

Appendix F:

Future HCM Worksheets

AM

HCM Signalized Intersection Capacity Analysis
 30: US 29 Ramps & Randolph Rd/Cherry Hill Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1315	20	250	1140	415	20	0	110	1175	0	80
Future Volume (vph)	110	1315	20	250	1140	415	20	0	110	1175	0	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	9.0		7.0	9.0	9.0	8.5		8.5	8.0		8.0
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00		0.88	0.97		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3319	3414		3319	3421	1531	1711		2694	3319		1531
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3319	3414		3319	3421	1531	1711		2694	3319		1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	1315	20	250	1140	415	20	0	110	1175	0	80
RTOR Reduction (vph)	0	1	0	0	0	161	0	0	85	0	0	56
Lane Group Flow (vph)	110	1334	0	250	1140	254	20	0	25	1175	0	24
Turn Type	Prot	NA		Prot	NA	Perm	Prot		pt+ov	Prot		Perm
Protected Phases	1	6		5	2		3		3 5	4		
Permitted Phases						2						4
Actuated Green, G (s)	10.3	47.4		16.6	53.7	53.7	7.8		24.4	45.7		45.7
Effective Green, g (s)	10.3	47.4		16.6	53.7	53.7	7.8		24.4	45.7		45.7
Actuated g/C Ratio	0.07	0.32		0.11	0.36	0.36	0.05		0.16	0.30		0.30
Clearance Time (s)	7.0	9.0		7.0	9.0	9.0	8.5			8.0		8.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0			3.0		3.0
Lane Grp Cap (vph)	227	1078		367	1224	548	88		438	1011		466
v/s Ratio Prot	0.03	c0.39		c0.08	c0.33		c0.01		0.01	c0.35		
v/s Ratio Perm						0.17						0.02
v/c Ratio	0.48	1.24		0.68	0.93	0.46	0.23		0.06	1.16		0.05
Uniform Delay, d1	67.3	51.3		64.2	46.4	37.1	68.2		53.1	52.1		36.8
Progression Factor	0.99	1.17		1.05	0.84	0.61	1.00		1.00	1.00		1.00
Incremental Delay, d2	1.0	111.9		4.2	11.7	2.3	1.3		0.1	84.1		0.0
Delay (s)	67.9	172.1		71.3	50.6	24.9	69.5		53.1	136.2		36.9
Level of Service	E	F		E	D	C	E		D	F		D
Approach Delay (s)		164.2			47.6			55.6			129.9	
Approach LOS		F			D			E			F	

Intersection Summary

HCM 2000 Control Delay	106.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	32.5
Intersection Capacity Utilization	97.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

42: Old Columbia Pike & Randolph Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	1205	555	60	1005	175	315	220	30	210	575	95
Future Volume (vph)	80	1205	555	60	1005	175	315	220	30	210	575	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	6.5	6.5	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	0.97	0.95	1.00	1.00	1.00	1.00	1.00	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)	1770	3539	1583	3433	3539	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.14	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	259	1863	1583	795	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	1310	603	65	1092	190	342	239	33	228	625	103
RTOR Reduction (vph)	0	0	250	0	0	114	0	0	26	0	0	52
Lane Group Flow (vph)	87	1310	353	65	1092	76	342	239	7	228	625	51
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov
Protected Phases	1	6		5	2		3	8		7	4	1
Permitted Phases			6			2	8		8	4		4
Actuated Green, G (s)	12.6	64.5	64.5	7.8	59.7	59.7	53.7	33.2	33.2	49.7	31.2	43.8
Effective Green, g (s)	12.6	64.5	64.5	7.8	59.7	59.7	53.7	33.2	33.2	49.7	31.2	43.8
Actuated g/C Ratio	0.08	0.43	0.43	0.05	0.40	0.40	0.36	0.22	0.22	0.33	0.21	0.29
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	4.0	0.2	0.2	4.0	0.2	0.2	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	148	1521	680	178	1408	630	299	412	350	383	736	530
v/s Ratio Prot	c0.05	c0.37		0.02	0.31		c0.16	0.13		0.07	0.18	0.01
v/s Ratio Perm			0.22			0.05	c0.25		0.00	0.12		0.02
v/c Ratio	0.59	0.86	0.52	0.37	0.78	0.12	1.14	0.58	0.02	0.60	0.85	0.10
Uniform Delay, d1	66.2	38.7	31.4	68.7	39.3	28.5	43.2	52.2	45.7	38.9	57.1	38.7
Progression Factor	1.00	1.00	1.00	1.50	0.15	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.9	6.6	2.8	1.0	2.5	0.2	96.7	2.5	0.0	2.9	9.4	0.1
Delay (s)	73.1	45.3	34.2	103.9	8.4	0.3	140.0	54.6	45.7	41.8	66.5	38.8
Level of Service	E	D	C	F	A	A	F	D	D	D	E	D
Approach Delay (s)		43.2			11.9			101.7			57.6	
Approach LOS		D			B			F			E	

Intersection Summary			
HCM 2000 Control Delay	44.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

43: Serpentine Way & Randolph Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	1760	0	0	1380	35	0	0	0	80	0	40
Future Volume (vph)	10	1760	0	0	1380	35	0	0	0	80	0	40
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	
Lane Util. Factor	1.00	0.95			0.95					1.00	1.00	
Frt	1.00	1.00			1.00					1.00	0.85	
Flt Protected	0.95	1.00			1.00					0.95	1.00	
Satd. Flow (prot)	1711	3421			3409					1711	1531	
Flt Permitted	0.17	1.00			1.00					0.76	1.00	
Satd. Flow (perm)	303	3421			3409					1363	1531	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	1760	0	0	1380	35	0	0	0	80	0	40
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	36	0
Lane Group Flow (vph)	10	1760	0	0	1414	0	0	0	0	80	4	0
Turn Type	Perm	NA		Perm	NA		Perm			Perm	NA	
Protected Phases		6			2			8			4	
Permitted Phases	6			2			8			4		
Actuated Green, G (s)	96.0	96.0			96.0					11.0	11.0	
Effective Green, g (s)	96.0	96.0			96.0					11.0	11.0	
Actuated g/C Ratio	0.80	0.80			0.80					0.09	0.09	
Clearance Time (s)	6.5	6.5			6.5					6.5	6.5	
Vehicle Extension (s)	0.2	0.2			0.2					3.0	3.0	
Lane Grp Cap (vph)	242	2736			2727					124	140	
v/s Ratio Prot		c0.51			0.41						0.00	
v/s Ratio Perm	0.03									c0.06		
v/c Ratio	0.04	0.64			0.52					0.65	0.03	
Uniform Delay, d1	2.5	4.9			4.1					52.6	49.6	
Progression Factor	1.00	1.00			1.00					1.00	1.00	
Incremental Delay, d2	0.3	1.2			0.7					11.0	0.1	
Delay (s)	2.8	6.1			4.8					63.6	49.7	
Level of Service	A	A			A					E	D	
Approach Delay (s)		6.1			4.8			0.0			59.0	
Approach LOS		A			A			A			E	

Intersection Summary

HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

44: Prosperity Dr & Cherry Hill Rd

5/23/2016



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↵	↑↑	↵	↵
Traffic Volume (vph)	2155	445	170	1620	185	110
Future Volume (vph)	2155	445	170	1620	185	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	4.0	6.0	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3421	1531	1711	3421	1711	1531
Flt Permitted	1.00	1.00	0.04	1.00	0.95	1.00
Satd. Flow (perm)	3421	1531	70	3421	1711	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2155	445	170	1620	185	110
RTOR Reduction (vph)	0	85	0	0	0	4
Lane Group Flow (vph)	2155	360	170	1620	185	106
Turn Type	NA	Perm	pm+pt	NA	Prot	pm+ov
Protected Phases	6		5	2	4	5
Permitted Phases		6	2			4
Actuated Green, G (s)	94.6	94.6	118.5	118.5	21.5	36.4
Effective Green, g (s)	94.6	94.6	118.5	118.5	21.5	36.4
Actuated g/C Ratio	0.63	0.63	0.79	0.79	0.14	0.24
Clearance Time (s)	6.5	6.5	6.5	4.0	6.0	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2157	965	218	2702	245	371
v/s Ratio Prot	c0.63		c0.08	0.47	c0.11	0.03
v/s Ratio Perm		0.24	0.54			0.04
v/c Ratio	1.00	0.37	0.78	0.60	0.76	0.29
Uniform Delay, d1	27.7	13.4	53.8	6.3	61.7	46.2
Progression Factor	0.92	0.97	1.04	0.94	1.00	1.00
Incremental Delay, d2	5.6	0.1	12.7	0.8	12.4	0.4
Delay (s)	30.9	13.1	68.5	6.7	74.1	46.7
Level of Service	C	B	E	A	E	D
Approach Delay (s)	27.9			12.5	63.9	
Approach LOS	C			B	E	

Intersection Summary

HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 45: Cherry Hill Rd & Broadbirch Dr/Calverton Blvd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	240	150	300	600	700	200	840	25	75	1690	500
Future Volume (vph)	250	240	150	300	600	700	200	840	25	75	1690	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	6.5	6.0		6.0	6.0	4.0	6.5	6.5		6.0	6.5	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	1.00	0.85	1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1755		1770	1863	1583	1770	3524		1770	3418	
Flt Permitted	0.10	1.00		0.40	1.00	1.00	0.06	1.00		0.19	1.00	
Satd. Flow (perm)	184	1755		748	1863	1583	105	3524		350	3418	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	261	163	326	652	761	217	913	27	82	1837	543
RTOR Reduction (vph)	0	9	0	0	0	0	0	1	0	0	18	0
Lane Group Flow (vph)	272	415	0	326	652	761	217	939	0	82	2362	0
Turn Type	pm+pt	NA		Perm	NA	Free	Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8		Free	2			6		
Actuated Green, G (s)	51.0	51.0		34.0	34.0	150.0	71.0	71.0		86.5	86.5	
Effective Green, g (s)	51.0	51.0		34.0	34.0	150.0	71.0	71.0		86.5	86.5	
Actuated g/C Ratio	0.34	0.34		0.23	0.23	1.00	0.47	0.47		0.58	0.58	
Clearance Time (s)	6.5	6.0		6.0	6.0		6.5	6.5		6.0	6.5	
Vehicle Extension (s)	5.0	4.0		4.0	4.0		0.2	0.2		4.0	0.2	
Lane Grp Cap (vph)	173	596		169	422	1583	49	1668		291	1971	
v/s Ratio Prot	c0.11	0.24			0.35			0.27		0.02	c0.69	
v/s Ratio Perm	0.42			c0.44		0.48	c2.07			0.14		
v/c Ratio	1.57	0.70		1.93	1.55	0.48	4.43	0.56		0.28	1.20	
Uniform Delay, d1	41.7	42.8		58.0	58.0	0.0	39.5	28.4		17.5	31.8	
Progression Factor	1.00	1.00		1.01	1.01	1.00	1.40	1.50		0.61	1.07	
Incremental Delay, d2	283.5	3.8		433.2	253.5	0.7	1587.5	1.3		0.4	91.8	
Delay (s)	325.1	46.6		491.6	311.9	0.7	1642.9	44.0		11.1	125.8	
Level of Service	F	D		F	F	A	F	D		B	F	
Approach Delay (s)		155.5			209.4			343.9			122.0	
Approach LOS		F			F			F			F	

Intersection Summary

HCM 2000 Control Delay	193.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	3.26		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	140.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 46: Cherry Hill Rd & Plum Orchard Dr/Clover Patch Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	15	325	35	25	25	265	980	20	15	1920	205
Future Volume (vph)	60	15	325	35	25	25	265	980	20	15	1920	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	4.0	6.5	6.5		6.0	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.93		1.00	1.00		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1711	1801	1531	1711	1666		1711	3411		1711	3421	1531
Flt Permitted	0.72	1.00	1.00	0.75	1.00		0.04	1.00		0.29	1.00	1.00
Satd. Flow (perm)	1304	1801	1531	1346	1666		71	3411		516	3421	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	15	325	35	25	25	265	980	20	15	1920	205
RTOR Reduction (vph)	0	0	0	0	23	0	0	0	0	0	0	36
Lane Group Flow (vph)	60	15	325	35	27	0	265	1000	0	15	1920	169
Turn Type	Perm	NA	Free	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		8			4		5	2			6	
Permitted Phases	8		Free	4			2			6		6
Actuated Green, G (s)	11.0	11.0	150.0	11.0	11.0		126.0	126.0		95.3	95.3	95.3
Effective Green, g (s)	11.0	11.0	150.0	11.0	11.0		126.0	126.0		95.3	95.3	95.3
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07		0.84	0.84		0.64	0.64	0.64
Clearance Time (s)	6.5	6.5		6.5	6.5		6.0	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		5.0	0.2		0.2	0.2	0.2
Lane Grp Cap (vph)	95	132	1531	98	122		329	2865		327	2173	972
v/s Ratio Prot		0.01			0.02		c0.13	0.29			c0.56	
v/s Ratio Perm	c0.05		0.21	0.03			0.54			0.03		0.11
v/c Ratio	0.63	0.11	0.21	0.36	0.22		0.81	0.35		0.05	0.88	0.17
Uniform Delay, d1	67.5	64.9	0.0	66.1	65.5		51.0	2.7		10.3	22.7	11.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.08	1.10		0.81	0.67	0.67
Incremental Delay, d2	12.9	0.4	0.3	2.2	0.9		14.5	0.3		0.0	0.6	0.0
Delay (s)	80.4	65.3	0.3	68.4	66.4		69.4	3.3		8.4	15.8	7.5
Level of Service	F	E	A	E	E		E	A		A	B	A
Approach Delay (s)		14.8			67.2			17.2			15.0	
Approach LOS		B			E			B			B	

Intersection Summary		
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.85	B
Actuated Cycle Length (s)	150.0	Sum of lost time (s)
Intersection Capacity Utilization	93.6%	19.0
Analysis Period (min)	15	ICU Level of Service
		F

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

47: Cherry Hill Rd & FDA Blvd

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	245	150	615	1020	1260	1020
Future Volume (vph)	245	150	615	1020	1260	1020
Ideal Flow (vphpl)	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	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3319	1531	1711	3421	3421	1531
Flt Permitted	0.95	1.00	0.09	1.00	1.00	1.00
Satd. Flow (perm)	3319	1531	166	3421	3421	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	245	150	615	1020	1260	1020
RTOR Reduction (vph)	0	134	0	0	0	380
Lane Group Flow (vph)	245	17	615	1020	1260	640
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		1	6	2	
Permitted Phases		4	6			2
Actuated Green, G (s)	16.5	16.5	121.5	121.5	72.0	72.0
Effective Green, g (s)	16.5	16.5	121.5	121.5	72.0	72.0
Actuated g/C Ratio	0.11	0.11	0.81	0.81	0.48	0.48
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	365	168	582	2771	1642	734
v/s Ratio Prot	c0.07		c0.31	0.30	0.37	
v/s Ratio Perm		0.01	c0.55			0.42
v/c Ratio	0.67	0.10	1.06	0.37	0.77	0.87
Uniform Delay, d1	64.1	60.1	43.4	3.9	32.1	34.9
Progression Factor	1.00	1.00	0.58	1.05	0.63	1.08
Incremental Delay, d2	4.8	0.3	48.6	0.3	2.2	9.0
Delay (s)	68.9	60.3	73.7	4.3	22.5	46.5
Level of Service	E	E	E	A	C	D
Approach Delay (s)	65.7			30.4	33.2	
Approach LOS	E			C	C	

Intersection Summary

HCM 2000 Control Delay	35.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	107.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

53: Cherry Hill Rd. & MD 212

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	465	0	520	795	460	80	925	65	230	1060	270
Future Volume (vph)	250	465	0	520	795	460	80	925	65	230	1060	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	6.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00		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)	3433	3539		1770	3539	1583	1770	3539	1583	3433	3539	1583
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 (perm)	3433	3539		1770	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	505	0	565	864	500	87	1005	71	250	1152	293
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	163
Lane Group Flow (vph)	272	505	0	565	864	500	87	1005	71	250	1152	130
Turn Type	Prot	NA		Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases						Free			4			8
Actuated Green, G (s)	16.7	29.0		35.0	47.3	150.0	12.2	47.5	47.5	15.5	50.8	50.8
Effective Green, g (s)	17.7	32.0		36.0	50.3	150.0	13.2	49.5	49.5	16.5	52.8	50.8
Actuated g/C Ratio	0.12	0.21		0.24	0.34	1.00	0.09	0.33	0.33	0.11	0.35	0.34
Clearance Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	3.0	3.0	2.5	3.0	3.0
Lane Grp Cap (vph)	405	754		424	1186	1583	155	1167	522	377	1245	536
v/s Ratio Prot	0.08	0.14		c0.32	c0.24		0.05	0.28		c0.07	c0.33	
v/s Ratio Perm						c0.32			0.04			0.08
v/c Ratio	0.67	0.67		1.33	0.73	0.32	0.56	0.86	0.14	0.66	0.93	0.24
Uniform Delay, d1	63.4	54.2		57.0	43.8	0.0	65.6	47.0	35.2	64.1	46.7	35.7
Progression Factor	1.00	1.00		0.93	0.80	1.00	1.00	1.00	1.00	1.33	0.77	1.03
Incremental Delay, d2	3.9	4.7		164.6	3.8	0.5	3.7	6.7	0.1	3.2	9.8	0.2
Delay (s)	67.3	58.8		217.5	38.9	0.5	69.4	53.7	35.4	88.6	45.5	37.1
Level of Service	E	E		F	D	A	E	D	D	F	D	D
Approach Delay (s)		61.8			81.3			53.8			50.4	
Approach LOS		E			F			D			D	

Intersection Summary

HCM 2000 Control Delay	63.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

35: Old Columbia Pike & Fairland Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	575	65	55	965	105	30	150	50	185	850	380
Future Volume (vph)	145	575	65	55	965	105	30	150	50	185	850	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.5	6.5		6.5	6.5	7.0	6.5	6.5		7.0	6.5	6.5
Lane Util. Factor	1.00	0.95		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.96		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)	1770	3485		1770	1863	1583	1770	1793		1770	1863	1583
Flt Permitted	0.09	1.00		0.39	1.00	1.00	0.13	1.00		0.41	1.00	1.00
Satd. Flow (perm)	165	3485		721	1863	1583	243	1793		768	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	625	71	60	1049	114	33	163	54	201	924	413
RTOR Reduction (vph)	0	7	0	0	0	46	0	10	0	0	0	172
Lane Group Flow (vph)	158	689	0	60	1049	68	33	207	0	201	924	241
Turn Type	pm+pt	NA		Perm	NA	pm+ov	Perm	NA		pm+pt	NA	Perm
Protected Phases	3	8		4	4	1	2	2		1	6	6
Permitted Phases	8			4	4	4	2			6		6
Actuated Green, G (s)	56.5	56.5		39.7	39.7	52.5	30.7	30.7		50.5	50.5	50.5
Effective Green, g (s)	56.5	56.5		39.7	39.7	52.5	30.7	30.7		50.5	50.5	50.5
Actuated g/C Ratio	0.47	0.47		0.33	0.33	0.44	0.26	0.26		0.42	0.42	0.42
Clearance Time (s)	5.5	6.5		6.5	6.5	7.0	6.5	6.5		7.0	6.5	6.5
Vehicle Extension (s)	3.0	5.0		5.0	5.0	3.0	0.2	0.2		3.0	0.2	0.2
Lane Grp Cap (vph)	228	1640		238	616	692	62	458		430	784	666
v/s Ratio Prot	c0.07	0.20			c0.56	0.01		0.12		0.05	c0.50	
v/s Ratio Perm	0.26			0.08		0.03	0.14			0.15		0.15
v/c Ratio	0.69	0.42		0.25	1.70	0.10	0.53	0.45		0.47	1.18	0.36
Uniform Delay, d1	26.2	20.9		29.3	40.1	19.8	38.5	37.6		23.5	34.8	23.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	8.8	0.4		1.2	323.2	0.1	29.0	3.2		0.8	93.4	1.5
Delay (s)	35.0	21.3		30.5	363.4	19.9	67.5	40.8		24.3	128.1	25.3
Level of Service	C	C		C	F	B	E	D		C	F	C
Approach Delay (s)		23.8			315.0			44.3			87.0	
Approach LOS		C			F			D			F	

