130	412	1310	20	207	21	509	346	431	112
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	1	0	8	0
Lane Group Flow (vph)	0	2018	0	412	1329	0	0	228	508	346	535	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)		48.7		65.7	65.7			43.0	53.7	43.0	43.0	
Effective Green, g (s)		48.7		65.7	65.7			43.0	53.7	43.0	43.0	
Actuated g/C Ratio		0.41		0.55	0.55			0.36	0.45	0.36	0.36	
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)		1268		214	1878			98	688	342	629	
v/s Ratio Prot				c0.17	0.39				0.07		0.31	
v/s Ratio Perm		0.65		c0.89				c0.83	0.26	0.36		
v/c Ratio		1.59		1.93	0.71			2.33	0.74	1.01	0.85	
Uniform Delay, d1		35.6		37.3	20.1			38.5	27.4	38.5	35.5	
Progression Factor		0.66		1.16	1.32			1.00	1.00	1.00	1.00	
Incremental Delay, d2		266.5		427.0	1.4			627.6	4.6	51.7	11.3	
Delay (s)		289.9		470.3	28.0			666.1	31.9	90.2	46.8	
Level of Service		F		F	C			F	C	F	D	
Approach Delay (s)		289.9			132.6			228.1			63.7	
Approach LOS		F			F			F			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			193.3			HCM Level of Service			F			
HCM Volume to Capacity ratio			2.02									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			11.3			
Intersection Capacity Utilization			140.7%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												





















# HCM Signalized Intersection Capacity Analysis

## 17: Woodruff Road & Bell Road

2015 PM Woodruff Improvements

7/6/2011
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	67	2403	110	37	1732	11	147	1	40	15	1	62
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			1692			1600	
Flt Permitted	0.07	1.00		0.04	1.00			0.70			0.94	
Satd. Flow (perm)	126	3416		81	3435			1224			1517	
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)	74	2670	122	41	1924	12	163	1	44	17	1	69
RTOR Reduction (vph)	0	3	0	0	0	0	0	7	0	0	29	0
Lane Group Flow (vph)	74	2789	0	41	1936	0	0	201	0	0	58	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	2			6			8			4		
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	89.6	89.6		89.6	89.6			18.8			18.8	
Effective Green, g (s)	89.6	89.6		89.6	89.6			18.8			18.8	
Actuated g/C Ratio	0.75	0.75		0.75	0.75			0.16			0.16	
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)	94	2551		60	2565			192			238	
v/s Ratio Prot	c0.82			0.56								
v/s Ratio Perm	0.59			0.51				c0.16			0.04	
v/c Ratio	0.79	1.09		0.68	0.75			1.05			0.25	
Uniform Delay, d1	9.3	15.2		7.9	8.8			50.6			44.4	
Progression Factor	0.60	0.61		0.96	0.92			1.00			1.00	
Incremental Delay, d2	6.0	42.8		43.8	1.9			78.2			0.9	
Delay (s)	11.6	52.0		51.4	10.0			128.8			45.2	
Level of Service	B	D		D	A			F			D	
Approach Delay (s)	50.9			10.8				128.8			45.2	
Approach LOS	D			B				F			D	
Intersection Summary												
HCM Average Control Delay	38.6			HCM Level of Service			D					
HCM Volume to Capacity ratio	1.09											
Actuated Cycle Length (s)	120.0			Sum of lost time (s)			11.6					
Intersection Capacity Utilization	96.9%			ICU Level of Service			F					
Analysis Period (min)	15											
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 18: Woodruff Road & SC 14

2015 PM Woodruff Improvements

7/6/2011
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	1291	363	100	853	74	186	276	54	202	412	117
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	0.11	1.00	1.00	0.09	1.00		0.14	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)	203	3438	1538	157	3397		250	1810	1538	547	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)	174	1434	403	111	948	82	207	307	60	224	458	130
RTOR Reduction (vph)	0	0	51	0	6	0	0	0	33	0	0	37
Lane Group Flow (vph)	174	1434	352	111	1024	0	207	307	27	224	458	93
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)	62.6	51.4	62.4	52.2	46.2		40.0	29.0	35.0	40.0	29.0	40.2
Effective Green, g (s)	62.6	51.4	62.4	52.2	46.2		40.0	29.0	35.0	40.0	29.0	40.2
Actuated g/C Ratio	0.52	0.43	0.52	0.44	0.39		0.33	0.24	0.29	0.33	0.24	0.34
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)	247	1473	800	146	1308		218	437	449	290	437	515
v/s Ratio Prot	c0.07	c0.42	0.04	0.04	0.30		c0.09	0.17	0.00	0.07	c0.25	0.02
v/s Ratio Perm	0.30		0.19	0.29			0.23		0.01	0.19		0.04
v/c Ratio	0.70	0.97	0.44	0.76	0.78		0.95	0.70	0.06	0.77	1.05	0.18
Uniform Delay, d1	21.3	33.6	17.9	27.4	32.5		33.3	41.6	30.7	32.6	45.5	28.3
Progression Factor	0.89	0.58	0.91	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	3.2	0.1	22.3	4.7		46.8	5.6	0.1	13.1	56.2	0.3
Delay (s)	19.8	22.6	16.4	49.7	37.2		80.1	47.2	30.7	45.8	101.7	28.5
Level of Service	B	C	B	D	D		F	D	C	D	F	C
Approach Delay (s)		21.1			38.4			57.3			74.5	
Approach LOS		C			D			E			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			39.6			HCM Level of Service				D		
HCM Volume to Capacity ratio			1.00									
Actuated Cycle Length (s)			120.0			Sum of lost time (s)			22.6			
Intersection Capacity Utilization			92.0%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 19: E Parkins Mill Road & US 276