Intersection Summary

HCM 2000 Control Delay	142.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.5
Intersection Capacity Utilization	130.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 37: Fairland Rd & US 29 Ramp

5/23/2016

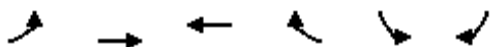


Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↑↑↑	↑↑		↘	↗	
Traffic Volume (veh/h)	0	810	405	0	300	720	
Future Volume (Veh/h)	0	810	405	0	300	720	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	0	810	405	0	300	720	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)		584	547				
pX, platoon unblocked	0.91				0.91	0.91	
vC, conflicting volume	405				675	202	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	155				451	0	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	100				39	27	
cM capacity (veh/h)	1297				489	989	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	270	270	270	202	202	300	720
Volume Left	0	0	0	0	0	300	0
Volume Right	0	0	0	0	0	0	720
cSH	1700	1700	1700	1700	1700	489	989
Volume to Capacity	0.16	0.16	0.16	0.12	0.12	0.61	0.73
Queue Length 95th (ft)	0	0	0	0	0	101	167
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	23.3	17.7
Lane LOS						C	C
Approach Delay (s)	0.0			0.0		19.4	
Approach LOS						C	
Intersection Summary							
Average Delay			8.8				
Intersection Capacity Utilization			62.4%		ICU Level of Service		B
Analysis Period (min)			15				

HCM Signalized Intersection Capacity Analysis

48: Calverton Blvd & Galway Dr

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	45	430	1190	30	125	150
Future Volume (vph)	45	430	1190	30	125	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		5.5	5.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1711	1801	1795		1711	1531
Flt Permitted	0.08	1.00	1.00		0.95	1.00
Satd. Flow (perm)	136	1801	1795		1711	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	430	1190	30	125	150
RTOR Reduction (vph)	0	0	1	0	0	83
Lane Group Flow (vph)	45	430	1219	0	125	67
Turn Type	Perm	NA	NA		Prot	Perm
Protected Phases		6	2		4	
Permitted Phases	6		2		4	4
Actuated Green, G (s)	52.9	52.9	52.9		10.6	10.6
Effective Green, g (s)	52.9	52.9	52.9		10.6	10.6
Actuated g/C Ratio	0.71	0.71	0.71		0.14	0.14
Clearance Time (s)	6.0	6.0	6.0		5.5	5.5
Vehicle Extension (s)	5.0	5.0	5.0		3.0	3.0
Lane Grp Cap (vph)	95	1270	1266		241	216
v/s Ratio Prot		0.24	c0.68		c0.07	
v/s Ratio Perm	0.33					0.04
v/c Ratio	0.47	0.34	0.96		0.52	0.31
Uniform Delay, d1	4.9	4.3	10.2		29.8	28.9
Progression Factor	1.55	1.08	1.00		1.00	1.00
Incremental Delay, d2	14.6	0.7	17.9		1.9	0.8
Delay (s)	22.2	5.3	28.0		31.7	29.7
Level of Service	C	A	C		C	C
Approach Delay (s)		6.9	28.0		30.6	
Approach LOS		A	C		C	

Intersection Summary

HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: Lockwood Shopping Ctr & Lockwood Dr

5/23/2016



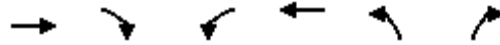
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	225	40	20	875	50	60	30	15	0	0	465
Future Volume (vph)	175	225	40	20	875	50	60	30	15	0	0	465
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0			6.0				6.0
Lane Util. Factor	1.00	1.00			0.95			1.00				0.88
Frt	1.00	0.98			0.99			0.98				0.85
Flt Protected	0.95	1.00			1.00			0.97				1.00
Satd. Flow (prot)	1711	1760			3391			1717				2694
Flt Permitted	0.25	1.00			0.95			0.97				1.00
Satd. Flow (perm)	451	1760			3209			1717				2694
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	175	225	40	20	875	50	60	30	15	0	0	465
RTOR Reduction (vph)	0	5	0	0	3	0	0	7	0	0	0	93
Lane Group Flow (vph)	175	260	0	0	942	0	0	98	0	0	0	372
Turn Type	pm+pt	NA		Perm	NA		Perm	NA				pm+ov
Protected Phases	1	2			2			4				1
Permitted Phases	2			2			4					4
Actuated Green, G (s)	62.8	51.2			51.2			9.2				20.8
Effective Green, g (s)	62.8	51.2			51.2			9.2				20.8
Actuated g/C Ratio	0.70	0.57			0.57			0.10				0.23
Clearance Time (s)	6.0	6.0			6.0			6.0				6.0
Vehicle Extension (s)	4.0	0.2			0.2			3.0				4.0
Lane Grp Cap (vph)	477	1001			1825			175				802
v/s Ratio Prot	0.05	0.15										c0.06
v/s Ratio Perm	0.21				c0.29			0.06				0.08
v/c Ratio	0.37	0.26			0.52			0.56				0.46
Uniform Delay, d1	5.2	9.8			11.8			38.5				29.8
Progression Factor	1.00	1.00			1.00			1.00				1.00
Incremental Delay, d2	0.7	0.6			1.0			3.8				0.6
Delay (s)	5.9	10.4			12.9			42.3				30.4
Level of Service	A	B			B			D				C
Approach Delay (s)		8.6			12.9			42.3			30.4	
Approach LOS		A			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 171: East U-Turn & MD 193 Westbound

5/23/2016



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑↑	↘↘	
Traffic Volume (vph)	0	0	0	1481	232	0
Future Volume (vph)	0	0	0	1481	232	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)				1.0	6.5	
Lane Util. Factor				0.86	0.97	
Fr _t				1.00	1.00	
Fl _t Protected				1.00	0.95	
Satd. Flow (prot)				6408	3433	
Fl _t Permitted				1.00	0.95	
Satd. Flow (perm)				6408	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1610	252	0
RTOR Reduction (vph)	0	0	0	0	219	0
Lane Group Flow (vph)	0	0	0	1610	33	0
Turn Type				NA	Prot	
Protected Phases				Free!	!	
Permitted Phases						
Actuated Green, G (s)				180.0	22.5	
Effective Green, g (s)				180.0	23.5	
Actuated g/C Ratio				1.00	0.13	
Clearance Time (s)					7.5	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)				6408	448	
v/s Ratio Prot				0.25	0.01	
v/s Ratio Perm						
v/c Ratio				0.25	0.07	
Uniform Delay, d ₁				0.0	68.7	
Progression Factor				1.00	6.30	
Incremental Delay, d ₂				0.1	0.0	
Delay (s)				0.1	433.1	
Level of Service				A	F	
Approach Delay (s)	0.0			0.1	433.1	
Approach LOS	A			A	F	

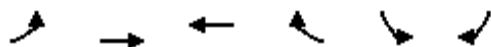
Intersection Summary			
HCM 2000 Control Delay	58.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

52: Riggs Rd/Powder Mill Rd

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑	↑		↙	↙
Traffic Volume (vph)	135	415	580	0	260	55
Future Volume (vph)	135	415	580	0	260	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	5.0	7.0	7.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1863		1770	1583
Flt Permitted	0.30	1.00	1.00		0.95	1.00
Satd. Flow (perm)	550	1863	1863		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	147	451	630	0	283	60
RTOR Reduction (vph)	0	0	0	0	0	48
Lane Group Flow (vph)	147	451	630	0	283	12
Turn Type	pm+pt	NA	NA		Prot	Prot
Protected Phases	1	6	2		4	4
Permitted Phases	6					
Actuated Green, G (s)	105.1	105.1	90.7		30.8	30.8
Effective Green, g (s)	105.1	105.1	90.7		30.8	30.8
Actuated g/C Ratio	0.71	0.71	0.61		0.21	0.21
Clearance Time (s)	5.0	7.0	7.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		7.0	7.0
Lane Grp Cap (vph)	465	1314	1134		366	327
v/s Ratio Prot	0.02	c0.24	c0.34		c0.16	0.01
v/s Ratio Perm	0.20					
v/c Ratio	0.32	0.34	0.56		0.77	0.04
Uniform Delay, d1	10.6	8.5	17.2		55.8	47.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	0.7	2.0		13.1	0.2
Delay (s)	11.0	9.2	19.2		68.8	47.4
Level of Service	B	A	B		E	D
Approach Delay (s)		9.6	19.2		65.1	
Approach LOS		A	B		E	

Intersection Summary

HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	148.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

54: Beltsville Dr. & MD 212

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	745	45	65	1655	1075	10	15	50	770	5	285
Future Volume (vph)	230	745	45	65	1655	1075	10	15	50	770	5	285
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	4.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.91	0.91	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	0.95	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	3221	1616	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	1863	1583	3221	1616	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	810	49	71	1799	1168	11	16	54	837	5	310
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	51	0	0	0
Lane Group Flow (vph)	250	810	28	71	1799	1168	11	16	3	561	281	310
Turn Type	Prot	NA	Perm	Prot	NA	Free	Split	NA	Perm	Split	NA	Free
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases			6			Free			3			Free
Actuated Green, G (s)	21.4	83.1	83.1	11.4	73.1	150.0	5.9	5.9	5.9	26.6	26.6	150.0
Effective Green, g (s)	22.4	85.1	85.1	12.4	75.1	150.0	7.9	7.9	7.9	28.6	28.6	150.0
Actuated g/C Ratio	0.15	0.57	0.57	0.08	0.50	1.00	0.05	0.05	0.05	0.19	0.19	1.00
Clearance Time (s)	5.0	6.0	6.0	5.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	264	2007	898	146	1771	1583	93	98	83	614	308	1583
v/s Ratio Prot	c0.14	0.23		0.04	c0.51		0.01	0.01		c0.17	0.17	
v/s Ratio Perm			0.02			c0.74			0.00			0.20
v/c Ratio	0.95	0.40	0.03	0.49	1.02	0.74	0.12	0.16	0.03	0.91	0.91	0.20
Uniform Delay, d1	63.2	18.2	14.3	65.8	37.5	0.0	67.7	67.9	67.4	59.5	59.5	0.0
Progression Factor	1.13	0.46	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	39.2	0.6	0.1	2.5	25.4	3.1	0.6	0.8	0.2	18.1	29.7	0.3
Delay (s)	110.6	8.9	14.4	68.3	62.9	3.1	68.3	68.7	67.6	77.6	89.2	0.3
Level of Service	F	A	B	E	E	A	E	E	E	E	F	A
Approach Delay (s)		32.0			40.0			67.9			59.6	
Approach LOS		C			D			E			E	

Intersection Summary

HCM 2000 Control Delay	43.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

1: MD 650 & Dilston Rd/Adelphi Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖↗		↖↗↘		↖↗	↖↗↘	
Traffic Volume (vph)	60	50	60	145	90	715	0	1525	15	680	2845	145
Future Volume (vph)	60	50	60	145	90	715	0	1525	15	680	2845	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		2.5		4.0	2.5	
Lane Util. Factor	1.00	1.00		1.00	1.00	0.88		0.91		0.97	0.91	
Frt	1.00	0.92		1.00	1.00	0.85		1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1711	1654		1711	1801	2694		5167		3319	4880	
Flt Permitted	0.63	1.00		0.58	1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)	1131	1654		1041	1801	2694		5167		3319	4880	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	53	63	153	95	753	0	1605	16	716	2995	153
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	3	0
Lane Group Flow (vph)	63	116	0	153	95	753	0	1620	0	716	3145	0
Turn Type	Perm	NA		Perm	NA	pm+ov		NA		Prot	NA	
Protected Phases		4			8	5		6		5	2	
Permitted Phases	4			8		8						
Actuated Green, G (s)	25.6	25.6		25.6	25.6	74.2		56.3		48.6	110.9	
Effective Green, g (s)	28.6	28.6		28.6	28.6	78.2		60.3		50.6	114.9	
Actuated g/C Ratio	0.19	0.19		0.19	0.19	0.52		0.40		0.34	0.77	
Clearance Time (s)	7.0	7.0		7.0	7.0	6.0		6.5		6.0	6.5	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0		0.2		5.0	0.2	
Lane Grp Cap (vph)	215	315		198	343	1404		2077		1119	3738	
v/s Ratio Prot		0.07			0.05	0.18		0.31		0.22	c0.64	
v/s Ratio Perm	0.06			c0.15		0.10						
v/c Ratio	0.29	0.37		0.77	0.28	0.54		0.78		0.64	0.84	
Uniform Delay, d1	52.0	52.8		57.6	51.9	23.9		39.1		42.0	11.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		1.08	0.27	
Incremental Delay, d2	1.6	1.5		19.5	0.9	0.7		3.0		0.6	0.8	
Delay (s)	53.6	54.4		77.1	52.8	24.6		42.1		46.0	3.9	
Level of Service	D	D		E	D	C		D		D	A	
Approach Delay (s)		54.1			35.3			42.1			11.7	
Approach LOS		D			D			D			B	

Intersection Summary

HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	10.5
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: MD 650 & Oakview Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔			↔	↔	↔	↑↑↑		↔	↑↑↑	
Traffic Volume (vph)	135	5	60	90	0	190	15	2265	20	50	3520	55
Future Volume (vph)	135	5	60	90	0	190	15	2265	20	50	3520	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.5	4.5	2.5		4.5	2.5	
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	*0.90		1.00	0.91	
Frt	1.00	0.86			1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1551			1711	1531	1711	4856		1711	4904	
Flt Permitted	0.63	1.00			0.70	1.00	0.04	1.00		0.04	1.00	
Satd. Flow (perm)	1130	1551			1252	1531	72	4856		69	4904	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	138	5	61	92	0	194	15	2311	20	51	3592	56
RTOR Reduction (vph)	0	50	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	138	16	0	0	92	194	15	2331	0	51	3647	0
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8	5	1	6		5	2	
Permitted Phases	4			8		8	6			2		
Actuated Green, G (s)	23.5	23.5			23.5	32.4	99.9	96.6		111.1	102.2	
Effective Green, g (s)	26.5	26.5			26.5	38.4	105.9	100.6		116.0	106.2	
Actuated g/C Ratio	0.18	0.18			0.18	0.26	0.71	0.67		0.77	0.71	
Clearance Time (s)	7.0	7.0			7.0	7.5	7.5	6.5		7.5	6.5	
Vehicle Extension (s)	5.0	5.0			5.0	5.0	5.0	0.2		5.0	0.2	
Lane Grp Cap (vph)	199	274			221	391	119	3256		183	3472	
v/s Ratio Prot		0.01				c0.04	0.01	0.48		0.02	c0.74	
v/s Ratio Perm	c0.12				0.07	0.09	0.08			0.19		
v/c Ratio	0.69	0.06			0.42	0.50	0.13	0.72		0.28	1.05	
Uniform Delay, d1	57.9	51.4			54.9	47.6	37.3	15.6		16.5	21.9	
Progression Factor	1.00	1.00			1.00	1.00	1.59	2.05		1.00	1.00	
Incremental Delay, d2	12.5	0.2			2.6	2.1	0.7	1.0		1.7	30.7	
Delay (s)	70.5	51.5			57.5	49.6	60.1	33.1		18.3	52.6	
Level of Service	E	D			E	D	E	C		B	D	
Approach Delay (s)		64.3			52.2			33.3			52.1	
Approach LOS		E			D			C			D	

Intersection Summary

HCM 2000 Control Delay	45.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: MD 650 & Elton Rd

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↘		↑↑↑	↗	↘	↑↑↑
Traffic Volume (vph)	100	20	2345	170	50	2540
Future Volume (vph)	100	20	2345	170	50	2540
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0		2.5	2.0	2.5	2.5
Lane Util. Factor	0.97		0.91	1.00	1.00	0.91
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3270		4916	1531	1711	4916
Flt Permitted	0.96		1.00	1.00	0.05	1.00
Satd. Flow (perm)	3270		4916	1531	87	4916
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	106	21	2495	181	53	2702
RTOR Reduction (vph)	7	0	0	0	0	0
Lane Group Flow (vph)	120	0	2495	181	53	2702
Turn Type	Prot		NA	pm+ov	Perm	NA
Protected Phases	3		2 4 9	3		6 4 9
Permitted Phases	3			2 4 9	6 4 9	
Actuated Green, G (s)	12.9		154.6	167.5	154.6	154.6
Effective Green, g (s)	15.9		158.6	170.5	158.6	158.6
Actuated g/C Ratio	0.09		0.88	0.95	0.88	0.88
Clearance Time (s)	6.0			6.0		
Vehicle Extension (s)	4.0			4.0		
Lane Grp Cap (vph)	288		4331	1467	76	4331
v/s Ratio Prot	c0.04		0.51	0.01		0.55
v/s Ratio Perm				0.11	c0.61	
v/c Ratio	0.42		0.58	0.12	0.70	0.62
Uniform Delay, d1	77.7		2.6	0.3	3.3	2.8
Progression Factor	1.00		1.45	1.00	1.49	1.14
Incremental Delay, d2	1.3		0.2	0.0	8.0	0.1
Delay (s)	79.0		3.9	0.3	13.0	3.3
Level of Service	E		A	A	B	A
Approach Delay (s)	79.0		3.7			3.5
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	5.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: MD 650 & Powder Mill Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	125	25	840	200	135	50	2155	170	110	2510	10
Future Volume (vph)	75	125	25	840	200	135	50	2155	170	110	2510	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1800	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	5.0	5.0	5.0	3.0	4.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1801	1531	3113	1604	1531	1711	4606		1711	4913	
Flt Permitted	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	1801	1531	3113	1604	1531	1711	4606		1711	4913	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	77	129	26	866	206	139	52	2222	175	113	2588	10
RTOR Reduction (vph)	0	0	0	0	0	107	0	5	0	0	0	0
Lane Group Flow (vph)	77	129	26	710	362	32	52	2392	0	113	2598	0
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	3	3		4	4		1	5		6	2	
Permitted Phases			3			4						
Actuated Green, G (s)	18.2	18.2	18.2	39.3	39.3	39.3	9.5	81.8		13.2	86.5	
Effective Green, g (s)	20.2	20.2	20.2	41.3	41.3	41.3	12.5	84.8		15.2	88.5	
Actuated g/C Ratio	0.11	0.11	0.11	0.23	0.23	0.23	0.07	0.47		0.08	0.49	
Clearance Time (s)	6.5	6.5	6.5	7.0	7.0	7.0	6.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)	192	202	171	714	368	351	118	2169		144	2415	
v/s Ratio Prot	0.05	c0.07		c0.23	0.23		0.03	c0.52		0.07	c0.53	
v/s Ratio Perm			0.02			0.02						
v/c Ratio	0.40	0.64	0.15	0.99	0.98	0.09	0.44	1.10		0.78	1.08	
Uniform Delay, d1	74.3	76.4	72.2	69.2	69.0	54.6	80.4	47.6		80.8	45.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.09	1.15		0.94	0.89	
Incremental Delay, d2	1.4	6.5	0.4	32.1	42.3	0.1	2.2	52.8		18.9	40.8	
Delay (s)	75.7	82.9	72.6	101.3	111.3	54.7	89.5	107.3		94.7	81.3	
Level of Service	E	F	E	F	F	D	F	F		F	F	
Approach Delay (s)		79.3			98.9			106.9			81.9	
Approach LOS		E			F			F			F	

Intersection Summary

HCM 2000 Control Delay	94.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

5: MD 650 & Chalmers Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↑↑↑		↖	↑↑↑	
Traffic Volume (vph)	40	0	65	0	0	0	35	2270	0	0	2565	5
Future Volume (vph)	40	0	65	0	0	0	35	2270	0	0	2565	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	1900	1900
Total Lost time (s)		7.0					3.0	3.0			3.0	
Lane Util. Factor		1.00					1.00	0.91			0.91	
Frt		0.92					1.00	1.00			1.00	
Flt Protected		0.98					0.95	1.00			1.00	
Satd. Flow (prot)		1619					1711	5175			4914	
Flt Permitted		0.87					0.03	1.00			1.00	
Satd. Flow (perm)		1443					63	5175			4914	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	0	68	0	0	0	37	2389	0	0	2700	5
RTOR Reduction (vph)	0	16	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	94	0	0	0	0	37	2389	0	0	2705	0
Turn Type	Perm	NA					Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)		17.8					149.2	149.2			149.2	
Effective Green, g (s)		17.8					152.2	152.2			152.2	
Actuated g/C Ratio		0.10					0.85	0.85			0.85	
Clearance Time (s)		7.0					6.0	6.0			6.0	
Vehicle Extension (s)		4.0					0.2	0.2			0.2	
Lane Grp Cap (vph)		142					53	4375			4155	
v/s Ratio Prot								0.46			0.55	
v/s Ratio Perm		c0.06					c0.59					
v/c Ratio		0.66					0.70	0.55			0.65	
Uniform Delay, d1		78.2					5.2	4.0			4.8	
Progression Factor		1.00					2.56	0.70			1.00	
Incremental Delay, d2		12.0					6.7	0.0			0.8	
Delay (s)		90.2					20.2	2.8			5.6	
Level of Service		F					C	A			A	
Approach Delay (s)		90.2			0.0			3.1			5.6	
Approach LOS		F			A			A			A	























Intersection Summary

HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: MD 650 & Schindler Dr/Mahan Rd

5/23/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	50	20	10	50	5	50	5	1590	715	320	2510	25	
Future Volume (vph)	50	20	10	50	5	50	5	1590	715	320	2510	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		8.0		4.0	8.0	4.0	9.0	2.5	4.5	6.0	2.5		
Lane Util. Factor		1.00		0.91	0.91	1.00	1.00	0.86	1.00	0.97	0.91		
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.97		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1718		3113	1580	1531	1711	6194	1531	3319	4908		
Flt Permitted		0.97		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1718		3113	1580	1531	1711	6194	1531	3319	4908		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	
Adj. Flow (vph)	52	21	10	52	5	52	5	1639	737	330	2588	26	
RTOR Reduction (vph)	0	0	0	0	0	49	0	0	212	0	0	0	
Lane Group Flow (vph)	0	83	0	38	19	3	5	1639	525	330	2614	0	
Turn Type	Split	NA		Split	NA	Perm	Prot	NA	Perm	Prot	NA		
Protected Phases	3	3		4	4		1	6		5	2		
Permitted Phases						4			6				
Actuated Green, G (s)		15.0		8.1	8.1	8.1	1.5	118.8	118.8	26.6	143.9		
Effective Green, g (s)		15.0		12.1	8.1	12.1	1.5	122.8	120.8	29.6	147.9		
Actuated g/C Ratio		0.08		0.06	0.04	0.06	0.01	0.61	0.60	0.15	0.74		
Clearance Time (s)		8.0		8.0	8.0	8.0	9.0	6.5	6.5	9.0	6.5		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	0.2	0.2	3.0	0.2		
Lane Grp Cap (vph)		128		188	63	92	12	3803	924	491	3629		
v/s Ratio Prot		c0.05		c0.01	0.01		0.00	0.26		c0.10	c0.53		
v/s Ratio Perm						0.00			0.34				
v/c Ratio		0.65		0.20	0.30	0.03	0.42	0.43	0.57	0.67	0.72		
Uniform Delay, d1		89.9		89.4	93.2	88.4	98.8	20.3	23.9	80.6	14.5		
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.19		
Incremental Delay, d2		10.8		0.5	2.7	0.2	21.8	0.4	2.5	2.5	0.9		
Delay (s)		100.7		89.9	95.9	88.6	120.6	20.6	26.4	82.8	3.7		
Level of Service		F		F	F	F	F	C	C	F	A		
Approach Delay (s)		100.7			90.3			22.6			12.6		
Approach LOS		F			F			C			B		
Intersection Summary													
HCM 2000 Control Delay			19.8		HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio			0.72										
Actuated Cycle Length (s)			200.0		Sum of lost time (s)					27.5			
Intersection Capacity Utilization			81.0%		ICU Level of Service					D			
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 7: MD 650 & Northwest Dr/Michelson Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↙ ↘	↘		↙	↑↑↑		↙ ↘	↑↑↑	
Traffic Volume (vph)	10	20	20	10	0	15	20	1535	135	455	2825	10
Future Volume (vph)	10	20	20	10	0	15	20	1535	135	455	2825	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		8.0		8.0	8.0		9.0	7.0		9.0	7.0	
Lane Util. Factor		1.00		0.97	1.00		1.00	0.86		0.97	0.91	
Frt		0.95		1.00	0.85		1.00	0.99		1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1687		3319	1531		1711	6119		3319	4913	
Flt Permitted		0.93		0.77	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1578		2677	1531		1711	6119		3319	4913	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	10	20	20	10	0	15	20	1566	138	464	2883	10
RTOR Reduction (vph)	0	14	0	0	14	0	0	5	0	0	0	0
Lane Group Flow (vph)	0	36	0	10	1	0	20	1699	0	464	2893	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8								
Actuated Green, G (s)		11.8		11.8	11.8		6.6	129.0		35.2	157.6	
Effective Green, g (s)		11.8		11.8	11.8		6.6	129.0		35.2	157.6	
Actuated g/C Ratio		0.06		0.06	0.06		0.03	0.64		0.18	0.79	
Clearance Time (s)		8.0		8.0	8.0		9.0	7.0		9.0	7.0	
Vehicle Extension (s)		5.0		5.0	5.0		5.0	0.2		5.0	0.2	
Lane Grp Cap (vph)		93		157	90		56	3946		584	3871	
v/s Ratio Prot					0.00		0.01	0.28		c0.14	c0.59	
v/s Ratio Perm		c0.02		0.00								
v/c Ratio		0.39		0.06	0.01		0.36	0.43		0.79	0.75	
Uniform Delay, d1		90.6		88.9	88.6		94.6	17.4		78.9	10.9	
Progression Factor		1.00		1.00	1.00		0.78	0.80		1.04	0.57	
Incremental Delay, d2		5.5		0.4	0.1		7.4	0.3		0.8	0.1	
Delay (s)		96.1		89.2	88.7		81.5	14.3		82.9	6.4	
Level of Service		F		F	F		F	B		F	A	
Approach Delay (s)		96.1			88.9			15.1			17.0	
Approach LOS		F			F			B			B	

Intersection Summary		
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.75	B
Actuated Cycle Length (s)	200.0	Sum of lost time (s)
Intersection Capacity Utilization	87.6%	24.0
Analysis Period (min)	15	ICU Level of Service
		E

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: MD 650 & Lockwood Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	180	300	755	450	195	200	1130	225	35	2250	250
Future Volume (vph)	130	180	300	755	450	195	200	1130	225	35	2250	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5	5.5
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.86	1.00	1.00	0.91	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	0.99	1.00	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1557	3255	1531	3113	1627	1531	1711	6194	1531	1711	4916	1531
Flt Permitted	0.95	0.99	1.00	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1557	3255	1531	3113	1627	1531	1711	6194	1531	1711	4916	1531
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	135	188	312	786	469	203	208	1177	234	36	2344	260
RTOR Reduction (vph)	0	0	95	0	0	88	0	0	74	0	0	31
Lane Group Flow (vph)	105	218	218	707	548	115	208	1177	160	36	2344	229
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	3	3		4	4		1	6	4	5	2	3
Permitted Phases			3			4			6			2
Actuated Green, G (s)	31.5	31.5	31.5	42.5	42.5	42.5	13.0	86.1	128.6	8.4	81.5	113.0
Effective Green, g (s)	35.5	35.5	35.5	46.5	46.5	46.5	16.0	90.1	136.6	11.4	85.5	117.0
Actuated g/C Ratio	0.18	0.18	0.18	0.23	0.23	0.23	0.08	0.45	0.68	0.06	0.43	0.58
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	9.0	7.5	7.5	9.0	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.2	3.0	3.0	0.2	3.0
Lane Grp Cap (vph)	276	577	271	723	378	355	136	2790	1045	97	2101	937
v/s Ratio Prot	0.07	0.07		0.23	c0.34		c0.12	c0.19	0.04	0.02	c0.48	0.04
v/s Ratio Perm			c0.14			0.07			0.07			0.11
v/c Ratio	0.38	0.38	0.81	0.98	1.45	0.32	1.53	0.42	0.15	0.37	1.12	0.24
Uniform Delay, d1	72.5	72.5	78.9	76.2	76.8	63.7	92.0	37.3	11.2	90.8	57.2	20.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.27	0.77	5.05	1.05	0.95	0.73
Incremental Delay, d2	0.9	0.4	15.9	27.7	216.7	0.5	269.5	0.4	0.1	2.1	58.4	0.1
Delay (s)	73.4	72.9	94.8	103.9	293.5	64.2	386.1	29.0	56.8	97.3	112.7	14.9
Level of Service	E	E	F	F	F	E	F	C	E	F	F	B
Approach Delay (s)		83.8			169.6			78.9			102.8	
Approach LOS		F			F			E			F	

Intersection Summary

HCM 2000 Control Delay	110.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	200.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

10: MD 650

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↖↗	↑↑↑	↑↑	
Traffic Volume (vph)	0	0	50	1215	2150	0
Future Volume (vph)	0	0	50	1215	2150	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	11	11
Total Lost time (s)			5.5	4.0	8.0	
Lane Util. Factor			0.97	0.91	0.95	
Frt			1.00	1.00	1.00	
Flt Protected			0.95	1.00	1.00	
Satd. Flow (prot)			3433	5085	3421	
Flt Permitted			0.95	1.00	1.00	
Satd. Flow (perm)			3433	5085	3421	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	52	1266	2240	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	52	1266	2240	0
Turn Type			Prot	NA	NA	
Protected Phases			1	Free	2	
Permitted Phases					2	
Actuated Green, G (s)			10.4	200.0	176.1	
Effective Green, g (s)			10.4	200.0	176.1	
Actuated g/C Ratio			0.05	1.00	0.88	
Clearance Time (s)			5.5		8.0	
Vehicle Extension (s)			5.0		0.2	
Lane Grp Cap (vph)			178	5085	3012	
v/s Ratio Prot			0.02	0.25	0.65	
v/s Ratio Perm						
v/c Ratio			0.29	0.25	0.74	
Uniform Delay, d1			91.3	0.0	4.1	
Progression Factor			0.79	1.00	1.00	
Incremental Delay, d2			1.8	0.1	1.7	
Delay (s)			73.7	0.1	5.8	
Level of Service			E	A	A	
Approach Delay (s)	0.0			3.0	5.8	
Approach LOS	A			A	A	

Intersection Summary

HCM 2000 Control Delay	4.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	200.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis
 12: MD 650 & Quaint Acres Dr/Heartfields Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↗	↗	↗	↗	↗	↗	↗
Traffic Volume (vph)	20	0	25	20	0	25	10	1380	15	25	2765	10
Future Volume (vph)	20	0	25	20	0	25	10	1380	15	25	2765	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		6.5			6.5	6.5	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.91		1.00	0.91	
Frt		0.93			1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1630			1711	1531	1770	5077		1711	4913	
Flt Permitted		0.85			0.90	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1409			1622	1531	1770	5077		1711	4913	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	22	0	27	22	0	27	11	1484	16	27	2973	11
RTOR Reduction (vph)	0	46	0	0	0	25	0	0	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	22	2	11	1500	0	27	2984	0
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8		8						
Actuated Green, G (s)		8.1			8.1	8.1	1.9	87.1		6.3	91.5	
Effective Green, g (s)		8.1			8.1	8.1	1.9	87.1		6.3	91.5	
Actuated g/C Ratio		0.07			0.07	0.07	0.02	0.73		0.05	0.76	
Clearance Time (s)		6.5			6.5	6.5	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0			5.0	5.0	5.0	0.2		5.0	0.2	
Lane Grp Cap (vph)		95			109	103	28	3685		89	3746	
v/s Ratio Prot							0.01	0.30		c0.02	c0.61	
v/s Ratio Perm		0.00			c0.01	0.00						
v/c Ratio		0.03			0.20	0.02	0.39	0.41		0.30	0.80	
Uniform Delay, d1		52.3			52.9	52.2	58.5	6.4		54.7	8.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00		0.91	0.80	
Incremental Delay, d2		0.3			1.9	0.1	18.0	0.3		3.4	1.6	
Delay (s)		52.6			54.8	52.4	76.4	6.7		53.4	8.5	
Level of Service		D			D	D	E	A		D	A	
Approach Delay (s)		52.6			53.5			7.2			8.9	
Approach LOS		D			D			A			A	

Intersection Summary

HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

13: MD 650 & Jackson Rd

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑↑↑		↰	↑↑↑
Traffic Volume (vph)	75	60	1315	100	175	2570
Future Volume (vph)	75	60	1315	100	175	2570
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.5	7.5	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	0.91		1.00	0.91
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1711	1531	4864		1711	4916
Flt Permitted	0.95	1.00	1.00		0.14	1.00
Satd. Flow (perm)	1711	1531	4864		259	4916
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	75	60	1315	100	175	2570
RTOR Reduction (vph)	0	55	4	0	0	0
Lane Group Flow (vph)	75	5	1411	0	175	2570
Turn Type	Perm	Perm	NA		pm+pt	NA
Protected Phases			6		5	2
Permitted Phases	4	4			2	
Actuated Green, G (s)	10.1	10.1	79.9		96.4	96.4
Effective Green, g (s)	10.1	10.1	79.9		96.4	96.4
Actuated g/C Ratio	0.08	0.08	0.67		0.80	0.80
Clearance Time (s)	7.5	7.5	6.0		6.0	6.0
Vehicle Extension (s)	4.0	4.0	0.2		4.0	0.2
Lane Grp Cap (vph)	144	128	3238		335	3949
v/s Ratio Prot			0.29		0.05	c0.52
v/s Ratio Perm	c0.04	0.00			0.37	
v/c Ratio	0.52	0.04	0.44		0.52	0.65
Uniform Delay, d1	52.6	50.5	9.4		5.0	4.9
Progression Factor	1.00	1.00	0.95		1.00	1.00
Incremental Delay, d2	4.4	0.2	0.4		1.9	0.8
Delay (s)	57.0	50.7	9.4		6.9	5.7
Level of Service	E	D	A		A	A
Approach Delay (s)	54.2		9.4			5.8
Approach LOS	D		A			A













Intersection Summary

HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
66: MD 650 & Ramp 2

5/23/2016

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑			↑↑↑				↑			↑↑
Traffic Volume (vph)	0	2015	0	0	2640	0	0	0	666	0	0	500
Future Volume (vph)	0	2015	0	0	2640	0	0	0	666	0	0	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.5			2.0				2.0			3.5
Lane Util. Factor		0.86			0.91				1.00			0.88
Frt		1.00			1.00				0.86			0.85
Flt Protected		1.00			1.00				1.00			1.00
Satd. Flow (prot)		6194			4916				1558			2694
Flt Permitted		1.00			1.00				1.00			1.00
Satd. Flow (perm)		6194			4916				1558			2694
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	2077	0	0	2722	0	0	0	687	0	0	515
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2077	0	0	2722	0	0	0	687	0	0	515
Turn Type		NA			NA				Free			Prot
Protected Phases		2			Free							8
Permitted Phases		2							Free			8
Actuated Green, G (s)		92.5			180.0				180.0			64.5
Effective Green, g (s)		96.5			180.0				180.0			67.5
Actuated g/C Ratio		0.54			1.00				1.00			0.38
Clearance Time (s)		6.5										6.5
Vehicle Extension (s)		0.2										4.0
Lane Grp Cap (vph)		3320			4916				1558			1010
v/s Ratio Prot		c0.34			0.55							0.19
v/s Ratio Perm									0.44			
v/c Ratio		0.63			0.55				0.44			0.51
Uniform Delay, d1		29.1			0.0				0.0			43.5
Progression Factor		1.00			1.00				1.00			1.00
Incremental Delay, d2		0.9			0.4				0.9			0.6
Delay (s)		30.0			0.4				0.9			44.0
Level of Service		C			A				A			D
Approach Delay (s)		30.0			0.4			0.9			44.0	
Approach LOS		C			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			14.4			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			180.0			Sum of lost time (s)			25.5			
Intersection Capacity Utilization			54.3%			ICU Level of Service			A			
Analysis Period (min)			15									

c Critical Lane Group

Intersection Sign configuration not allowed in HCM analysis.