2015 PM Woodruff Improvements

7/6/2011

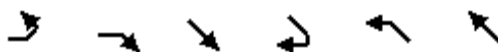
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	120	67	102	72	83	156	1167	198	85	1455	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0	6.0	4.0	7.0	7.0	4.0	7.0	7.0
Lane Util. 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	0.59	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1065	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)	120	133	74	113	80	92	173	1297	220	94	1617	260
RTOR Reduction (vph)	0	66	0	0	0	83	0	0	98	0	0	101
Lane Group Flow (vph)	120	141	0	113	80	9	173	1297	122	94	1617	159
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)	20.4	11.5		7.0	9.6	9.6	15.2	56.4	56.4	6.0	47.2	47.2
Effective Green, g (s)	20.4	11.5		7.0	9.6	9.6	15.2	56.4	56.4	6.0	47.2	47.2
Actuated g/C Ratio	0.20	0.11		0.07	0.09	0.09	0.15	0.55	0.55	0.06	0.46	0.46
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)	270	367		229	171	145	256	2734	851	196	2288	712
v/s Ratio Prot	c0.04	0.04		0.03	0.04		c0.10	0.26		0.03	c0.33	
v/s Ratio Perm	c0.05					0.01			0.08			0.10
v/c Ratio	0.44	0.39		0.49	0.47	0.06	0.68	0.47	0.14	0.48	0.71	0.22
Uniform Delay, d1	35.1	41.9		45.7	43.7	42.0	41.0	13.8	11.0	46.4	21.8	16.4
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	1.8	1.4		2.6	4.0	0.4	7.9	0.3	0.2	2.9	1.3	0.3
Delay (s)	36.9	43.3		48.4	47.8	42.4	48.9	14.0	11.2	49.3	23.1	16.7
Level of Service	D	D		D	D	D	D	B	B	D	C	B
Approach Delay (s)		40.9			46.3			17.2			23.5	
Approach LOS		D			D			B			C	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			101.9			Sum of lost time (s)			19.0			
Intersection Capacity Utilization			64.4%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 20: Duvall Drive & US 276

2015 PM Woodruff Improvements

7/6/2011



























Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	393	152	1254	370	142	1128
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	4771		1719	4940
Flt Permitted	0.95	1.00	1.00		0.10	1.00
Satd. Flow (perm)	1719	1538	4771		175	4940
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	437	169	1393	411	158	1253
RTOR Reduction (vph)	0	50	82	0	0	0
Lane Group Flow (vph)	437	119	1722	0	158	1253
Turn Type	Perm				Perm	
Protected Phases	8		2			6
Permitted Phases		8			6	
Actuated Green, G (s)	11.0	11.0	41.7		41.7	41.7
Effective Green, g (s)	11.0	11.0	41.7		41.7	41.7
Actuated g/C Ratio	0.17	0.17	0.64		0.64	0.64
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)	291	260	3061		112	3169
v/s Ratio Prot	c0.25		0.36			0.25
v/s Ratio Perm		0.08			c0.90	
v/c Ratio	1.50	0.46	0.56		1.41	0.40
Uniform Delay, d1	27.0	24.3	6.5		11.6	5.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	243.0	2.6	0.4		229.3	0.2
Delay (s)	270.0	26.9	6.9		241.0	5.8
Level of Service	F	C	A		F	A
Approach Delay (s)	202.2		6.9			32.1
Approach LOS	F		A			C
<b>Intersection Summary</b>						
HCM Average Control Delay			47.2		HCM Level of Service	D
HCM Volume to Capacity ratio			1.43			
Actuated Cycle Length (s)			65.0		Sum of lost time (s)	12.3
Intersection Capacity Utilization			83.1%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