HCM Unsignalized Intersection Capacity Analysis

41: Old Columbia Pike & Industrial Parkway

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑				↗		↑↑	
Traffic Volume (veh/h)	50	1810	100	30	775	235	0	0	715	100	425	45
Future Volume (Veh/h)	50	1810	100	30	775	235	0	0	715	100	425	45
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	50	1810	100	30	775	235	0	0	715	100	425	45
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		175										
pX, platoon unblocked												
vC, conflicting volume	775			1910			2536	2795	955	2672	2962	376
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	775			1910			2536	2795	955	2672	2962	376
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			90			0	100	0	0	0	93
cM capacity (veh/h)	837			307			0	15	259	0	12	622
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	NB 1	NB 2	SB 1	SB 2		
Volume Total	955	1005	30	310	310	390	358	358	312	258		
Volume Left	50	0	30	0	0	0	0	0	100	0		
Volume Right	0	100	0	0	0	235	358	358	0	45		
cSH	837	1700	307	1700	1700	1700	259	259	0	14		
Volume to Capacity	0.06	0.59	0.10	0.18	0.18	0.23	1.38	1.38	Err	17.78		
Queue Length 95th (ft)	5	0	8	0	0	0	482	482	Err	Err		
Control Delay (s)	1.7	0.0	18.0	0.0	0.0	0.0	231.3	231.3	Err	Err		
Lane LOS	A		C				F	F	F	F		
Approach Delay (s)	0.8		0.5				231.3		Err			
Approach LOS							F		F			
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			105.8%		ICU Level of Service				G			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

102: FDA Blvd & Industrial Parkway

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↑	↔↑		↔↑	↔↑
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						
Lane Util. Factor						
Frt						
Flt Protected						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0
Turn Type					Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)						
Effective Green, g (s)						
Actuated g/C Ratio						
Clearance Time (s)						
Lane Grp Cap (vph)						
v/s Ratio Prot						
v/s Ratio Perm						
v/c Ratio						
Uniform Delay, d1						
Progression Factor						
Incremental Delay, d2						
Delay (s)						
Level of Service						
Approach Delay (s)		0.0	0.0		0.0	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	0.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.00		
Actuated Cycle Length (s)	40.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 189: B-6 & Prosperity Dr

















5/23/2016



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Volume (veh/h)	225	175	275	340	75	70
Future Volume (Veh/h)	225	175	275	340	75	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	225	175	275	340	75	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	986					
pX, platoon unblocked						
vC, conflicting volume			400		1032	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			400		1032	200
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			76		57	91
cM capacity (veh/h)			1155		174	808
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	150	250	388	227	145	
Volume Left	0	0	275	0	75	
Volume Right	0	175	0	0	70	
cSH	1700	1700	1155	1700	280	
Volume to Capacity	0.09	0.15	0.24	0.13	0.52	
Queue Length 95th (ft)	0	0	23	0	69	
Control Delay (s)	0.0	0.0	7.1	0.0	30.9	
Lane LOS			A			D
Approach Delay (s)	0.0		4.5		30.9	
Approach LOS						D
Intersection Summary						
Average Delay			6.2			
Intersection Capacity Utilization			47.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 190: Plum Orchard/B-6 & Broadbirch Dr

5/23/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control		Stop			Stop			Stop			Stop		
Traffic Volume (vph)	50	485	225	375	800	125	25	25	35	120	285	100	
Future Volume (vph)	50	485	225	375	800	125	25	25	35	120	285	100	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	50	485	225	375	800	125	25	25	35	120	285	100	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1							
Volume Total (vph)	293	468	775	525	85	505							
Volume Left (vph)	50	0	375	0	25	120							
Volume Right (vph)	0	225	0	125	35	100							
Hadj (s)	0.12	-0.30	0.28	-0.13	-0.15	-0.04							
Departure Headway (s)	8.3	7.9	8.4	8.0	9.4	7.5							
Degree Utilization, x	0.68	1.00	1.00	1.00	0.22	1.00							
Capacity (veh/h)	428	468	775	525	379	505							
Control Delay (s)	25.8	69.3	71.7	69.8	15.0	68.6							
Approach Delay (s)	52.5		70.9		15.0	68.6							
Approach LOS	F		F		C	F							
Intersection Summary													
Delay			63.4										
Level of Service			F										
Intersection Capacity Utilization			103.4%		ICU Level of Service			G					
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis
 191: B-5 & Plum Orchard/Plum Orchard Dr

5/23/2016

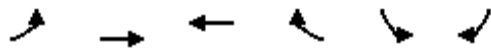


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	150	735	455	40	45	250
Future Volume (Veh/h)	150	735	455	40	45	250
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	150	735	455	40	45	250
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1301					
pX, platoon unblocked						
vC, conflicting volume			885			1468 518
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			885			1468 518
tC, single (s)			4.1			6.4 6.2
tC, 2 stage (s)						
tF (s)			2.2			3.5 3.3
p0 queue free %			41			21 55
cM capacity (veh/h)			765			57 558
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	885	495	295			
Volume Left	0	455	45			
Volume Right	735	0	250			
cSH	1700	765	238			
Volume to Capacity	0.52	0.59	1.24			
Queue Length 95th (ft)	0	100	366			
Control Delay (s)	0.0	15.9	179.8			
Lane LOS			C	F		
Approach Delay (s)	0.0	15.9	179.8			
Approach LOS			F			
Intersection Summary						
Average Delay			36.4			
Intersection Capacity Utilization			108.4%	ICU Level of Service		G
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

192: FDA Blvd & B-5

5/23/2016

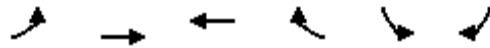


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↕	↔↕		↔↕	
Traffic Volume (veh/h)	140	150	1480	155	245	945
Future Volume (Veh/h)	140	150	1480	155	245	945
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	140	150	1480	155	245	945
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)	942					
pX, platoon unblocked						
vC, conflicting volume	1635				1912	818
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1635				1912	818
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	64				0	0
cM capacity (veh/h)	393				38	319
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	190	100	987	648	1190	
Volume Left	140	0	0	0	245	
Volume Right	0	0	0	155	945	
cSH	393	1700	1700	1700	127	
Volume to Capacity	0.36	0.06	0.58	0.38	9.33	
Queue Length 95th (ft)	40	0	0	0	Err	
Control Delay (s)	16.0	0.0	0.0	0.0	Err	
Lane LOS	C				F	
Approach Delay (s)	10.5		0.0		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			3820.8			
Intersection Capacity Utilization			135.9%	ICU Level of Service	H	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

195: B-6 & B-7

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↘	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	75	375	120	80	130	25
Future Volume (vph)	75	375	120	80	130	25
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	75	375	120	80	130	25



















Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	450	200	155
Volume Left (vph)	75	0	130
Volume Right (vph)	0	80	25
Hadj (s)	0.07	-0.21	0.10
Departure Headway (s)	4.7	4.7	5.5
Degree Utilization, x	0.58	0.26	0.24
Capacity (veh/h)	746	726	584
Control Delay (s)	14.0	9.3	10.2
Approach Delay (s)	14.0	9.3	10.2
Approach LOS	B	A	B

Intersection Summary			
Delay		12.1	
Level of Service		B	
Intersection Capacity Utilization		53.8%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis

40: Old Columbia Pike & Tech Rd

5/23/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	40	35	15	235	20	415	0	110	55	730	455	5
Future Volume (vph)	40	35	15	235	20	415	0	110	55	730	455	5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	40	35	15	235	20	415	0	110	55	730	455	5
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2						
Volume Total (vph)	90	235	435	165	730	460						
Volume Left (vph)	40	235	0	0	730	0						
Volume Right (vph)	15	0	415	55	0	5						
Hadj (s)	0.02	0.53	-0.63	-0.17	0.53	0.03						
Departure Headway (s)	8.3	8.1	6.9	7.7	7.8	7.3						
Degree Utilization, x	0.21	0.53	0.83	0.35	1.00	0.93						
Capacity (veh/h)	408	439	514	449	730	460						
Control Delay (s)	13.4	18.5	34.5	14.9	68.7	50.0						
Approach Delay (s)	13.4	28.9		14.9	61.5							
Approach LOS	B	D		B	F							
Intersection Summary												
Delay			45.5									
Level of Service			E									
Intersection Capacity Utilization			94.6%	ICU Level of Service	F							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 49: Old Columbia Pike/Prosperity Dr & Tech Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (veh/h)	180	1375	265	60	820	110	50	110	125	70	245	100
Future Volume (Veh/h)	180	1375	265	60	820	110	50	110	125	70	245	100
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	180	1375	265	60	820	110	50	110	125	70	245	100
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		177										
pX, platoon unblocked												
vC, conflicting volume	930			1640			2483	2918	820	2222	2995	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	930			1640			2483	2918	820	2222	2995	328
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	75			85			0	0	61	0	0	85
cM capacity (veh/h)	731			391			0	10	318	0	9	667
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2			
Volume Total	868	952	265	410	315	105	180	192	222			
Volume Left	180	0	60	0	0	50	0	70	0			
Volume Right	0	265	0	0	110	0	125	0	100			
cSH	731	1700	391	1700	1700	0	30	0	15			
Volume to Capacity	0.25	0.56	0.15	0.24	0.19	Err	6.08	Err	14.41			
Queue Length 95th (ft)	24	0	13	0	0	Err	Err	Err	Err			
Control Delay (s)	6.2	0.0	5.7	0.0	0.0	Err	Err	Err	Err			
Lane LOS	A		A			F	F	F	F			
Approach Delay (s)	2.9		1.5			Err		Err				
Approach LOS						F		F				
Intersection Summary												
Average Delay				Err								
Intersection Capacity Utilization			105.0%		ICU Level of Service				G			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
50: Tech Rd & Broadbirch Dr

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	215	710	390	405	355	1215
Future Volume (vph)	215	710	390	405	355	1215
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	215	710	390	405	355	1215
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	215	710	260	535	760	810
Volume Left (vph)	215	0	0	0	355	0
Volume Right (vph)	0	710	0	405	0	0
Hadj (s)	0.53	-0.67	0.03	-0.50	0.27	0.03
Departure Headway (s)	9.0	7.8	8.4	7.9	8.4	8.1
Degree Utilization, x	0.54	1.00	0.61	1.00	1.00	1.00
Capacity (veh/h)	393	710	415	535	760	810
Control Delay (s)	20.9	69.0	22.6	69.4	71.5	70.4
Approach Delay (s)	57.8		54.1		70.9	
Approach LOS	F		F		F	

Intersection Summary

Delay	63.2
Level of Service	F
Intersection Capacity Utilization	89.6%
ICU Level of Service	E
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis

51: Tech Rd & Industrial Parkway

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	580	1785	65	0	600	220	50	45	5	940	190	300
Future Volume (vph)	580	1785	65	0	600	220	50	45	5	940	190	300
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	580	1785	65	0	600	220	50	45	5	940	190	300

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	1473	958	300	520	73	28	1035	395
Volume Left (vph)	580	0	0	0	50	0	940	0
Volume Right (vph)	0	65	0	220	0	5	0	300
Hadj (s)	0.23	-0.01	0.03	-0.26	0.38	-0.09	0.49	-0.50
Departure Headway (s)	9.1	8.8	9.2	8.9	11.3	10.8	9.5	8.5
Degree Utilization, x	1.00	1.00	0.77	1.00	0.23	0.08	1.00	0.93
Capacity (veh/h)	1473	958	378	520	300	320	1035	395
Control Delay (s)	74.8	73.8	35.5	74.0	16.4	13.6	76.6	57.0
Approach Delay (s)	74.4		59.9		15.6		71.2	
Approach LOS	F		F		C		F	

Intersection Summary

Delay	69.7
Level of Service	F
Intersection Capacity Utilization	160.6%
ICU Level of Service	H
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis

14: US 29 & MD 193 Eastbound

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↑↑↑	↷					↑↑↑	↷		↑↑↑	
Traffic Volume (vph)	290	1370	225	0	0	0	0	3200	235	0	3815	0
Future Volume (vph)	290	1370	225	0	0	0	0	3200	235	0	3815	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0					6.0	6.0		6.0	
Lane Util. Factor	1.00	0.91	1.00					0.86	1.00		0.86	
Frt	1.00	1.00	0.85					1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770	5085	1583					6408	1583		6408	
Flt Permitted	0.95	1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770	5085	1583					6408	1583		6408	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	315	1489	245	0	0	0	0	3478	255	0	4147	0
RTOR Reduction (vph)	0	0	42	0	0	0	0	0	43	0	0	0
Lane Group Flow (vph)	315	1489	203	0	0	0	0	3478	212	0	4147	0
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						5			2	
Permitted Phases	4		4						5			
Actuated Green, G (s)	39.0	39.0	39.0					117.0	117.0		128.0	
Effective Green, g (s)	41.0	41.0	41.0					117.0	117.0		128.0	
Actuated g/C Ratio	0.23	0.23	0.23					0.65	0.65		0.71	
Clearance Time (s)	7.0	7.0	7.0					6.0	6.0		6.0	
Vehicle Extension (s)	5.0	5.0	5.0					0.2	0.2		0.2	
Lane Grp Cap (vph)	403	1158	360					4165	1028		4556	
v/s Ratio Prot		c0.29						0.54			c0.65	
v/s Ratio Perm	0.18		0.13						0.13			
v/c Ratio	0.78	1.29	0.56					0.84	0.21		0.91	
Uniform Delay, d1	65.3	69.5	61.6					24.1	12.7		21.3	
Progression Factor	1.06	1.06	1.08					1.00	1.00		0.22	
Incremental Delay, d2	10.6	135.0	3.2					2.1	0.5		1.7	
Delay (s)	79.9	208.4	70.0					26.2	13.2		6.4	
Level of Service	E	F	E					C	B		A	
Approach Delay (s)		172.1			0.0			25.3			6.4	
Approach LOS		F			A			C			A	

Intersection Summary

HCM 2000 Control Delay	47.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

15: US 29 & MD 193 Westbound

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑↑↑↑	↗		↑↑↑↑			↑↑↑↑	
Traffic Volume (vph)	0	0	0	310	1525	85	0	3490	0	0	3505	160
Future Volume (vph)	0	0	0	310	1525	85	0	3490	0	0	3505	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)				5.0	5.0	5.0		6.0			6.0	
Lane Util. Factor				1.00	0.86	1.00		0.86			0.86	
Frt				1.00	1.00	0.85		1.00			0.99	
Flt Protected				0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)				1770	6408	1583		6408			6366	
Flt Permitted				0.95	1.00	1.00		1.00			1.00	
Satd. Flow (perm)				1770	6408	1583		6408			6366	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	337	1658	92	0	3793	0	0	3810	174
RTOR Reduction (vph)	0	0	0	0	0	42	0	0	0	0	3	0
Lane Group Flow (vph)	0	0	0	337	1658	50	0	3793	0	0	3981	0
Turn Type				Perm	NA	Perm		NA			NA	
Protected Phases					4			2			5	
Permitted Phases				4		4						
Actuated Green, G (s)				39.0	39.0	39.0		128.0			128.0	
Effective Green, g (s)				41.0	41.0	41.0		128.0			128.0	
Actuated g/C Ratio				0.23	0.23	0.23		0.71			0.71	
Clearance Time (s)				7.0	7.0	7.0		6.0			6.0	
Vehicle Extension (s)				6.0	6.0	6.0		0.2			0.2	
Lane Grp Cap (vph)				403	1459	360		4556			4526	
v/s Ratio Prot					c0.26			0.59			c0.63	
v/s Ratio Perm				0.19		0.03						
v/c Ratio				0.84	1.14	0.14		0.83			0.88	
Uniform Delay, d1				66.3	69.5	55.4		18.4			20.1	
Progression Factor				0.79	0.80	0.53		0.31			0.52	
Incremental Delay, d2				15.8	70.2	0.5		1.0			0.3	
Delay (s)				68.3	126.0	30.0		6.6			10.6	
Level of Service				E	F	C		A			B	
Approach Delay (s)		0.0			112.5			6.6			10.6	
Approach LOS		A			F			A			B	

Intersection Summary

HCM 2000 Control Delay	30.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Gas Sta./West Crossover & MD 193 Eastbound

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑							↑	↑	↑	
Traffic Volume (vph)	0	1595	0	0	0	0	0	0	0	84	0	0
Future Volume (vph)	0	1595	0	0	0	0	0	0	0	84	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		5.0								6.5	6.5	
Lane Util. Factor		0.91								0.95	0.95	
Frt		1.00								1.00	1.00	
Flt Protected		1.00								0.95	0.95	
Satd. Flow (prot)		5085								1681	1681	
Flt Permitted		1.00								0.95	0.95	
Satd. Flow (perm)		5085								1681	1681	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1734	0	0	0	0	0	0	0	91	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	44	44	0
Lane Group Flow (vph)	0	1734	0	0	0	0	0	0	0	1	2	0
Turn Type		NA								Free	Perm	NA
Protected Phases		2										4
Permitted Phases										Free	4	
Actuated Green, G (s)		161.6									4.9	4.9
Effective Green, g (s)		162.6									5.9	5.9
Actuated g/C Ratio		0.90									0.03	0.03
Clearance Time (s)		6.0									7.5	7.5
Vehicle Extension (s)		0.2									3.0	3.0
Lane Grp Cap (vph)		4593									55	55
v/s Ratio Prot		c0.34										
v/s Ratio Perm											0.00	0.00
v/c Ratio		0.38									0.03	0.03
Uniform Delay, d1		1.3									84.3	84.3
Progression Factor		1.00									1.45	1.38
Incremental Delay, d2		0.2									0.0	0.0
Delay (s)		1.5									122.5	116.5
Level of Service		A									F	F
Approach Delay (s)		1.5			0.0			0.0				119.5
Approach LOS		A			A			A				F

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	61.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

18: US 29 & Lorain Ave

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations		↕			↕		↕	↑↑↑		↕	↑↑↑			
Traffic Volume (veh/h)	10	5	40	15	0	35	15	3345	5	20	3770	15		
Future Volume (Veh/h)	10	5	40	15	0	35	15	3345	5	20	3770	15		
Sign Control		Stop			Stop			Free			Free			
Grade		0%			0%			0%			0%			
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Hourly flow rate (vph)	10	5	40	15	0	35	15	3345	5	20	3770	15		
Pedestrians														
Lane Width (ft)														
Walking Speed (ft/s)														
Percent Blockage														
Right turn flare (veh)														
Median type														
Median storage veh														
Upstream signal (ft)														
pX, platoon unblocked														
vC, conflicting volume														
vC1, stage 1 conf vol														
vC2, stage 2 conf vol														
vCu, unblocked vol														
tC, single (s)														
tC, 2 stage (s)														
tF (s)														
p0 queue free %														
cM capacity (veh/h)														
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4				
Volume Total	55	50	15	1338	1338	674	20	1508	1508	769				
Volume Left	10	15	15	0	0	0	20	0	0	0				
Volume Right	40	35	0	0	0	5	0	0	0	15				
cSH	0	0	83	1700	1700	1700	81	1700	1700	1700				
Volume to Capacity	Err	Err	0.18	0.79	0.79	0.40	0.25	0.89	0.89	0.45				
Queue Length 95th (ft)	Err	Err	15	0	0	0	22	0	0	0				
Control Delay (s)	Err	Err	57.9	0.0	0.0	0.0	63.0	0.0	0.0	0.0				
Lane LOS	F	F	F				F							
Approach Delay (s)	Err	Err	0.3				0.3							
Approach LOS	F	F												
Intersection Summary														
Average Delay														
Intersection Capacity Utilization														
Analysis Period (min)														
			Err						84.8%			ICU Level of Service		
												E		
			15											

HCM Signalized Intersection Capacity Analysis

19: US 29 & Southwood Ave

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶	↷	↶	↑↑↑	↓↓↓	
Traffic Volume (vph)	185	65	20	3370	3740	65
Future Volume (vph)	185	65	20	3370	3740	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	5.5	5.5	5.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	5085	5072	
Flt Permitted	0.95	1.00	0.03	1.00	1.00	
Satd. Flow (perm)	1770	1583	55	5085	5072	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	201	71	22	3663	4065	71
RTOR Reduction (vph)	0	60	0	0	1	0
Lane Group Flow (vph)	201	11	22	3663	4135	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	26.4	26.4	140.6	140.6	128.7	
Effective Green, g (s)	27.4	27.4	142.6	142.6	130.7	
Actuated g/C Ratio	0.15	0.15	0.79	0.79	0.73	
Clearance Time (s)	6.5	6.5	7.5	6.5	6.5	
Vehicle Extension (s)	5.0	5.0	4.0	0.2	0.2	
Lane Grp Cap (vph)	269	240	104	4028	3682	
v/s Ratio Prot	c0.11		0.01	c0.72	c0.82	
v/s Ratio Perm		0.01	0.16			
v/c Ratio	0.75	0.05	0.21	0.91	1.12	
Uniform Delay, d1	73.0	65.1	53.1	13.9	24.7	
Progression Factor	1.00	1.00	2.18	1.96	0.54	
Incremental Delay, d2	12.8	0.2	0.9	2.7	56.4	
Delay (s)	85.8	65.3	116.5	30.0	69.8	
Level of Service	F	E	F	C	E	
Approach Delay (s)	80.4			30.5	69.8	
Approach LOS	F			C	E	

Intersection Summary

HCM 2000 Control Delay	52.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

20: US 29 & Burnt Mills Shopping Ctr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↗	↑↑↑		↖	↑↑↑	
Traffic Volume (vph)	0	0	0	50	0	20	15	3465	65	60	4100	0
Future Volume (vph)	0	0	0	50	0	20	15	3465	65	60	4100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					7.5		7.5	7.0		7.5	7.0	
Lane Util. Factor					1.00		1.00	0.91		1.00	0.91	
Frt					0.96		1.00	1.00		1.00	1.00	
Flt Protected					0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)					1672		1711	4902		1711	4916	
Flt Permitted					0.79		0.03	1.00		0.03	1.00	
Satd. Flow (perm)					1364		51	4902		49	4916	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	50	0	20	15	3465	65	60	4100	0
RTOR Reduction (vph)	0	0	0	0	67	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	3	0	15	3529	0	60	4100	0
Turn Type				Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)					8.3		145.5	142.0		153.9	146.2	
Effective Green, g (s)					8.3		145.5	142.0		153.9	146.2	
Actuated g/C Ratio					0.05		0.81	0.79		0.86	0.81	
Clearance Time (s)					7.5		7.5	7.0		7.5	7.0	
Vehicle Extension (s)					4.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)					62		73	3867		112	3992	
v/s Ratio Prot							0.00	0.72		c0.02	c0.83	
v/s Ratio Perm					c0.00		0.16			0.43		
v/c Ratio					0.05		0.21	0.91		0.54	1.03	
Uniform Delay, d1					82.1		56.7	14.3		48.0	16.9	
Progression Factor					1.00		1.39	0.87		0.98	0.81	
Incremental Delay, d2					0.5		0.6	2.0		1.2	15.4	
Delay (s)					82.6		79.6	14.5		48.3	29.0	
Level of Service					F		E	B		D	C	
Approach Delay (s)		0.0			82.6			14.8			29.3	
Approach LOS		A			F			B			C	

Intersection Summary

HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	95.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

21: US 29 & Lockwood Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖		↗	↖↗	↔			↕↔		↖	↕↔	
Traffic Volume (vph)	5	0	5	850	0	5	0	2910	5	10	3495	20
Future Volume (vph)	5	0	5	850	0	5	0	2910	5	10	3495	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0		5.0	5.0	5.0			4.0		4.0	4.0	
Lane Util. Factor	1.00		1.00	0.91	0.91			0.91		1.00	0.91	
Frt	1.00		0.85	1.00	1.00			1.00		1.00	1.00	
Flt Protected	0.95		1.00	0.95	0.95			1.00		0.95	1.00	
Satd. Flow (prot)	1770		1583	3221	1611			5084		1770	5081	
Flt Permitted	0.13		1.00	0.95	0.95			1.00		0.03	1.00	
Satd. Flow (perm)	248		1583	3221	1611			5084		53	5081	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	0	5	924	0	5	0	3163	5	11	3799	22
RTOR Reduction (vph)	0	0	4	0	20	0	0	0	0	0	0	0
Lane Group Flow (vph)	5	0	1	647	262	0	0	3168	0	11	3821	0
Turn Type	Perm		Perm	Perm	NA			NA		Perm	NA	
Protected Phases					8			6				2
Permitted Phases	4		4	8						2		
Actuated Green, G (s)	28.0		28.0	28.0	28.0			138.0		138.0	138.0	
Effective Green, g (s)	30.0		30.0	30.0	30.0			141.0		141.0	141.0	
Actuated g/C Ratio	0.17		0.17	0.17	0.17			0.78		0.78	0.78	
Clearance Time (s)	7.0		7.0	7.0	7.0			7.0		7.0	7.0	
Vehicle Extension (s)	5.0		5.0	5.0	5.0			0.2		0.2	0.2	
Lane Grp Cap (vph)	41		263	536	268			3982		41	3980	
v/s Ratio Prot								0.62				c0.75
v/s Ratio Perm	0.02		0.00	c0.20	0.16					0.21		
v/c Ratio	0.12		0.00	1.21	0.98			0.80		0.27	0.96	
Uniform Delay, d1	63.8		62.5	75.0	74.7			11.2		5.3	17.0	
Progression Factor	1.00		1.00	1.00	1.00			0.63		0.10	0.79	
Incremental Delay, d2	2.8		0.0	109.8	48.7			0.7		6.3	3.6	
Delay (s)	66.6		62.5	184.8	123.4			7.8		6.8	17.1	
Level of Service	E		E	F	F			A		A	B	
Approach Delay (s)		64.6			166.2			7.8			17.0	
Approach LOS		E			F			A			B	

Intersection Summary

HCM 2000 Control Delay	30.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	100.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: US 29 & Burnt Mills Ave

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↑↑↑		↖	↑↑↑	
Traffic Volume (vph)	30	5	25	10	5	5	15	2900	5	0	3490	5
Future Volume (vph)	30	5	25	10	5	5	15	2900	5	0	3490	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		6.5			6.5		6.5	4.0			4.0	
Lane Util. Factor		1.00			1.00		1.00	0.91			0.91	
Frt		0.94			0.97		1.00	1.00			1.00	
Flt Protected		0.98			0.97		0.95	1.00			1.00	
Satd. Flow (prot)		1715			1757		1770	5084			5084	
Flt Permitted		0.83			0.83		0.03	1.00			1.00	
Satd. Flow (perm)		1458			1496		50	5084			5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	5	27	11	5	5	16	3152	5	0	3793	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	65	0	0	21	0	16	3157	0	0	3798	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)		14.2			14.2		151.3	151.3			140.2	
Effective Green, g (s)		15.2			15.2		152.3	154.3			143.2	
Actuated g/C Ratio		0.08			0.08		0.85	0.86			0.80	
Clearance Time (s)		7.5			7.5		7.5	7.0			7.0	
Vehicle Extension (s)		4.0			4.0		3.0	0.2			0.2	
Lane Grp Cap (vph)		123			126		86	4358			4044	
v/s Ratio Prot							0.00	c0.62			c0.75	
v/s Ratio Perm		c0.04			0.01		0.15					
v/c Ratio		0.53			0.17		0.19	0.72			0.94	
Uniform Delay, d1		79.0			76.5		49.5	4.8			14.9	
Progression Factor		1.00			1.00		1.55	1.28			0.21	
Incremental Delay, d2		5.2			0.9		0.6	0.6			3.4	
Delay (s)		84.2			77.4		77.3	6.8			6.6	
Level of Service		F			E		E	A			A	
Approach Delay (s)		84.2			77.4			7.2			6.6	
Approach LOS		F			E			A			A	

Intersection Summary

HCM 2000 Control Delay	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

23: US 29 & Prelude Dr

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	115	80	20	3225	3215	5
Future Volume (vph)	115	80	20	3225	3215	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	5.5	5.5	7.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	5085	5084	
Flt Permitted	0.95	1.00	0.03	1.00	1.00	
Satd. Flow (perm)	1770	1583	52	5085	5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	125	87	22	3505	3495	5
RTOR Reduction (vph)	0	45	0	0	0	0
Lane Group Flow (vph)	125	42	22	3505	3500	0
Turn Type	Perm	Perm	pm+pt	NA	NA	
Protected Phases			1	6	2	
Permitted Phases	4	4	6			
Actuated Green, G (s)	18.9	18.9	147.6	147.6	136.9	
Effective Green, g (s)	19.9	19.9	147.6	150.6	139.9	
Actuated g/C Ratio	0.11	0.11	0.82	0.84	0.78	
Clearance Time (s)	6.5	6.5	7.0	7.0	7.0	
Vehicle Extension (s)	4.0	4.0	3.0	0.2	0.2	
Lane Grp Cap (vph)	195	175	77	4254	3951	
v/s Ratio Prot			0.01	c0.69	c0.69	
v/s Ratio Perm	c0.07	0.03	0.23			
v/c Ratio	0.64	0.24	0.29	0.82	0.89	
Uniform Delay, d1	76.6	73.1	36.1	7.7	14.3	
Progression Factor	1.00	1.00	2.09	0.69	1.00	
Incremental Delay, d2	7.8	1.0	1.6	1.5	3.3	
Delay (s)	84.4	74.1	77.0	6.8	17.7	
Level of Service	F	E	E	A	B	
Approach Delay (s)	80.2			7.3	17.7	
Approach LOS	F			A	B	

Intersection Summary

HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

24: US 29 & Stewart La

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↑↑↑	↗	↖	↑↑↑	↗
Traffic Volume (vph)	55	45	30	140	10	35	10	3415	200	490	3285	55
Future Volume (vph)	55	45	30	140	10	35	10	3415	200	490	3285	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		6.5	6.5	6.5	6.5		7.5	4.0	4.0	7.5	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.91	1.00	1.00	0.91	1.00
Frt		1.00	0.85	1.00	0.88		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1813	1583	1770	1646		1770	5085	1583	1770	5085	1583
Flt Permitted		0.80	1.00	0.57	1.00		0.04	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)		1493	1583	1061	1646		75	5085	1583	69	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	49	33	152	11	38	11	3712	217	533	3571	60
RTOR Reduction (vph)	0	0	30	0	35	0	0	0	0	0	0	14
Lane Group Flow (vph)	0	109	3	152	14	0	11	3712	217	533	3571	46
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)		12.5	12.5	12.5	12.5		102.4	100.0	100.0	123.0	113.1	113.1
Effective Green, g (s)		13.5	13.5	13.5	13.5		102.4	103.0	103.0	123.0	116.1	116.1
Actuated g/C Ratio		0.09	0.09	0.09	0.09		0.68	0.69	0.69	0.82	0.77	0.77
Clearance Time (s)		7.5	7.5	7.5	7.5		7.5	7.0	7.0	7.5	7.0	7.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		134	142	95	148		78	3491	1086	232	3935	1225
v/s Ratio Prot					0.01		0.00	0.73		c0.24	0.70	
v/s Ratio Perm		0.07	0.00	c0.14			0.09		0.14	c1.64		0.03
v/c Ratio		0.81	0.02	1.60	0.10		0.14	1.06	0.20	2.30	0.91	0.04
Uniform Delay, d1		67.0	62.2	68.2	62.7		26.1	23.5	8.5	59.4	12.9	3.9
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		30.0	0.1	313.5	0.3		0.8	35.4	0.4	597.3	4.1	0.1
Delay (s)		97.0	62.3	381.8	62.9		27.0	58.9	8.9	656.6	17.0	4.0
Level of Service		F	E	F	E		C	E	A	F	B	A
Approach Delay (s)		89.0			304.0			56.1			98.7	
Approach LOS		F			F			E			F	

Intersection Summary

HCM 2000 Control Delay	83.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	2.22		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	122.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

26: US 29 & Industrial Parkway

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	755	65	2230	1275	685	3075
Future Volume (vph)	755	65	2230	1275	685	3075
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	6.0	5.0	4.0	4.0	6.0	4.0
Lane Util. Factor	0.97	1.00	0.91	0.88	1.00	0.91
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)	3433	1583	5085	2787	1770	5085
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1583	5085	2787	1770	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	821	71	2424	1386	745	3342
RTOR Reduction (vph)	0	1	0	1	0	0
Lane Group Flow (vph)	821	70	2424	1385	745	3342
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	4	5	6	4	5	2
Permitted Phases		4		6		
Actuated Green, G (s)	42.0	72.0	88.0	130.0	30.0	124.0
Effective Green, g (s)	43.0	74.0	91.0	136.0	30.0	127.0
Actuated g/C Ratio	0.24	0.41	0.51	0.76	0.17	0.71
Clearance Time (s)	7.0	6.0	7.0	7.0	6.0	7.0
Vehicle Extension (s)	4.0	3.0	0.2	4.0	3.0	0.2
Lane Grp Cap (vph)	820	650	2570	2167	295	3587
v/s Ratio Prot	c0.24	0.02	0.48	0.16	c0.42	c0.66
v/s Ratio Perm		0.03		0.34		
v/c Ratio	1.00	0.11	0.94	0.64	2.53	0.93
Uniform Delay, d1	68.5	32.7	42.1	10.4	75.0	22.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	31.7	0.1	8.7	0.7	696.4	5.8
Delay (s)	100.2	32.7	50.7	11.1	771.4	28.5
Level of Service	F	C	D	B	F	C
Approach Delay (s)	94.9		36.3			163.9
Approach LOS	F		D			F

Intersection Summary

HCM 2000 Control Delay	101.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	115.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 28: US 29 & Tech Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↔		↖	↑↑↑	↗	↖	↑↑↑	↗
Traffic Volume (vph)	30	640	150	335	240	395	205	1510	580	600	3275	225
Future Volume (vph)	30	640	150	335	240	395	205	1510	580	600	3275	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91		0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	0.91		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)	1770	1863	1583	1610	3074		3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1610	3074		3433	5085	1583	1770	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	696	163	364	261	429	223	1641	630	652	3560	245
RTOR Reduction (vph)	0	0	45	0	165	0	0	0	283	0	0	41
Lane Group Flow (vph)	33	696	118	364	525	0	223	1641	347	652	3560	204
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	3	6	4	4		6	2		1	5	
Permitted Phases			3						2			5
Actuated Green, G (s)	10.0	10.0	26.1	35.0	35.0		16.1	93.0	93.0	21.0	94.9	94.9
Effective Green, g (s)	11.0	11.0	32.1	36.0	36.0		19.1	96.0	96.0	21.0	97.9	97.9
Actuated g/C Ratio	0.06	0.06	0.18	0.20	0.20		0.11	0.53	0.53	0.12	0.54	0.54
Clearance Time (s)	5.0	5.0	7.0	5.0	5.0		7.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	3.0	3.0	4.0	3.0	3.0
Lane Grp Cap (vph)	108	113	282	322	614		364	2712	844	206	2765	860
v/s Ratio Prot	0.02	c0.37	0.04	c0.23	0.17		0.06	0.32		c0.37	c0.70	
v/s Ratio Perm			0.03						0.22			0.13
v/c Ratio	0.31	6.16	0.42	1.13	0.92dr		0.61	0.61	0.41	3.17	1.29	0.24
Uniform Delay, d1	80.8	84.5	65.7	72.0	69.5		76.9	28.9	25.1	79.5	41.0	21.5
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	2.2	2340.5	1.0	90.2	11.6		3.0	1.0	1.5	986.9	132.2	0.7
Delay (s)	83.0	2425.0	66.7	162.2	81.1		80.0	30.0	26.6	1066.4	173.3	22.2
Level of Service	F	F	E	F	F		E	C	C	F	F	C
Approach Delay (s)		1907.4			109.1			33.6			295.6	
Approach LOS		F			F			C			F	

Intersection Summary

HCM 2000 Control Delay	361.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.82		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	135.5%	ICU Level of Service	H
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

31: US 29 & Musgrove Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	50	75	140	195	35	275	1990	65	20	4870	500
Future Volume (vph)	65	50	75	140	195	35	275	1990	65	20	4870	500
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		7.0	7.0		6.0	7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	0.86		1.00	0.86	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1801	1531	1711	1760		3319	6165		1711	6108	
Flt Permitted	0.27	1.00	1.00	0.72	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	492	1801	1531	1304	1760		3319	6165		1711	6108	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	65	50	75	140	195	35	275	1990	65	20	4870	500
RTOR Reduction (vph)	0	0	63	0	4	0	0	2	0	0	8	0
Lane Group Flow (vph)	65	50	12	140	226	0	275	2053	0	20	5362	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		6	2		1	5	
Permitted Phases	4		4	8								
Actuated Green, G (s)	29.0	29.0	29.0	29.0	29.0		20.5	126.7		5.3	110.5	
Effective Green, g (s)	29.0	29.0	29.0	29.0	29.0		20.5	126.7		5.3	110.5	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.11	0.70		0.03	0.61	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		7.0	7.0		6.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)	79	290	246	210	283		377	4339		50	3749	
v/s Ratio Prot		0.03			0.13		c0.08	0.33		0.01	c0.88	
v/s Ratio Perm	c0.13		0.01	0.11								
v/c Ratio	0.82	0.17	0.05	0.67	0.80		0.73	0.47		0.40	1.43	
Uniform Delay, d1	73.0	65.1	63.8	71.0	72.7		77.1	11.8		85.8	34.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.36	0.49	
Incremental Delay, d2	47.3	0.3	0.1	7.8	14.4		6.9	0.4		0.5	193.8	
Delay (s)	120.3	65.4	63.9	78.7	87.1		84.0	12.2		117.3	210.9	
Level of Service	F	E	E	E	F		F	B		F	F	
Approach Delay (s)		83.6			83.9			20.7			210.6	
Approach LOS		F			F			C			F	

Intersection Summary

HCM 2000 Control Delay	148.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	125.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

32: Fairland Rd & US 29

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	625	390	95	140	350	210	55	2010	25	0	5155	0
Future Volume (vph)	625	390	95	140	350	210	55	2010	25	0	5155	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	7.0			7.0	
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.86			0.81	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1557	3208	1531	1557	3271	1531	1711	6183			7293	
Flt Permitted	0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (perm)	1557	3208	1531	1557	3271	1531	1711	6183			7293	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	625	390	95	140	350	210	55	2010	25	0	5155	0
RTOR Reduction (vph)	0	0	84	0	0	115	0	1	0	0	0	0
Lane Group Flow (vph)	331	684	11	126	364	95	55	2034	0	0	5155	0
Turn Type	Split	NA	Prot	Split	NA	Prot	Prot	NA			NA	
Protected Phases	3	3	3	4	4	4	1	6			2	
Permitted Phases												
Actuated Green, G (s)	21.5	21.5	21.5	17.5	17.5	17.5	10.9	117.0			97.6	
Effective Green, g (s)	21.5	21.5	21.5	17.5	17.5	17.5	10.9	117.0			97.6	
Actuated g/C Ratio	0.12	0.12	0.12	0.10	0.10	0.10	0.06	0.65			0.54	
Clearance Time (s)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	0.2			0.2	
Lane Grp Cap (vph)	185	383	182	151	318	148	103	4018			3954	
v/s Ratio Prot	0.21	c0.21	0.01	0.08	c0.11	0.06	0.03	c0.33			c0.71	
v/s Ratio Perm												
v/c Ratio	1.79	1.79	0.06	0.83	1.14	0.64	0.53	0.51			1.30	
Uniform Delay, d1	79.2	79.2	70.3	79.8	81.2	78.3	82.1	16.4			41.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.84	1.87			1.00	
Incremental Delay, d2	376.0	364.0	0.2	32.0	95.6	10.3	8.5	0.4			138.6	
Delay (s)	455.2	443.3	70.5	111.8	176.8	88.5	77.8	31.2			179.8	
Level of Service	F	F	E	F	F	F	E	C			F	
Approach Delay (s)		414.9			138.6			32.4			179.8	
Approach LOS		F			F			C			F	