## 23: US 276 & Millennium Blvd

2015 PM Woodruff Improvements

7/6/2011





















												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	93	1766	117	31	1289	10	88	53	68	62	21	50
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
Frt	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	3148		1719	1810	2707
Flt Permitted	0.13	1.00	1.00	0.06	1.00	1.00	0.95	1.00		0.74	1.00	1.00
Satd. Flow (perm)	229	3438	1538	100	3438	1538	3335	3148		1340	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)	103	1962	130	34	1432	11	98	59	76	69	23	56
RTOR Reduction (vph)	0	0	37	0	0	4	0	71	0	0	0	50
Lane Group Flow (vph)	103	1962	93	34	1432	7	98	64	0	69	23	6
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)	99.9	92.0	92.0	91.1	87.7	87.7	8.0	8.7		10.1	5.4	13.6
Effective Green, g (s)	99.9	92.0	92.0	91.1	87.7	87.7	8.0	8.7		10.1	5.4	13.6
Actuated g/C Ratio	0.76	0.70	0.70	0.69	0.67	0.67	0.06	0.07		0.08	0.04	0.10
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)	266	2400	1074	111	2288	1023	202	208		116	74	279
v/s Ratio Prot	c0.02	c0.57		0.01	0.42		c0.03	c0.02		0.02	0.01	0.00
v/s Ratio Perm	0.27		0.06	0.20		0.00				c0.02		0.00
v/c Ratio	0.39	0.82	0.09	0.31	0.63	0.01	0.49	0.31		0.59	0.31	0.02
Uniform Delay, d1	8.8	14.0	6.4	14.8	12.6	7.4	59.9	58.7		58.5	61.4	53.1
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	1.5	2.6	0.1	2.5	0.7	0.0	2.9	2.6		10.0	7.3	0.0
Delay (s)	10.3	16.6	6.5	17.3	13.4	7.4	62.8	61.3		68.5	68.7	53.2
Level of Service	B	B	A	B	B	A	E	E		E	E	D
Approach Delay (s)		15.7			13.4			61.9			62.8	
Approach LOS		B			B			E			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			19.2			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.82									
Actuated Cycle Length (s)			131.8			Sum of lost time (s)			28.5			
Intersection Capacity Utilization			80.1%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 24: Pelham Road & The Parkway

2015 PM Woodruff Improvements

7/6/2011

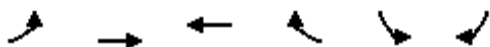
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	204	803	675	0	928	733	0	0	0	287	474	286
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8		5.8	5.3				5.3	5.3	5.3
Lane Util. Factor	0.97	0.95	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)	227	892	750	0	1031	814	0	0	0	319	527	318
RTOR Reduction (vph)	0	0	68	0	0	11	0	0	0	0	0	157
Lane Group Flow (vph)	227	892	682	0	1031	803	0	0	0	319	527	161
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)	11.9	70.6	70.6		52.9	96.2				43.3	43.3	43.3
Effective Green, g (s)	11.9	70.6	70.6		52.9	96.2				43.3	43.3	43.3
Actuated g/C Ratio	0.10	0.56	0.56		0.42	0.77				0.35	0.35	0.35
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)	317	1942	869		1455	1184				595	627	533
v/s Ratio Prot	0.07	0.26			0.30	0.23					c0.29	
v/s Ratio Perm			c0.44			0.29				0.19		0.10
v/c Ratio	0.72	0.46	0.78		0.71	0.68				0.54	0.84	0.30
Uniform Delay, d1	54.9	16.0	21.3		29.7	6.9				32.8	37.7	29.8
Progression Factor	1.00	1.00	1.00		0.57	1.29				1.00	1.00	1.00
Incremental Delay, d2	8.3	0.8	7.0		2.1	1.3				1.3	10.5	0.5
Delay (s)	63.2	16.8	28.3		19.1	10.3				34.1	48.2	30.3
Level of Service	E	B	C		B	B				C	D	C
Approach Delay (s)		27.0			15.2			0.0			39.4	
Approach LOS		C			B			A			D	
<b>Intersection Summary</b>												
HCM Average Control Delay			25.5			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			125.0			Sum of lost time (s)				11.1		
Intersection Capacity Utilization			106.5%			ICU Level of Service				G		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011









Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑	↑↑
Volume (vph)	0	1090	1350	0	446	311
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	1211	1500	0	496	346
RTOR Reduction (vph)	0	0	0	0	0	28
Lane Group Flow (vph)	0	1211	1500	0	496	318
Turn Type					Perm	
Protected Phases		2	6		4	
Permitted Phases						4
Actuated Green, G (s)		71.7	71.7		42.4	42.4
Effective Green, g (s)		71.7	71.7		42.4	42.4
Actuated g/C Ratio		0.57	0.57		0.34	0.34
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)		1972	1972		583	918
v/s Ratio Prot		0.35	c0.44		c0.29	
v/s Ratio Perm						0.12
v/c Ratio		0.61	0.76		0.85	0.35
Uniform Delay, d1		17.5	20.2		38.4	30.9
Progression Factor		0.86	1.07		1.00	1.00
Incremental Delay, d2		1.3	2.0		12.1	0.4
Delay (s)		16.3	23.5		50.4	31.3
Level of Service		B	C		D	C
Approach Delay (s)		16.3	23.5		42.6	
Approach LOS		B	C		D	
<b>Intersection Summary</b>						
HCM Average Control Delay			25.6		HCM Level of Service	C
HCM Volume to Capacity ratio			0.79			
Actuated Cycle Length (s)			125.0		Sum of lost time (s)	10.9
Intersection Capacity Utilization			104.6%		ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↔	↔
Volume (vph)	557	0	0	621	1329	732
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)	619	0	0	690	1477	813
RTOR Reduction (vph)	0	0	0	0	0	20
Lane Group Flow (vph)	619	0	0	690	1477	793
Turn Type					Perm	
Protected Phases	2			6	8	
Permitted Phases						8
Actuated Green, G (s)	36.6			36.6	77.6	77.6
Effective Green, g (s)	36.6			36.6	77.6	77.6
Actuated g/C Ratio	0.29			0.29	0.62	0.62
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)	1007			1007	2070	955
v/s Ratio Prot	0.18			c0.20	0.44	
v/s Ratio Perm						c0.52
v/c Ratio	0.61			0.69	0.71	0.83
Uniform Delay, d1	38.1			39.1	16.1	18.5
Progression Factor	0.72			0.88	1.00	1.00
Incremental Delay, d2	2.1			3.0	1.3	6.6
Delay (s)	29.7			37.6	17.5	25.2
Level of Service	C			D	B	C
Approach Delay (s)	29.7			37.6	20.2	
Approach LOS	C			D	C	
<b>Intersection Summary</b>						
HCM Average Control Delay			25.2		HCM Level of Service	C
HCM Volume to Capacity ratio			0.78			
Actuated Cycle Length (s)			125.0		Sum of lost time (s)	10.8
Intersection Capacity Utilization			135.4%		ICU Level of Service	H
Analysis Period (min)			15			
c Critical Lane Group						






















# HCM Signalized Intersection Capacity Analysis

## 27: Pelham Road & Boland Court

2015 PM Woodruff Improvements

7/6/2011





















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	855	378	310	1157	20	220	17	294	27	13	30
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	3280		1719	3429			1729	1538		1672	
Flt Permitted	0.21	1.00		0.06	1.00			0.71	1.00		0.65	
Satd. Flow (perm)	381	3280		115	3429			1290	1538		1109	
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)	62	950	420	344	1286	22	244	19	327	30	14	33
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	256	0	22	0
Lane Group Flow (vph)	62	1330	0	344	1307	0	0	263	71	0	55	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)	56.1	56.1		84.8	84.8			27.2	27.2		27.2	
Effective Green, g (s)	56.1	56.1		84.8	84.8			27.2	27.2		27.2	
Actuated g/C Ratio	0.45	0.45		0.68	0.68			0.22	0.22		0.22	
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)	171	1472		360	2326			281	335		241	
v/s Ratio Prot	0.41			c0.17		0.38	c0.20		0.05	0.05		
v/s Ratio Perm	0.16			c0.48			c0.20		0.05	0.05		
v/c Ratio	0.36	0.90		0.96	0.56			0.94	0.21		0.23	
Uniform Delay, d1	22.7	31.9		41.0	10.4			48.0	40.1		40.3	
Progression Factor	0.70	0.67		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	4.0	6.7		36.0	1.0			37.2	0.5		0.8	
Delay (s)	19.9	28.2		76.9	11.4			85.2	40.6		41.0	
Level of Service	B	C		E	B			F	D		D	
Approach Delay (s)	27.8			25.1			60.5			41.0		
Approach LOS	C			C			E			D		
Intersection Summary												
HCM Average Control Delay			32.0	HCM Level of Service			C					
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			125.0	Sum of lost time (s)			13.0					
Intersection Capacity Utilization			89.1%	ICU Level of Service			E					
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 28: Forsythia Dr & E Butler Road