Intersection Summary

HCM 2000 Control Delay	171.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.32		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	32.5
Intersection Capacity Utilization	108.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

PM

HCM Signalized Intersection Capacity Analysis
 30: US 29 Ramps & Randolph Rd/Cherry Hill Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	185	1060	30	185	1140	845	25	0	100	650	0	70
Future Volume (vph)	185	1060	30	185	1140	845	25	0	100	650	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	9.0		7.0	9.0	9.0	8.5		8.5	8.0		8.0
Lane Util. Factor	0.97	0.95		0.97	0.95	1.00	1.00		0.88	0.97		1.00
Frt	1.00	1.00		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3319	3407		3319	3421	1531	1711		2694	3319		1531
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3319	3407		3319	3421	1531	1711		2694	3319		1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	185	1060	30	185	1140	845	25	0	100	650	0	70
RTOR Reduction (vph)	0	1	0	0	0	370	0	0	84	0	0	57
Lane Group Flow (vph)	185	1089	0	185	1140	475	25	0	16	650	0	13
Turn Type	Prot	NA		Prot	NA	Perm	Prot		pt+ov	Prot		Perm
Protected Phases	1	6		5	2		3		3 5	4		
Permitted Phases						2						4
Actuated Green, G (s)	14.6	65.4		14.6	65.4	65.4	9.9		24.5	27.6		27.6
Effective Green, g (s)	14.6	65.4		14.6	65.4	65.4	9.9		24.5	27.6		27.6
Actuated g/C Ratio	0.10	0.44		0.10	0.44	0.44	0.07		0.16	0.18		0.18
Clearance Time (s)	7.0	9.0		7.0	9.0	9.0	8.5			8.0		8.0
Vehicle Extension (s)	6.0	0.2		6.0	0.2	0.2	6.0			6.0		6.0
Lane Grp Cap (vph)	323	1485		323	1491	667	112		440	610		281
v/s Ratio Prot	c0.06	0.32		0.06	c0.33		c0.01		0.01	c0.20		
v/s Ratio Perm						0.31						0.01
v/c Ratio	0.57	0.73		0.57	0.76	0.71	0.22		0.04	1.07		0.05
Uniform Delay, d1	64.7	35.1		64.7	35.8	34.6	66.4		52.8	61.2		50.4
Progression Factor	0.91	1.26		1.14	0.82	0.74	1.00		1.00	1.00		1.00
Incremental Delay, d2	3.4	2.3		2.8	2.2	3.7	2.8		0.1	55.2		0.2
Delay (s)	62.4	46.4		76.6	31.3	29.3	69.2		52.9	116.4		50.6
Level of Service	E	D		E	C	C	E		D	F		D
Approach Delay (s)		48.7			34.4			56.2			110.0	
Approach LOS		D			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	52.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	32.5
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

42: Old Columbia Pike & Randolph Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	1050	460	50	1035	150	640	450	50	175	400	85
Future Volume (vph)	80	1050	460	50	1035	150	640	450	50	175	400	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	6.5	6.5	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	0.97	0.95	1.00	1.00	1.00	1.00	1.00	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)	1770	3539	1583	3433	3539	1583	1770	1863	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.31	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	568	1863	1583	229	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	1141	500	54	1125	163	696	489	54	190	435	92
RTOR Reduction (vph)	0	0	240	0	0	100	0	0	41	0	0	51
Lane Group Flow (vph)	87	1141	260	54	1125	63	696	489	13	190	435	41
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov
Protected Phases	1	6		5	2		3	8		7	4	1
Permitted Phases			6			2	8		8	4		4
Actuated Green, G (s)	12.6	63.6	63.6	7.4	58.4	58.4	56.3	35.8	35.8	49.7	32.5	45.1
Effective Green, g (s)	12.6	63.6	63.6	7.4	58.4	58.4	56.3	35.8	35.8	49.7	32.5	45.1
Actuated g/C Ratio	0.08	0.42	0.42	0.05	0.39	0.39	0.38	0.24	0.24	0.33	0.22	0.30
Clearance Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	4.0	0.2	0.2	4.0	0.2	0.2	4.0	4.0	4.0	4.0	4.0	4.0
Lane Grp Cap (vph)	148	1500	671	169	1377	616	377	444	377	252	766	544
v/s Ratio Prot	c0.05	c0.32		0.02	c0.32		c0.25	0.26		0.09	0.12	0.01
v/s Ratio Perm			0.16			0.04	c0.44		0.01	0.16		0.02
v/c Ratio	0.59	0.76	0.39	0.32	0.82	0.10	1.85	1.10	0.03	0.75	0.57	0.08
Uniform Delay, d1	66.2	36.7	29.8	68.9	41.0	29.1	41.5	57.1	43.8	40.6	52.5	37.5
Progression Factor	1.00	1.00	1.00	1.58	0.29	0.12	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.9	3.7	1.7	1.1	4.1	0.2	390.9	73.1	0.1	12.8	3.0	0.1
Delay (s)	73.1	40.4	31.5	109.9	16.0	3.9	432.4	130.2	43.9	53.3	55.5	37.6
Level of Service	E	D	C	F	B	A	F	F	D	D	E	D
Approach Delay (s)		39.5			18.3			296.2			52.6	
Approach LOS		D			B			F			D	

Intersection Summary			
HCM 2000 Control Delay	99.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	101.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 43: Serpentine Way & Randolph Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	1545	0	5	1660	95	0	0	5	40	0	15
Future Volume (vph)	25	1545	0	5	1660	95	0	0	5	40	0	15
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	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1711	3421		1711	3393			1531		1711	1531	
Flt Permitted	0.11	1.00		0.15	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	203	3421		266	3393			1531		1359	1531	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	25	1545	0	5	1660	95	0	0	5	40	0	15
RTOR Reduction (vph)	0	0	0	0	2	0	0	5	0	0	14	0
Lane Group Flow (vph)	25	1545	0	5	1753	0	0	0	0	40	1	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			8			4	
Permitted Phases	6			2			8			4		
Actuated Green, G (s)	99.1	99.1		99.1	99.1			7.9		7.9	7.9	
Effective Green, g (s)	99.1	99.1		99.1	99.1			7.9		7.9	7.9	
Actuated g/C Ratio	0.83	0.83		0.83	0.83			0.07		0.07	0.07	
Clearance Time (s)	6.5	6.5		6.5	6.5			6.5		6.5	6.5	
Vehicle Extension (s)	0.2	0.2		0.2	0.2			3.0		3.0	3.0	
Lane Grp Cap (vph)	167	2825		219	2802			100		89	100	
v/s Ratio Prot		0.45			c0.52			0.00			0.00	
v/s Ratio Perm	0.12			0.02						c0.03		
v/c Ratio	0.15	0.55		0.02	0.63			0.00		0.45	0.01	
Uniform Delay, d1	2.1	3.3		1.9	3.8			52.4		54.0	52.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.8		0.2	1.1			0.0		3.6	0.0	
Delay (s)	4.0	4.1		2.0	4.8			52.4		57.5	52.4	
Level of Service	A	A		A	A			D		E	D	
Approach Delay (s)		4.1			4.8			52.4			56.1	
Approach LOS		A			A			D			E	

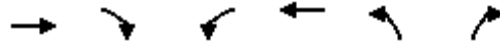
Intersection Summary		
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.61	A
Actuated Cycle Length (s)	120.0	Sum of lost time (s)
Intersection Capacity Utilization	68.6%	13.0
Analysis Period (min)	15	ICU Level of Service
		C

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

44: Prosperity Dr & Cherry Hill Rd

5/23/2016



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Volume (vph)	1645	165	100	1760	410	230
Future Volume (vph)	1645	165	100	1760	410	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	6.5	6.5	6.0	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3421	1531	1711	3421	1711	1531
Flt Permitted	1.00	1.00	0.06	1.00	0.95	1.00
Satd. Flow (perm)	3421	1531	102	3421	1711	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1645	165	100	1760	410	230
RTOR Reduction (vph)	0	47	0	0	0	13
Lane Group Flow (vph)	1645	118	100	1760	410	217
Turn Type	NA	Perm	pm+pt	NA	Prot	pm+ov
Protected Phases	6		5	2	4	5
Permitted Phases		6	2			4
Actuated Green, G (s)	87.1	87.1	105.5	105.5	32.0	43.9
Effective Green, g (s)	87.1	87.1	105.5	105.5	32.0	43.9
Actuated g/C Ratio	0.58	0.58	0.70	0.70	0.21	0.29
Clearance Time (s)	6.5	6.5	6.5	6.5	6.0	6.5
Vehicle Extension (s)	0.2	0.2	5.0	0.2	5.0	5.0
Lane Grp Cap (vph)	1986	889	199	2406	365	448
v/s Ratio Prot	c0.48		0.04	c0.51	c0.24	0.04
v/s Ratio Perm		0.08	0.31			0.10
v/c Ratio	0.83	0.13	0.50	0.73	1.12	0.48
Uniform Delay, d1	25.4	14.3	25.0	13.6	59.0	43.7
Progression Factor	1.49	2.01	1.63	0.70	1.00	1.00
Incremental Delay, d2	2.3	0.2	1.8	0.9	84.9	1.7
Delay (s)	40.1	28.9	42.6	10.4	143.9	45.5
Level of Service	D	C	D	B	F	D
Approach Delay (s)	39.1			12.2	108.5	
Approach LOS	D			B	F	

Intersection Summary

HCM 2000 Control Delay	37.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 45: Cherry Hill Rd & Broadbirch Dr/Calverton Blvd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↕		↖	↗	
Traffic Volume (vph)	295	900	230	100	380	310	100	1255	60	205	1220	450
Future Volume (vph)	295	900	230	100	380	310	100	1255	60	205	1220	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	6.5	6.0		6.0	6.0	4.0	6.5	6.5		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1806		1770	1863	1583	1770	3515		1770	3405	
Flt Permitted	0.11	1.00		0.14	1.00	1.00	0.07	1.00		0.06	1.00	
Satd. Flow (perm)	210	1806		257	1863	1583	128	3515		115	3405	
Peak-hour factor, PHF	1.00	1.00	1.00	0.92	1.00	0.92	1.00	0.92	0.92	0.92	0.92	1.00
Adj. Flow (vph)	295	900	230	109	380	337	100	1364	65	223	1326	450
RTOR Reduction (vph)	0	6	0	0	0	0	0	2	0	0	22	0
Lane Group Flow (vph)	295	1124	0	109	380	337	100	1427	0	223	1754	0
Turn Type	pm+pt	NA		Perm	NA	Free	Perm	NA		pm+pt	NA	
Protected Phases	7	4			8			2		1	6	
Permitted Phases	4			8		Free	2			6		
Actuated Green, G (s)	54.0	54.0		29.0	29.0	150.0	58.2	58.2		84.0	84.0	
Effective Green, g (s)	54.0	54.0		29.0	29.0	150.0	58.2	58.2		84.0	84.0	
Actuated g/C Ratio	0.36	0.36		0.19	0.19	1.00	0.39	0.39		0.56	0.56	
Clearance Time (s)	6.5	6.0		6.0	6.0		6.5	6.5		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		0.2	0.2		4.0	0.2	
Lane Grp Cap (vph)	268	650		49	360	1583	49	1363		277	1906	
v/s Ratio Prot	0.14	c0.62			0.20			0.41		0.10	c0.52	
v/s Ratio Perm	0.26			c0.42		0.21	c0.78			0.35		
v/c Ratio	1.10	1.73		2.22	1.06	0.21	2.04	1.05		0.81	0.92	
Uniform Delay, d1	45.9	48.0		60.5	60.5	0.0	45.9	45.9		46.3	30.0	
Progression Factor	1.00	1.00		0.94	0.94	1.00	1.06	1.05		1.46	0.79	
Incremental Delay, d2	84.6	334.3		604.6	59.9	0.3	526.3	36.4		11.9	6.5	
Delay (s)	130.5	382.3		661.6	116.7	0.3	574.9	84.7		79.6	30.2	
Level of Service	F	F		F	F	A	F	F		E	C	
Approach Delay (s)		330.2			141.1			116.7			35.7	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	144.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.93		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	25.0
Intersection Capacity Utilization	141.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 46: Cherry Hill Rd & Plum Orchard Dr/Clover Patch Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	85	585	15	45	10	400	1255	50	30	1375	145
Future Volume (vph)	150	85	585	15	45	10	400	1255	50	30	1375	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5	6.5	4.0	6.5	6.5		6.0	6.5		6.5	6.5	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1711	1801	1531	1711	1752		1711	3402		1711	3421	1531
Flt Permitted	0.72	1.00	1.00	0.70	1.00		0.05	1.00		0.21	1.00	1.00
Satd. Flow (perm)	1299	1801	1531	1264	1752		98	3402		380	3421	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	150	85	585	15	45	10	400	1255	50	30	1375	145
RTOR Reduction (vph)	0	0	0	0	6	0	0	1	0	0	0	51
Lane Group Flow (vph)	150	85	585	15	49	0	400	1304	0	30	1375	94
Turn Type	Perm	NA	Free	Perm	NA		pm+pt	NA		Perm	NA	Perm
Protected Phases		8			4		5	2			6	
Permitted Phases	8		Free	4			2			6		6
Actuated Green, G (s)	22.7	22.7	150.0	22.7	22.7		114.3	114.3		67.4	67.4	67.4
Effective Green, g (s)	22.7	22.7	150.0	22.7	22.7		114.3	114.3		67.4	67.4	67.4
Actuated g/C Ratio	0.15	0.15	1.00	0.15	0.15		0.76	0.76		0.45	0.45	0.45
Clearance Time (s)	6.5	6.5		6.5	6.5		6.0	6.5		6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0		3.0	3.0		5.0	0.2		0.2	0.2	0.2
Lane Grp Cap (vph)	196	272	1531	191	265		514	2592		170	1537	687
v/s Ratio Prot		0.05			0.03		c0.21	0.38			c0.40	
v/s Ratio Perm	c0.12		0.38	0.01			0.38			0.08		0.06
v/c Ratio	0.77	0.31	0.38	0.08	0.19		0.78	0.50		0.18	0.89	0.14
Uniform Delay, d1	61.1	56.7	0.0	54.7	55.6		42.7	6.9		24.7	38.0	24.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.28	0.20		0.63	0.71	0.34
Incremental Delay, d2	16.2	0.7	0.7	0.2	0.3		7.1	0.6		0.2	0.9	0.0
Delay (s)	77.3	57.4	0.7	54.8	55.9		61.9	2.0		15.8	27.9	8.4
Level of Service	E	E	A	D	E		E	A		B	C	A
Approach Delay (s)		20.6			55.7			16.0			25.8	
Approach LOS		C			E			B			C	

Intersection Summary		
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.84	
Actuated Cycle Length (s)	150.0	Sum of lost time (s) 19.0
Intersection Capacity Utilization	91.0%	ICU Level of Service E
Analysis Period (min)	15	

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
47: Cherry Hill Rd & FDA Blvd

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	675	400	350	1030	1520	455
Future Volume (vph)	675	400	350	1030	1520	455
Ideal Flow (vphpl)	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	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3319	1531	1711	3421	3421	1531
Flt Permitted	0.95	1.00	0.05	1.00	1.00	1.00
Satd. Flow (perm)	3319	1531	92	3421	3421	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	675	400	350	1030	1520	455
RTOR Reduction (vph)	0	188	0	0	0	227
Lane Group Flow (vph)	675	212	350	1030	1520	228
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	4		1	6	2	
Permitted Phases		4	6			2
Actuated Green, G (s)	36.1	36.1	101.9	101.9	72.0	72.0
Effective Green, g (s)	36.1	36.1	101.9	101.9	72.0	72.0
Actuated g/C Ratio	0.24	0.24	0.68	0.68	0.48	0.48
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	798	368	320	2323	1642	734
v/s Ratio Prot	c0.20		c0.17	0.30	0.44	
v/s Ratio Perm		0.14	c0.57			0.15
v/c Ratio	0.85	0.58	1.09	0.44	0.93	0.31
Uniform Delay, d1	54.3	50.2	52.8	11.0	36.5	23.8
Progression Factor	1.00	1.00	0.74	0.92	1.31	6.00
Incremental Delay, d2	8.2	2.2	72.1	0.5	7.4	0.7
Delay (s)	62.5	52.4	111.4	10.6	55.2	143.8
Level of Service	E	D	F	B	E	F
Approach Delay (s)	58.7			36.2	75.6	
Approach LOS	E			D	E	

Intersection Summary

HCM 2000 Control Delay	59.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

53: Cherry Hill Rd. & MD 212

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	360	590	30	290	565	385	80	830	35	415	1280	320
Future Volume (vph)	360	590	30	290	565	385	80	830	35	415	1280	320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	6.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	0.99		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)	3433	3513		1770	3539	1583	1770	3539	1583	3433	3539	1583
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 (perm)	3433	3513		1770	3539	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	391	641	33	315	614	418	87	902	38	451	1391	348
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	0	0	0	160
Lane Group Flow (vph)	391	671	0	315	614	418	87	902	38	451	1391	188
Turn Type	Prot	NA		Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases						Free			4			8
Actuated Green, G (s)	22.0	43.0		22.0	43.0	150.0	12.2	43.0	43.0	19.0	49.8	49.8
Effective Green, g (s)	23.0	46.0		23.0	46.0	150.0	13.2	45.0	45.0	20.0	51.8	49.8
Actuated g/C Ratio	0.15	0.31		0.15	0.31	1.00	0.09	0.30	0.30	0.13	0.35	0.33
Clearance Time (s)	5.0	7.0		5.0	7.0		5.0	6.0	6.0	5.0	6.0	6.0
Vehicle Extension (s)	2.5	5.0		2.5	5.0		2.5	3.0	3.0	2.5	3.0	3.0
Lane Grp Cap (vph)	526	1077		271	1085	1583	155	1061	474	457	1222	525
v/s Ratio Prot	0.11	c0.19		c0.18	0.17		0.05	0.25		c0.13	c0.39	
v/s Ratio Perm						0.26			0.02			0.12
v/c Ratio	0.74	0.62		1.16	0.57	0.26	0.56	0.85	0.08	0.99	1.14	0.36
Uniform Delay, d1	60.7	44.6		63.5	43.6	0.0	65.6	49.3	37.7	64.9	49.1	38.0
Progression Factor	1.00	1.00		1.13	0.75	1.00	1.00	1.00	1.00	1.39	0.87	0.92
Incremental Delay, d2	5.3	2.7		103.6	1.9	0.4	3.7	6.7	0.1	29.6	69.0	0.3
Delay (s)	66.0	47.3		175.5	34.7	0.4	69.4	56.0	37.7	119.7	111.9	35.3
Level of Service	E	D		F	C	A	E	E	D	F	F	D
Approach Delay (s)		54.2			57.0			56.4			101.3	
Approach LOS		D			E			E			F	

Intersection Summary		
HCM 2000 Control Delay	73.6	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.96	E
Actuated Cycle Length (s)	150.0	Sum of lost time (s)
Intersection Capacity Utilization	86.5%	16.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		E

HCM Signalized Intersection Capacity Analysis

35: Old Columbia Pike & Fairland Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	275	735	30	45	645	170	85	545	140	140	405	190
Future Volume (vph)	275	735	30	45	645	170	85	545	140	140	405	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.5	6.5		6.5	6.5	4.0	6.5	6.5		4.0	6.5	6.5
Lane Util. Factor	1.00	0.95		1.00	1.00	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	0.97		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)	1770	3518		1770	1863	1583	1770	1806		1770	1863	1583
Flt Permitted	0.12	1.00		0.34	1.00	1.00	0.51	1.00		0.09	1.00	1.00
Satd. Flow (perm)	219	3518		631	1863	1583	945	1806		167	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	799	33	49	701	185	92	592	152	152	440	207
RTOR Reduction (vph)	0	2	0	0	0	69	0	7	0	0	0	111
Lane Group Flow (vph)	299	830	0	49	701	116	92	737	0	152	440	96
Turn Type	pm+pt	NA		Perm	NA	pm+ov	Perm	NA		pm+pt	NA	Perm
Protected Phases	3	8		4	4	1	2	2		1	6	6
Permitted Phases	8			4		4	2			6		6
Actuated Green, G (s)	51.5	51.5		28.6	28.6	39.6	40.5	40.5		55.5	55.5	55.5
Effective Green, g (s)	51.5	51.5		28.6	28.6	39.6	40.5	40.5		55.5	55.5	55.5
Actuated g/C Ratio	0.43	0.43		0.24	0.24	0.33	0.34	0.34		0.46	0.46	0.46
Clearance Time (s)	5.5	6.5		6.5	6.5	4.0	6.5	6.5		4.0	6.5	6.5
Vehicle Extension (s)	3.0	5.0		5.0	5.0	3.0	0.2	0.2		3.0	0.2	0.2
Lane Grp Cap (vph)	318	1509		150	444	522	318	609		224	861	732
v/s Ratio Prot	c0.14	0.24			c0.38	0.02		c0.41		c0.06	0.24	
v/s Ratio Perm	0.27			0.08		0.05	0.10			0.25		0.06
v/c Ratio	0.94	0.55		0.33	1.58	0.22	0.29	1.21		0.68	0.51	0.13
Uniform Delay, d1	34.3	25.6		37.7	45.7	29.1	29.2	39.8		26.4	22.7	18.5
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	35.0	0.7		2.7	271.1	0.2	2.3	109.1		7.9	2.2	0.4
Delay (s)	69.3	26.3		40.4	316.8	29.3	31.5	148.9		34.3	24.9	18.8
Level of Service	E	C		D	F	C	C	F		C	C	B
Approach Delay (s)		37.7			245.4			135.9			25.1	
Approach LOS		D			F			F			C	

Intersection Summary

HCM 2000 Control Delay	109.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	22.5
Intersection Capacity Utilization	112.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

37: Fairland Rd & US 29 Ramp

5/23/2016

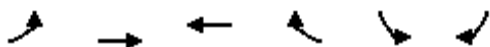


Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations		↑↑↑	↑↑		↘	↗	
Traffic Volume (veh/h)	0	1015	385	0	165	475	
Future Volume (Veh/h)	0	1015	385	0	165	475	
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Hourly flow rate (vph)	0	1015	385	0	165	475	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type		None	None				
Median storage (veh)							
Upstream signal (ft)		584	547				
pX, platoon unblocked	0.93				0.96	0.93	
vC, conflicting volume	385				723	192	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	197				222	0	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)							
tF (s)	2.2				3.5	3.3	
p0 queue free %	100				77	53	
cM capacity (veh/h)	1281				720	1012	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	338	338	338	192	192	165	475
Volume Left	0	0	0	0	0	165	0
Volume Right	0	0	0	0	0	0	475
cSH	1700	1700	1700	1700	1700	720	1012
Volume to Capacity	0.20	0.20	0.20	0.11	0.11	0.23	0.47
Queue Length 95th (ft)	0	0	0	0	0	22	64
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	11.5	11.7
Lane LOS						B	B
Approach Delay (s)	0.0			0.0		11.6	
Approach LOS						B	
Intersection Summary							
Average Delay	3.6						
Intersection Capacity Utilization	46.7%			ICU Level of Service		A	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis

48: Calverton Blvd & Galway Dr

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	150	805	665	135	80	90
Future Volume (vph)	150	805	665	135	80	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0		5.5	5.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.98		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1711	1801	1760		1711	1531
Flt Permitted	0.30	1.00	1.00		0.95	1.00
Satd. Flow (perm)	545	1801	1760		1711	1531
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	150	805	665	135	80	90
RTOR Reduction (vph)	0	0	7	0	0	81
Lane Group Flow (vph)	150	805	793	0	80	9
Turn Type	Perm	NA	NA		Prot	Prot
Protected Phases		6	2		4	4
Permitted Phases	6		2			4
Actuated Green, G (s)	55.8	55.8	55.8		7.7	7.7
Effective Green, g (s)	55.8	55.8	55.8		7.7	7.7
Actuated g/C Ratio	0.74	0.74	0.74		0.10	0.10
Clearance Time (s)	6.0	6.0	6.0		5.5	5.5
Vehicle Extension (s)	5.0	5.0	5.0		3.0	3.0
Lane Grp Cap (vph)	405	1339	1309		175	157
v/s Ratio Prot		0.45	c0.45		c0.05	0.01
v/s Ratio Perm	0.28					
v/c Ratio	0.37	0.60	0.61		0.46	0.06
Uniform Delay, d1	3.4	4.4	4.5		31.7	30.4
Progression Factor	2.08	3.06	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.2	2.1		1.9	0.2
Delay (s)	7.3	13.8	6.6		33.6	30.5
Level of Service	A	B	A		C	C
Approach Delay (s)		12.8	6.6		32.0	
Approach LOS		B	A		C	

Intersection Summary

HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	75.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

9: Lockwood Shopping Ctr & Lockwood Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	580	450	40	0	425	75	25	45	20	0	0	700
Future Volume (vph)	580	450	40	0	425	75	25	45	20	0	0	700
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	1.00	1.00			0.95			1.00				0.88
Frt	1.00	0.99			0.98			0.97				0.85
Flt Protected	0.95	1.00			1.00			0.99				1.00
Satd. Flow (prot)	1711	1779			3344			1723				2694
Flt Permitted	0.44	1.00			1.00			0.99				1.00
Satd. Flow (perm)	798	1779			3344			1723				2694
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	580	450	40	0	425	75	25	45	20	0	0	700
RTOR Reduction (vph)	0	3	0	0	15	0	0	13	0	0	0	345
Lane Group Flow (vph)	580	487	0	0	485	0	0	77	0	0	0	355
Turn Type	pm+pt	NA			NA		Perm	NA				pm+ov
Protected Phases	1	2			2			4				1
Permitted Phases	2			2			4					4
Actuated Green, G (s)	63.7	41.8			41.8			8.3				30.2
Effective Green, g (s)	63.7	41.8			41.8			8.3				30.2
Actuated g/C Ratio	0.71	0.46			0.46			0.09				0.34
Clearance Time (s)	6.0	6.0			6.0			6.0				6.0
Vehicle Extension (s)	4.0	1.0			1.0			3.0				4.0
Lane Grp Cap (vph)	786	826			1553			158				1083
v/s Ratio Prot	c0.18	0.27			0.15							0.08
v/s Ratio Perm	c0.34							0.04				0.05
v/c Ratio	0.74	0.59			0.31			0.49				0.33
Uniform Delay, d1	5.9	17.8			15.1			38.8				22.3
Progression Factor	1.84	1.13			1.00			1.00				1.00
Incremental Delay, d2	3.1	2.4			0.5			2.4				0.2
Delay (s)	14.0	22.6			15.6			41.2				22.6
Level of Service	B	C			B			D				C
Approach Delay (s)		17.9			15.6			41.2			22.6	
Approach LOS		B			B			D			C	

Intersection Summary

HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

141: East J Turn & MD 193 Westbound

5/23/2016



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↗↘	
Traffic Volume (vph)	0	0	0	1689	89	0
Future Volume (vph)	0	0	0	1689	89	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)				1.0	6.5	
Lane Util. Factor				0.86	0.97	
Flt				1.00	1.00	
Flt Protected				1.00	0.95	
Satd. Flow (prot)				6408	3433	
Flt Permitted				1.00	0.95	
Satd. Flow (perm)				6408	3433	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1836	97	0
RTOR Reduction (vph)	0	0	0	0	77	0
Lane Group Flow (vph)	0	0	0	1836	20	0
Turn Type				NA	Prot	
Protected Phases				Free!	1!	
Permitted Phases						
Actuated Green, G (s)				180.0	35.5	
Effective Green, g (s)				180.0	36.5	
Actuated g/C Ratio				1.00	0.20	
Clearance Time (s)					7.5	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)				6408	696	
v/s Ratio Prot				0.29	0.01	
v/s Ratio Perm						
v/c Ratio				0.29	0.03	
Uniform Delay, d1				0.0	57.5	
Progression Factor				1.00	1.00	
Incremental Delay, d2				0.1	0.0	
Delay (s)				0.1	57.6	
Level of Service				A	E	
Approach Delay (s)	0.0			0.1	57.6	
Approach LOS	A			A	E	

Intersection Summary

HCM 2000 Control Delay	3.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

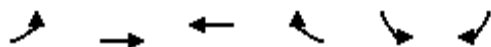
! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

52: Riggs Rd/Powder Mill Rd

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	150	930	640	0	385	65
Future Volume (vph)	150	930	640	0	385	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	5.0	7.0	7.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1863		1770	1583
Flt Permitted	0.24	1.00	1.00		0.95	1.00
Satd. Flow (perm)	448	1863	1863		1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	1011	696	0	418	71
RTOR Reduction (vph)	0	0	0	0	0	44
Lane Group Flow (vph)	163	1011	696	0	418	27
Turn Type	pm+pt	NA	NA		Prot	Prot
Protected Phases	1	6	2		4	4
Permitted Phases	6					
Actuated Green, G (s)	105.0	105.0	89.8		35.0	35.0
Effective Green, g (s)	105.0	105.0	89.8		35.0	35.0
Actuated g/C Ratio	0.69	0.69	0.59		0.23	0.23
Clearance Time (s)	5.0	7.0	7.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0		7.0	7.0
Lane Grp Cap (vph)	395	1278	1093		404	362
v/s Ratio Prot	0.03	c0.54	0.37		c0.24	0.02
v/s Ratio Perm	0.26					
v/c Ratio	0.41	0.79	0.64		1.03	0.07
Uniform Delay, d1	14.3	16.5	20.8		59.0	46.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.7	5.1	2.8		54.0	0.3
Delay (s)	15.0	21.5	23.7		113.0	46.6
Level of Service	B	C	C		F	D
Approach Delay (s)		20.6	23.7		103.4	
Approach LOS		C	C		F	

Intersection Summary

HCM 2000 Control Delay	38.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	153.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

54: Beltsville Dr. & MD 212

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	295	1005	30	30	995	645	20	30	75	1160	10	230
Future Volume (vph)	295	1005	30	30	995	645	20	30	75	1160	10	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	2.0	4.0	4.0	4.0	4.0	4.0	2.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.91	0.91	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	0.95	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	3221	1616	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	1863	1583	3221	1616	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	1092	33	33	1082	701	22	33	82	1261	11	250
RTOR Reduction (vph)	0	0	18	0	0	0	0	0	76	0	0	0
Lane Group Flow (vph)	321	1092	15	33	1082	701	22	33	6	845	427	250
Turn Type	Prot	NA	Perm	Prot	NA	Free	Split	NA	Perm	Split	NA	Free
Protected Phases	1	6		5	2		3	3		4	4	
Permitted Phases			6			Free			3			Free
Actuated Green, G (s)	30.0	66.2	66.2	7.2	43.4	150.0	8.4	8.4	8.4	45.2	45.2	150.0
Effective Green, g (s)	31.0	68.2	68.2	8.2	45.4	150.0	10.4	10.4	10.4	47.2	47.2	150.0
Actuated g/C Ratio	0.21	0.45	0.45	0.05	0.30	1.00	0.07	0.07	0.07	0.31	0.31	1.00
Clearance Time (s)	5.0	6.0	6.0	5.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	365	1609	719	96	1071	1583	122	129	109	1013	508	1583
v/s Ratio Prot	c0.18	0.31		0.02	c0.31		0.01	0.02		0.26	c0.26	
v/s Ratio Perm			0.01			c0.44			0.00			0.16
v/c Ratio	0.88	0.68	0.02	0.34	1.01	0.44	0.18	0.26	0.05	0.83	0.84	0.16
Uniform Delay, d1	57.7	32.3	22.5	68.3	52.3	0.0	65.8	66.1	65.2	47.8	47.9	0.0
Progression Factor	0.95	0.71	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.2	2.3	0.1	2.1	30.0	0.9	0.7	1.1	0.2	6.0	11.9	0.2
Delay (s)	75.3	25.3	22.6	70.5	82.3	0.9	66.5	67.2	65.4	53.8	59.8	0.2
Level of Service	E	C	C	E	F	A	E	E	E	D	E	A
Approach Delay (s)		36.3			50.7			66.0			46.7	
Approach LOS		D			D			E			D	

Intersection Summary

HCM 2000 Control Delay	45.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

1: MD 650 & Dilston Rd/Adelphi Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖↗		↖↗↘		↖↗	↖↗↘	
Traffic Volume (vph)	75	55	30	65	80	1005	0	2015	20	660	1955	115
Future Volume (vph)	75	55	30	65	80	1005	0	2015	20	660	1955	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		2.0		4.0	2.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	0.88		0.91		0.97	0.91	
Frt	1.00	0.95		1.00	1.00	0.85		1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1711	1705		1711	1801	2694		5167		3319	4875	
Flt Permitted	0.62	1.00		0.60	1.00	1.00		1.00		0.95	1.00	
Satd. Flow (perm)	1116	1705		1080	1801	2694		5167		3319	4875	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	58	32	68	84	1058	0	2121	21	695	2058	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	3	0
Lane Group Flow (vph)	79	90	0	68	84	1058	0	2141	0	695	2176	0
Turn Type	Perm	NA		Perm	NA	pm+ov		NA		Prot	NA	
Protected Phases		4			8	5		6		5	2	
Permitted Phases	4			8		8						
Actuated Green, G (s)	17.1	17.1		17.1	17.1	62.7		68.3		45.6	119.9	
Effective Green, g (s)	20.1	20.1		20.1	20.1	66.7		72.3		47.6	123.9	
Actuated g/C Ratio	0.13	0.13		0.13	0.13	0.44		0.48		0.32	0.83	
Clearance Time (s)	7.0	7.0		7.0	7.0	6.0		6.0		6.0	6.0	
Vehicle Extension (s)	5.0	5.0		5.0	5.0	5.0		0.2		5.0	0.2	
Lane Grp Cap (vph)	149	228		144	241	1197		2490		1053	4026	
v/s Ratio Prot		0.05			0.05	c0.28		c0.41		0.21	0.45	
v/s Ratio Perm	0.07			0.06		0.11						
v/c Ratio	0.53	0.39		0.47	0.35	0.88		0.86		0.66	0.54	
Uniform Delay, d1	60.5	59.4		60.0	59.0	38.1		34.4		44.2	4.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00		0.84	2.07	
Incremental Delay, d2	6.5	2.3		5.0	1.8	8.6		4.2		1.2	0.3	
Delay (s)	67.0	61.7		65.1	60.8	46.7		38.5		38.2	8.8	
Level of Service	E	E		E	E	D		D		D	A	
Approach Delay (s)		64.2			48.7			38.5			15.9	
Approach LOS		E			D			D			B	

Intersection Summary

HCM 2000 Control Delay	31.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	86.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: MD 650 & Oakview Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↖	↗	↖	↑↑↑		↖	↑↑↑	
Traffic Volume (vph)	135	5	30	60	0	340	40	3035	20	200	2640	160
Future Volume (vph)	135	5	30	60	0	340	40	3035	20	200	2640	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.5	4.5	2.5		4.5	2.5	
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	*0.90		1.00	0.91	
Frt	1.00	0.87			1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1568			1711	1531	1711	4857		1711	4874	
Flt Permitted	0.71	1.00			0.73	1.00	0.04	1.00		0.04	1.00	
Satd. Flow (perm)	1273	1568			1321	1531	80	4857		76	4874	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	138	5	31	61	0	347	41	3097	20	204	2694	163
RTOR Reduction (vph)	0	26	0	0	0	0	0	0	0	0	3	0
Lane Group Flow (vph)	138	10	0	0	61	347	41	3117	0	204	2854	0
Turn Type	Perm	NA		Perm	NA	pm+ov	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8	5	1	6		5	2	
Permitted Phases	4			8		8	6			2	2	
Actuated Green, G (s)	22.4	22.4			22.4	41.9	94.1	87.1		114.1	99.6	
Effective Green, g (s)	25.4	25.4			25.4	47.9	100.1	91.1		117.1	103.6	
Actuated g/C Ratio	0.17	0.17			0.17	0.32	0.67	0.61		0.78	0.69	
Clearance Time (s)	7.0	7.0			7.0	7.5	7.5	6.5		7.5	6.5	
Vehicle Extension (s)	5.0	5.0			5.0	5.0	5.0	0.2		5.0	0.2	
Lane Grp Cap (vph)	215	265			223	488	162	2949		304	3366	
v/s Ratio Prot		0.01				c0.11	0.02	c0.64		0.10	c0.59	
v/s Ratio Perm	0.11				0.05	0.12	0.15			0.42		
v/c Ratio	0.64	0.04			0.27	0.71	0.25	1.06		0.67	0.85	
Uniform Delay, d1	58.1	52.1			54.3	45.0	19.1	29.5		49.8	17.3	
Progression Factor	1.00	1.00			1.00	1.00	0.98	0.80		1.00	1.00	
Incremental Delay, d2	8.7	0.1			1.4	6.0	0.9	30.5		7.4	2.9	
Delay (s)	66.7	52.2			55.7	50.9	19.5	54.0		57.2	20.2	
Level of Service	E	D			E	D	B	D		E	C	
Approach Delay (s)		63.7			51.6			53.6			22.6	
Approach LOS		E			D			D			C	

Intersection Summary

HCM 2000 Control Delay	39.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	98.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

3: MD 650 & Elton Rd

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙↘		↑↑↑	↗	↘	↑↑↑
Traffic Volume (vph)	215	45	2405	345	15	1960
Future Volume (vph)	215	45	2405	345	15	1960
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0		2.5	2.0	2.5	2.5
Lane Util. Factor	0.97		0.91	1.00	1.00	0.91
Frt	0.97		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3267		4916	1531	1711	4916
Flt Permitted	0.96		1.00	1.00	0.04	1.00
Satd. Flow (perm)	3267		4916	1531	73	4916
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	229	48	2559	367	16	2085
RTOR Reduction (vph)	8	0	0	0	0	0
Lane Group Flow (vph)	269	0	2559	367	16	2085
Turn Type	Prot		NA	pm+ov	Perm	NA
Protected Phases	3		2 4 9	3		6 4 9
Permitted Phases	3			2 4 9	6 4 9	
Actuated Green, G (s)	22.0		145.5	167.5	145.5	145.5
Effective Green, g (s)	25.0		149.5	170.5	149.5	149.5
Actuated g/C Ratio	0.14		0.83	0.95	0.83	0.83
Clearance Time (s)	6.0			6.0		
Vehicle Extension (s)	4.0			4.0		
Lane Grp Cap (vph)	453		4083	1467	60	4083
v/s Ratio Prot	c0.08		c0.52	0.04		0.42
v/s Ratio Perm				0.20	0.22	
v/c Ratio	0.59		0.63	0.25	0.27	0.51
Uniform Delay, d1	72.7		5.4	0.3	3.3	4.5
Progression Factor	1.00		0.97	1.00	0.89	0.72
Incremental Delay, d2	2.4		0.3	0.1	1.6	0.1
Delay (s)	75.2		5.5	0.4	4.5	3.3
Level of Service	E		A	A	A	A
Approach Delay (s)	75.2		4.9			3.3
Approach LOS	E		A			A