2015 PM Woodruff Improvements

7/6/2011


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	0	4	34	0	99	7	674	17	79	991	17
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	3425		1719	3429	
Flt Permitted		0.66	1.00		0.91		0.25	1.00		0.36	1.00	
Satd. Flow (perm)		1199	1538		1478		461	3425		651	3429	
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)	13	0	4	38	0	110	8	749	19	88	1101	19
RTOR Reduction (vph)	0	0	3	0	53	0	0	3	0	0	2	0
Lane Group Flow (vph)	0	13	1	0	95	0	8	765	0	88	1118	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)		8.8	8.8		8.8		15.7	15.7		15.7	15.7	
Effective Green, g (s)		8.8	8.8		8.8		15.7	15.7		15.7	15.7	
Actuated g/C Ratio		0.24	0.24		0.24		0.43	0.43		0.43	0.43	
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)		289	371		356		198	1473		280	1475	
v/s Ratio Prot								0.22			c0.33	
v/s Ratio Perm		0.01	0.00		c0.06		0.02			0.14		
v/c Ratio		0.04	0.00		0.27		0.04	0.52		0.31	0.76	
Uniform Delay, d1		10.6	10.5		11.2		6.0	7.6		6.9	8.8	
Progression Factor		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1	0.0		0.6		0.1	0.5		1.0	2.5	
Delay (s)		10.7	10.5		11.9		6.2	8.1		7.9	11.3	
Level of Service		B	B		B		A	A		A	B	
Approach Delay (s)		10.7			11.9			8.1			11.1	
Approach LOS		B			B			A			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			10.0			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			36.5			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			60.9%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011








												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	0	730	75	388	663	0	412	0	419	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			
Flt		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		0.11	1.00			0.95	1.00			
Satd. Flow (perm)		3390		191	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	811	83	431	737	0	458	0	466	0	0	0
RTOR Reduction (vph)	0	7	0	0	0	0	0	0	150	0	0	0
Lane Group Flow (vph)	0	887	0	431	737	0	0	458	316	0	0	0
Turn Type				pm+pt			Perm		Perm			
Protected Phases				1	6			4				
Permitted Phases		2		6			4		4			
Actuated Green, G (s)		31.8		62.0	62.0			31.4	31.4			
Effective Green, g (s)		31.8		62.0	62.0			31.4	31.4			
Actuated g/C Ratio		0.30		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)		1023		463	2022			512	458			
v/s Ratio Prot				c0.21	0.21							
v/s Ratio Perm		0.26		c0.33				0.27	0.21			
v/c Ratio		0.87		0.93	0.36			0.89	0.69			
Uniform Delay, d1		34.8		30.0	11.4			35.4	32.7			
Progression Factor		1.00		1.00	1.00			1.00	1.00			
Incremental Delay, d2		8.3		26.0	0.2			18.4	4.9			
Delay (s)		43.1		56.0	11.6			53.9	37.6			
Level of Service		D		E	B			D	D			
Approach Delay (s)		43.1			27.9			45.6			0.0	
Approach LOS		D			C			D			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			38.0			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			105.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			81.9%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

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

2015 PM Woodruff Improvements

7/6/2011
























											
Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	NWL2	NWL	NWR
Lane Configurations											
Volume (vph)	0	0	268	874	0	0	1009	756	42	0	220
Ideal Flow (vphpl)	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			0.15	1.00			1.00	1.00	0.95		1.00
Satd. Flow (perm)			276	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
Adj. Flow (vph)	0	0	298	971	0	0	1121	840	47	0	244
RTOR Reduction (vph)	0	0	0	0	0	0	0	314	0	0	168
Lane Group Flow (vph)	0	0	298	971	0	0	1121	526	47	0	76
Turn Type			pm+pt				custom		custom		custom
Protected Phases			5	2							8
Permitted Phases			2				6	6	8		
Actuated Green, G (s)			74.7	74.7			51.2	51.2	11.3		11.3
Effective Green, g (s)			74.7	74.7			51.2	51.2	11.3		11.3
Actuated g/C Ratio			0.76	0.76			0.52	0.52	0.12		0.12
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)			468	2621			1796	804	198		177
v/s Ratio Prot			c0.11	0.28							c0.05
v/s Ratio Perm			c0.37				0.33	0.34	0.03		
v/c Ratio			0.64	0.37			0.62	0.65	0.24		0.43
Uniform Delay, d1			12.0	3.9			16.6	17.0	39.4		40.3
Progression Factor			1.00	1.00			1.00	1.00	1.00		1.00
Incremental Delay, d2			3.4	0.1			0.8	2.3	1.0		2.6
Delay (s)			15.4	4.0			17.4	19.2	40.4		43.0
Level of Service			B	A			B	B	D		D
Approach Delay (s)	0.0			6.7			18.2			42.6	
Approach LOS	A			A			B			D	
<b>Intersection Summary</b>											
HCM Average Control Delay			16.1		HCM Level of Service				B		
HCM Volume to Capacity ratio			0.59								
Actuated Cycle Length (s)			98.0		Sum of lost time (s)				12.0		
Intersection Capacity Utilization			81.9%		ICU Level of Service				D		
Analysis Period (min)			15								
c Critical Lane Group											

# HCM Signalized Intersection Capacity Analysis

## 34: Frontage Road & Roper Mountain Road

2015 PM Woodruff Improvements

7/6/2011




















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	12	366	592	50	54	174	1224	189	13	950	25
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	1546		1633	1649	1538	1719	3438	1538	1719	3425	
Flt Permitted	0.95	1.00		0.95	0.96	1.00	0.11	1.00	1.00	0.13	1.00	
Satd. Flow (perm)	1719	1546		1633	1649	1538	196	3438	1538	233	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)	28	13	407	658	56	60	193	1360	210	14	1056	28
RTOR Reduction (vph)	0	131	0	0	0	21	0	0	116	0	2	0
Lane Group Flow (vph)	28	289	0	355	359	39	193	1360	95	14	1082	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)	16.0	16.0		21.0	21.0	21.0	45.0	45.0	45.0	31.0	31.0	
Effective Green, g (s)	16.0	16.0		21.0	21.0	21.0	45.0	45.0	45.0	31.0	31.0	
Actuated g/C Ratio	0.16	0.16		0.21	0.21	0.21	0.45	0.45	0.45	0.31	0.31	
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)	275	247		343	346	323	210	1547	692	72	1062	
v/s Ratio Prot	0.02	c0.19		0.22	c0.22		0.07	c0.40			c0.32	
v/s Ratio Perm						0.03	0.34		0.06	0.06		
v/c Ratio	0.10	1.17		1.03	1.04	0.12	0.92	0.88	0.14	0.19	1.02	
Uniform Delay, d1	35.9	42.0		39.5	39.5	32.0	22.9	25.0	16.1	25.3	34.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.77	0.90	1.13	1.00	1.00	
Incremental Delay, d2	0.3	111.0		57.9	58.5	0.3	35.1	6.1	0.3	5.9	32.4	
Delay (s)	36.2	153.0		97.4	98.0	32.3	52.7	28.5	18.5	31.3	66.9	
Level of Service	D	F		F	F	C	D	C	B	C	E	
Approach Delay (s)		145.7			92.6			30.0			66.5	
Approach LOS		F			F			C			E	
<b>Intersection Summary</b>												
HCM Average Control Delay			64.4			HCM Level of Service			E			
HCM Volume to Capacity ratio			1.08									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			24.0			
Intersection Capacity Utilization			115.7%			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

2015 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	426	0	470	333	1117	0	0	1416	492
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	473	0	522	370	1241	0	0	1573	547
RTOR Reduction (vph)	0	0	0	0	0	151	0	0	0	0	0	258
Lane Group Flow (vph)	0	0	0	236	237	371	370	1241	0	0	1573	289
Turn Type				Perm		Perm	Prot					Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8						6
Actuated Green, G (s)				17.7	17.7	17.7	13.7	70.3			50.6	50.6
Effective Green, g (s)				17.7	17.7	17.7	13.7	70.3			50.6	50.6
Actuated g/C Ratio				0.18	0.18	0.18	0.14	0.70			0.51	0.51
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)				289	289	479	457	2417			1740	778
v/s Ratio Prot							c0.11	0.36			c0.46	
v/s Ratio Perm				0.14	0.15	0.14						0.19
v/c Ratio				0.82	0.82	0.78	0.81	0.51			0.90	0.37
Uniform Delay, d1				39.6	39.6	39.3	41.9	6.9			22.5	15.0
Progression Factor				1.00	1.00	1.00	1.28	0.25			0.63	1.15
Incremental Delay, d2				18.0	18.5	8.9	4.8	0.3			0.9	0.1
Delay (s)				57.5	58.1	48.1	58.4	2.1			15.0	17.3
Level of Service				E	E	D	E	A			B	B
Approach Delay (s)		0.0			52.7			15.0			15.6	
Approach LOS		A			D			B			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			23.2				HCM Level of Service				C	
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			112.1%				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

2015 PM Woodruff Improvements

7/6/2011





















												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑	↑	↑	↑↑		↑	↑	↑↑			
Volume (vph)	0	1010	663	1133	709	0	440	0	331	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	0.16	1.00		0.95	0.95	1.00			
Satd. Flow (perm)		4940	1538	285	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	1122	737	1259	788	0	489	0	368	0	0	0
RTOR Reduction (vph)	0	0	178	0	0	0	0	0	328	0	0	0
Lane Group Flow (vph)	0	1122	559	1259	788	0	244	245	40	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)		32.6	32.6	77.2	76.6		10.9	10.9	10.9			
Effective Green, g (s)		32.6	32.6	77.2	76.6		10.9	10.9	10.9			
Actuated g/C Ratio		0.33	0.33	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)		1610	501	768	2634		178	178	295			
v/s Ratio Prot		0.23		c0.63	0.23							
v/s Ratio Perm			0.36	c0.64			0.15	0.15	0.01			
v/c Ratio		0.70	1.12	1.64	0.30		1.37	1.38	0.14			
Uniform Delay, d1		29.4	33.7	20.4	3.6		44.5	44.5	40.3			
Progression Factor		0.50	0.32	0.64	0.85		1.00	1.00	1.00			
Incremental Delay, d2		1.6	68.5	290.4	0.1		198.3	200.6	0.4			
Delay (s)		16.4	79.4	303.4	3.2		242.9	245.2	40.7			
Level of Service		B	E	F	A		F	F	D			
Approach Delay (s)		41.4			187.8			156.7			0.0	
Approach LOS		D			F			F			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			125.1			HCM Level of Service			F			
HCM Volume to Capacity ratio			1.57									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			11.9			
Intersection Capacity Utilization			112.1%			ICU Level of Service			H			
Analysis Period (min)			15									
c Critical Lane Group												

# HCM Signalized Intersection Capacity Analysis

## 37: Roper Mountain Road & Congaree Road

2015 PM Woodruff Improvements

7/6/2011

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (vph)	104	1041	1	6	659	375	625	1	322	4	1	7
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			3436	1538	1719	1539			1740	1538
Flt Permitted	0.20	1.00			0.94	1.00	0.75	1.00			0.85	1.00
Satd. Flow (perm)	356	4939			3226	1538	1365	1539			1545	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)	116	1157	1	7	732	417	694	1	358	4	1	8
RTOR Reduction (vph)	0	0	0	0	0	281	0	95	0	0	0	4
Lane Group Flow (vph)	116	1158	0	0	739	136	694	264	0	0	5	4
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)	42.5	42.5			32.5	32.5	45.0	45.0			45.0	45.0
Effective Green, g (s)	42.5	42.5			32.5	32.5	45.0	45.0			45.0	45.0
Actuated g/C Ratio	0.42	0.42			0.32	0.32	0.45	0.45			0.45	0.45
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)	209	2099			1048	500	614	693			695	692
v/s Ratio Prot	0.02	c0.23						0.17				
v/s Ratio Perm	0.21				c0.23	0.09	c0.51				0.00	0.00
v/c Ratio	0.56	0.55			0.71	0.27	1.13	0.38			0.01	0.01
Uniform Delay, d1	19.7	21.6			29.6	25.0	27.5	18.3			15.2	15.2
Progression Factor	0.85	0.93			1.16	2.51	1.00	1.00			1.00	1.00
Incremental Delay, d2	2.9	0.7			3.7	1.2	77.8	0.7			0.0	0.0
Delay (s)	19.6	20.8			38.1	63.9	105.3	19.0			15.2	15.2
Level of Service	B	C			D	E	F	B			B	B
Approach Delay (s)		20.7			47.4			75.9			15.2	
Approach LOS		C			D			E			B	
<b>Intersection Summary</b>												
HCM Average Control Delay			46.1			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.96									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)			18.9			
Intersection Capacity Utilization			107.0%			ICU Level of Service			G			
Analysis Period (min)			15									
c Critical Lane Group												














# HCM Unsignalized Intersection Capacity Analysis

## 21: Frontage Rd & US 276

2015 PM Woodruff Improvements

7/6/2011










						
Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (veh/h)	53	119	37	2967	1654	53
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)	59	132	41	3297	1838	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)					1010	
pX, platoon unblocked	0.76	0.76	0.76			
vC, conflicting volume	3598	948	1897			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3789	291	1543			
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	75	87			
cM capacity (veh/h)	2	527	312			
Direction, Lane #	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2
Volume Total	191	41	1648	1648	1225	671
Volume Left	59	41	0	0	0	0
Volume Right	132	0	0	0	0	59
cSH	6	312	1700	1700	1700	1700
Volume to Capacity	33.14	0.13	0.97	0.97	0.72	0.39
Queue Length 95th (ft)	Err	11	0	0	0	0
Control Delay (s)	Err	18.3	0.0	0.0	0.0	0.0
Lane LOS	F	C				
Approach Delay (s)	Err	0.2			0.0	
Approach LOS	F					
<b>Intersection Summary</b>						
Average Delay			352.3			
Intersection Capacity Utilization			98.9%		ICU Level of Service	F
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 22: US 276 & St Josephs Dr

2015 PM Woodruff Improvements

7/6/2011

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Volume (veh/h)	1710	410	87	1340	367	266
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)	1900	456	97	1489	408	296
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				862		
pX, platoon unblocked					0.75	
vC, conflicting volume			2356		3066	1178
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2356		3088	1178
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			51		0	0
cM capacity (veh/h)			196		3	179
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	
Volume Total	1267	1089	593	993	703	
Volume Left	0	0	97	0	408	
Volume Right	0	456	0	0	296	
cSH	1700	1700	196	1700	6	
Volume to Capacity	0.75	0.64	0.49	0.58	125.59	
Queue Length 95th (ft)	0	0	61	0	Err	
Control Delay (s)	0.0	0.0	29.9	0.0	Err	
Lane LOS			D		F	
Approach Delay (s)	0.0		11.2		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			1518.0			
Intersection Capacity Utilization			145.8%		ICU Level of Service	H
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 29: Rothwell Dr & E Butler Road

2015 PM Woodruff Improvements

7/6/2011













Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	21	6	1	784	1081	1
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)	23	7	1	871	1201	1
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	0.90	0.89	0.89			
vC, conflicting volume	1639	601	1202			
vC1, stage 1 conf vol	1202					
vC2, stage 2 conf vol	438					
vCu, unblocked vol	1381	304	980			
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 %	91	99	100			
cM capacity (veh/h)	265	608	607			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	30	1	436	436	801	401
Volume Left	23	1	0	0	0	0
Volume Right	7	0	0	0	0	1
cSH	340	607	1700	1700	1700	1700
Volume to Capacity	0.09	0.00	0.26	0.26	0.47	0.24
Queue Length 95th (ft)	7	0	0	0	0	0
Control Delay (s)	17.9	10.9	0.0	0.0	0.0	0.0
Lane LOS	C	B				
Approach Delay (s)	17.9	0.0			0.0	
Approach LOS	C					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			39.9%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 32: New Commerce Ct & E Butler Road

2015 PM Woodruff Improvements

7/6/2011




















						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	57	65	1090	4	57	1708
Sign Control	Stop		Free		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)	63	72	1211	4	63	1898
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	0.91	0.91			0.91	
vC, conflicting volume	2289	608			1216	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2218	369			1038	
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	87			89	
cM capacity (veh/h)	29	563			589	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	136	807	408	63	949	949
Volume Left	63	0	0	63	0	0
Volume Right	72	0	4	0	0	0
cSH	58	1700	1700	589	1700	1700
Volume to Capacity	2.32	0.47	0.24	0.11	0.56	0.56
Queue Length 95th (ft)	336	0	0	9	0	0
Control Delay (s)	754.3	0.0	0.0	11.8	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	754.3	0.0		0.4		
Approach LOS	F					
Intersection Summary						
Average Delay		31.1				
Intersection Capacity Utilization		61.0%		ICU Level of Service		B
Analysis Period (min)		15				

# HCM Unsignalized Intersection Capacity Analysis

## 33: E Butler Road & Brookfield Pkwy

2015 PM Woodruff Improvements

7/6/2011

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Volume (veh/h)	17	1134	4	1	1557	10	2	0	190	18	0	4
Sign Control	Free				Free				Stop			
Grade	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)	19	1260	4	1	1730	11	2	0	211	20	0	4
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				0.95			0.95			0.95		
vC, conflicting volume	1741			1264			2410			3040		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1741			1179			2381			3042		
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 %	95			100			86			100		
cM capacity (veh/h)	344			545			16			11		
Direction, Lane #	NB 1	NB 2	NB 3	SB 1	SB 2	SE 1	SE 2	NW 1	NW 2			
Volume Total	19	840	424	866	876	2	211	20	4			
Volume Left	19	0	0	1	0	2	0	20	0			
Volume Right	0	0	4	0	11	0	211	0	4			
cSH	344	1700	1700	545	1700	16	289	4	473			
Volume to Capacity	0.05	0.49	0.25	0.00	0.52	0.14	0.73	4.46	0.01			
Queue Length 95th (ft)	4	0	0	0	0	10	132	Err	1			
Control Delay (s)	16.1	0.0	0.0	0.1	0.0	270.9	45.2	Err	12.7			
Lane LOS	C			A		F	E	F	B			
Approach Delay (s)	0.2			0.0			47.5			8183.3		
Approach LOS							E			F		
Intersection Summary												
Average Delay	64.5											
Intersection Capacity Utilization	68.5%			ICU Level of Service			C					
Analysis Period (min)	15											