Intersection Summary

HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

4: MD 650 & Powder Mill Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	75	75	485	50	300	50	2160	250	245	2440	10
Future Volume (vph)	125	75	75	485	50	300	50	2160	250	245	2440	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1800	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	5.0	5.0	5.0	3.0	4.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	1.00	1.00	0.91		1.00	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1801	1531	3113	1582	1531	1711	4585		1711	4913	
Flt Permitted	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1711	1801	1531	3113	1582	1531	1711	4585		1711	4913	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	129	77	77	500	52	309	52	2227	258	253	2515	10
RTOR Reduction (vph)	0	0	0	0	0	235	0	7	0	0	0	0
Lane Group Flow (vph)	129	77	77	365	187	74	52	2478	0	253	2525	0
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	3	3		4	4		1	5		6	2	
Permitted Phases			3			4						
Actuated Green, G (s)	18.9	18.9	18.9	26.8	26.8	26.8	9.6	85.5		21.3	98.2	
Effective Green, g (s)	20.9	20.9	20.9	28.8	28.8	28.8	12.6	88.5		23.3	100.2	
Actuated g/C Ratio	0.12	0.12	0.12	0.16	0.16	0.16	0.07	0.49		0.13	0.56	
Clearance Time (s)	6.5	6.5	6.5	7.0	7.0	7.0	6.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)	198	209	177	498	253	244	119	2254		221	2734	
v/s Ratio Prot	c0.08	0.04		0.12	c0.12		0.03	c0.54		c0.15	0.51	
v/s Ratio Perm			0.05			0.05						
v/c Ratio	0.65	0.37	0.44	0.73	0.74	0.30	0.44	1.10		1.14	0.92	
Uniform Delay, d1	76.1	73.5	74.1	71.9	72.0	66.7	80.3	45.8		78.3	36.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	0.57		1.16	1.32	
Incremental Delay, d2	7.5	1.1	1.7	5.5	10.7	0.7	2.1	51.1		97.7	5.2	
Delay (s)	83.5	74.6	75.8	77.5	82.8	67.4	92.5	77.4		188.3	53.2	
Level of Service	F	E	E	E	F	E	F	E		F	D	
Approach Delay (s)		79.0			75.0			77.7			65.5	
Approach LOS		E			E			E			E	

Intersection Summary

HCM 2000 Control Delay	72.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	91.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

5: MD 650 & Chalmers Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕↕↕		↗	↕↕↕	
Traffic Volume (vph)	30	0	30	0	0	5	45	2455	0	0	2665	5
Future Volume (vph)	30	0	30	0	0	5	45	2455	0	0	2665	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	2000	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0		3.0	3.0			3.0	
Lane Util. Factor		1.00			1.00		1.00	0.91			0.91	
Frt		0.93			0.86		1.00	1.00			1.00	
Flt Protected		0.98			1.00		0.95	1.00			1.00	
Satd. Flow (prot)		1638			1558		1711	5175			4914	
Flt Permitted		0.84			1.00		0.03	1.00			1.00	
Satd. Flow (perm)		1410			1558		58	5175			4914	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	0	32	0	0	5	47	2584	0	0	2805	5
RTOR Reduction (vph)	0	17	0	0	5	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	47	0	0	0	0	47	2584	0	0	2810	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)		12.2			12.2		154.8	154.8			154.8	
Effective Green, g (s)		12.2			12.2		157.8	157.8			157.8	
Actuated g/C Ratio		0.07			0.07		0.88	0.88			0.88	
Clearance Time (s)		7.0			7.0		6.0	6.0			6.0	
Vehicle Extension (s)		4.0			4.0		0.2	0.2			0.2	
Lane Grp Cap (vph)		95			105		50	4536			4307	
v/s Ratio Prot					0.00			0.50			0.57	
v/s Ratio Perm		c0.03					c0.81					
v/c Ratio		0.50			0.00		0.94	0.57			0.65	
Uniform Delay, d1		80.9			78.2		7.8	2.7			3.2	
Progression Factor		1.00			1.00		4.31	5.25			1.69	
Incremental Delay, d2		5.5			0.0		46.5	0.1			0.6	
Delay (s)		86.4			78.2		80.0	14.5			6.0	
Level of Service		F			E		F	B			A	
Approach Delay (s)		86.4			78.2			15.6			6.0	
Approach LOS		F			E			B			A	























Intersection Summary

HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: MD 650 & Schindler Dr/Mahan Rd

5/23/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	50	5	10	510	0	335	5	2445	40	30	2150	70	
Future Volume (vph)	50	5	10	510	0	335	5	2445	40	30	2150	70	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		8.0		4.0	8.0	4.0	9.0	2.5	4.5	6.0	2.5		
Lane Util. Factor		1.00		0.91	0.91	1.00	1.00	0.86	1.00	0.97	0.91		
Frt		0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		0.96		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1698		3113	1557	1531	1711	6194	1531	3319	4893		
Flt Permitted		0.96		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (perm)		1698		3113	1557	1531	1711	6194	1531	3319	4893		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	
Adj. Flow (vph)	52	5	10	526	0	345	5	2521	41	31	2216	72	
RTOR Reduction (vph)	0	0	0	0	0	224	0	0	18	0	1	0	
Lane Group Flow (vph)	0	67	0	352	174	121	5	2521	23	31	2287	0	
Turn Type	Split	NA		Split	NA	Perm	Prot	NA	Perm	Prot	NA		
Protected Phases	3	3		4	4		1	6		5	2		
Permitted Phases						4			6				
Actuated Green, G (s)		12.4		29.6	29.6	29.6	3.0	100.5	100.5	6.0	103.5		
Effective Green, g (s)		12.4		33.6	29.6	33.6	3.0	104.5	102.5	9.0	107.5		
Actuated g/C Ratio		0.07		0.19	0.16	0.19	0.02	0.58	0.57	0.05	0.60		
Clearance Time (s)		8.0		8.0	8.0	8.0	9.0	6.5	6.5	9.0	6.5		
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	0.2	0.2	3.0	0.2		
Lane Grp Cap (vph)		116		581	256	285	28	3595	871	165	2922		
v/s Ratio Prot		c0.04		c0.11	0.11		0.00	c0.41		0.01	c0.47		
v/s Ratio Perm						0.08			0.02				
v/c Ratio		0.58		0.61	0.68	0.42	0.18	0.70	0.03	0.19	0.78		
Uniform Delay, d1		81.3		67.1	70.7	64.6	87.3	26.7	16.9	82.0	27.4		
Progression Factor		1.00		1.00	1.00	1.00	0.98	0.55	1.00	0.88	1.47		
Incremental Delay, d2		6.8		1.8	7.0	1.0	2.5	1.0	0.0	0.4	1.7		
Delay (s)		88.1		68.9	77.7	65.7	88.4	15.7	17.0	72.5	42.1		
Level of Service		F		E	E	E	F	B	B	E	D		
Approach Delay (s)		88.1			69.4			15.9			42.5		
Approach LOS		F			E			B			D		
Intersection Summary													
HCM 2000 Control Delay			35.3		HCM 2000 Level of Service					D			
HCM 2000 Volume to Capacity ratio			0.79										
Actuated Cycle Length (s)			180.0		Sum of lost time (s)					27.5			
Intersection Capacity Utilization			73.7%		ICU Level of Service					D			
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

7: MD 650 & Northwest Dr/Michelson Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↗ ↘	↗		↗	↑↑↑		↗ ↘	↑↑↑	
Traffic Volume (vph)	5	0	20	170	20	465	10	2820	0	10	2060	25
Future Volume (vph)	5	0	20	170	20	465	10	2820	0	10	2060	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		8.0		8.0	8.0		9.0	7.0		9.0	7.0	
Lane Util. Factor		1.00		0.97	1.00		1.00	0.86		0.97	0.91	
Frt		0.89		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1590		3319	1541		1711	6194		3319	4907	
Flt Permitted		0.46		0.74	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		743		2588	1541		1711	6194		3319	4907	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	5	0	20	173	20	474	10	2878	0	10	2102	26
RTOR Reduction (vph)	0	20	0	0	106	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	5	0	173	388	0	10	2878	0	10	2127	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8								
Actuated Green, G (s)		34.0		34.0	34.0		3.9	118.6		3.4	118.1	
Effective Green, g (s)		34.0		34.0	34.0		3.9	118.6		3.4	118.1	
Actuated g/C Ratio		0.19		0.19	0.19		0.02	0.66		0.02	0.66	
Clearance Time (s)		8.0		8.0	8.0		9.0	7.0		9.0	7.0	
Vehicle Extension (s)		5.0		5.0	5.0		5.0	0.2		5.0	0.2	
Lane Grp Cap (vph)		140		488	291		37	4081		62	3219	
v/s Ratio Prot					c0.25		c0.01	c0.46		0.00	0.43	
v/s Ratio Perm		0.01		0.07								
v/c Ratio		0.03		0.35	1.33		0.27	0.71		0.16	0.66	
Uniform Delay, d1		59.6		63.5	73.0		86.6	19.6		86.9	18.8	
Progression Factor		1.00		1.00	1.00		1.26	0.15		1.19	0.31	
Incremental Delay, d2		0.2		0.9	171.3		5.9	0.8		1.4	0.6	
Delay (s)		59.8		64.4	244.3		115.1	3.6		105.1	6.5	
Level of Service		E		E	F		F	A		F	A	
Approach Delay (s)		59.8			197.6			4.0			7.0	
Approach LOS		E			F			A			A	

Intersection Summary

HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: MD 650 & Lockwood Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	245	430	210	725	275	150	305	2570	505	135	1360	190
Future Volume (vph)	245	430	210	725	275	150	305	2570	505	135	1360	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.5	3.5	3.5	3.5	3.5	3.5	6.0	3.5	3.5	6.0	3.5	5.5
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.86	1.00	1.00	0.91	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	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1557	3268	1531	3113	1622	1531	1711	6194	1531	1711	4916	1531
Flt Permitted	0.95	1.00	1.00	0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1557	3268	1531	3113	1622	1531	1711	6194	1531	1711	4916	1531
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	255	448	219	755	286	156	318	2677	526	141	1417	198
RTOR Reduction (vph)	0	0	129	0	0	96	0	0	46	0	0	66
Lane Group Flow (vph)	227	476	90	679	362	60	318	2677	480	141	1417	132
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	3	3		4	4		1	6	4	5	2	3
Permitted Phases			3			4			6			2
Actuated Green, G (s)	32.8	32.8	32.8	40.2	40.2	40.2	16.0	59.9	100.1	15.6	59.5	92.3
Effective Green, g (s)	36.8	36.8	36.8	44.2	44.2	44.2	19.0	63.9	108.1	18.6	63.5	96.3
Actuated g/C Ratio	0.20	0.20	0.20	0.25	0.25	0.25	0.11	0.35	0.60	0.10	0.35	0.53
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	9.0	7.5	7.5	9.0	7.5	7.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	0.2	3.0	3.0	0.2	3.0
Lane Grp Cap (vph)	318	668	313	764	398	375	180	2198	919	176	1734	865
v/s Ratio Prot	c0.15	0.15		0.22	c0.22		c0.19	c0.43	0.13	0.08	0.29	0.03
v/s Ratio Perm			0.06			0.04			0.19			0.06
v/c Ratio	0.71	0.71	0.29	0.89	0.91	0.16	1.77	1.22	0.52	0.80	0.82	0.15
Uniform Delay, d1	66.7	66.7	60.5	65.5	66.0	53.3	80.5	58.0	20.9	78.9	53.0	21.2
Progression Factor	1.00	1.00	1.00	1.02	1.02	1.18	1.21	0.94	1.25	1.01	0.98	0.76
Incremental Delay, d2	7.4	3.6	0.5	11.5	22.7	0.2	360.0	101.1	0.4	22.0	4.3	0.1
Delay (s)	74.1	70.3	61.0	78.4	90.2	63.2	457.7	155.7	26.6	101.6	56.2	16.1
Level of Service	E	E	E	E	F	E	F	F	C	F	E	B
Approach Delay (s)		69.0			80.0			163.7			55.3	
Approach LOS		E			E			F			E	

Intersection Summary

HCM 2000 Control Delay	112.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

10: MD 650

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations			↖↖	↑↑↑	↑↑	
Traffic Volume (vph)	0	0	160	2225	970	0
Future Volume (vph)	0	0	160	2225	970	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	11	11	12	12	11	11
Total Lost time (s)			5.5	4.0	8.0	
Lane Util. Factor			0.97	0.91	0.95	
Frt			1.00	1.00	1.00	
Flt Protected			0.95	1.00	1.00	
Satd. Flow (prot)			3433	5085	3421	
Flt Permitted			0.95	1.00	1.00	
Satd. Flow (perm)			3433	5085	3421	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	167	2318	1010	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	167	2318	1010	0
Turn Type			Prot	NA	NA	
Protected Phases			1	Free	2	
Permitted Phases					2	
Actuated Green, G (s)			16.0	180.0	150.5	
Effective Green, g (s)			16.0	180.0	150.5	
Actuated g/C Ratio			0.09	1.00	0.84	
Clearance Time (s)			5.5		8.0	
Vehicle Extension (s)			5.0		0.2	
Lane Grp Cap (vph)			305	5085	2860	
v/s Ratio Prot			0.05	0.46	0.30	
v/s Ratio Perm						
v/c Ratio			0.55	0.46	0.35	
Uniform Delay, d1			78.5	0.0	3.4	
Progression Factor			0.77	1.00	1.00	
Incremental Delay, d2			0.3	0.0	0.3	
Delay (s)			60.6	0.0	3.8	
Level of Service			E	A	A	
Approach Delay (s)	0.0			4.1	3.8	
Approach LOS	A			A	A	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	63.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection has too many lanes per leg.

HCM All-Way analysis is limited to two lanes per leg.

Channelized right turn lanes are not counted.

HCM Signalized Intersection Capacity Analysis

12: MD 650 & Quaint Acres Dr/Heartfields Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕↕↕		↕	↕↕↕	
Traffic Volume (vph)	5	0	10	25	0	20	15	2675	40	30	1535	10
Future Volume (vph)	5	0	10	25	0	20	15	2675	40	30	1535	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	11	11	11	12	12	12	11	11	11
Total Lost time (s)		6.5			6.5	6.5	6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.91		1.00	0.91	
Frt		0.91			1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1608			1711	1531	1770	5074		1711	4911	
Flt Permitted		0.89			0.75	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1446			1345	1531	1770	5074		1711	4911	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	0	11	27	0	22	16	2876	43	32	1651	11
RTOR Reduction (vph)	0	15	0	0	0	21	0	0	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	27	1	16	2919	0	32	1662	0
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8		8						
Actuated Green, G (s)		6.8			6.8	6.8	3.9	88.2		6.5	90.8	
Effective Green, g (s)		6.8			6.8	6.8	3.9	88.2		6.5	90.8	
Actuated g/C Ratio		0.06			0.06	0.06	0.03	0.74		0.05	0.76	
Clearance Time (s)		6.5			6.5	6.5	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0			5.0	5.0	5.0	0.2		5.0	0.2	
Lane Grp Cap (vph)		81			76	86	57	3729		92	3715	
v/s Ratio Prot							0.01	c0.58		c0.02	c0.34	
v/s Ratio Perm		0.00			c0.02	0.00						
v/c Ratio		0.01			0.36	0.01	0.28	0.78		0.35	0.45	
Uniform Delay, d1		53.4			54.5	53.4	56.7	9.9		54.7	5.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		0.96	0.90	
Incremental Delay, d2		0.1			5.9	0.1	5.6	1.7		4.5	0.4	
Delay (s)		53.5			60.4	53.6	62.3	11.6		57.2	5.2	
Level of Service		D			E	D	E	B		E	A	
Approach Delay (s)		53.5			57.3			11.9			6.2	
Approach LOS		D			E			B			A	

Intersection Summary

HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

13: MD 650 & Jackson Rd

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↕↕↕		↶	↕↕↕
Traffic Volume (vph)	65	75	2680	105	95	1530
Future Volume (vph)	65	75	2680	105	95	1530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.5	7.5	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	0.91		1.00	0.91
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1711	1531	4888		1711	4916
Flt Permitted	0.95	1.00	1.00		0.05	1.00
Satd. Flow (perm)	1711	1531	4888		83	4916
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	65	75	2680	105	95	1530
RTOR Reduction (vph)	0	68	2	0	0	0
Lane Group Flow (vph)	65	7	2783	0	95	1530
Turn Type	Perm	Perm	NA		pm+pt	NA
Protected Phases			6		5	2
Permitted Phases	4	4			2	
Actuated Green, G (s)	10.9	10.9	80.9		95.6	95.6
Effective Green, g (s)	10.9	10.9	80.9		95.6	95.6
Actuated g/C Ratio	0.09	0.09	0.67		0.80	0.80
Clearance Time (s)	7.5	7.5	6.0		6.0	6.0
Vehicle Extension (s)	4.0	4.0	0.2		4.0	0.2
Lane Grp Cap (vph)	155	139	3295		184	3916
v/s Ratio Prot			c0.57		0.04	c0.31
v/s Ratio Perm	c0.04	0.00			0.37	
v/c Ratio	0.42	0.05	0.84		0.52	0.39
Uniform Delay, d1	51.6	49.8	14.8		25.2	3.6
Progression Factor	1.00	1.00	1.22		1.00	1.00
Incremental Delay, d2	2.5	0.2	2.0		3.2	0.3
Delay (s)	54.1	50.0	20.0		28.4	3.9
Level of Service	D	D	B		C	A
Approach Delay (s)	51.9		20.0			5.3
Approach LOS	D		B			A













Intersection Summary

HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
66: MD 650 & Ramp 2

5/23/2016

												
Movement	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑↑↑			↑↑↑				↑			↑↑
Traffic Volume (vph)	0	1814	0	0	1749	0	0	0	1108	0	0	707
Future Volume (vph)	0	1814	0	0	1749	0	0	0	1108	0	0	707
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		2.5			2.0				2.0			3.5
Lane Util. Factor		0.86			0.91				1.00			0.88
Frt		1.00			1.00				0.86			0.85
Flt Protected		1.00			1.00				1.00			1.00
Satd. Flow (prot)		6194			4916				1558			2694
Flt Permitted		1.00			1.00				1.00			1.00
Satd. Flow (perm)		6194			4916				1558			2694
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1870	0	0	1803	0	0	0	1142	0	0	729
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1870	0	0	1803	0	0	0	1142	0	0	729
Turn Type		NA			NA				Free			Prot
Protected Phases		2			Free							8
Permitted Phases									Free			8
Actuated Green, G (s)		80.5			180.0				180.0			76.5
Effective Green, g (s)		84.5			180.0				180.0			79.5
Actuated g/C Ratio		0.47			1.00				1.00			0.44
Clearance Time (s)		6.5										6.5
Vehicle Extension (s)		0.2										4.0
Lane Grp Cap (vph)		2907			4916				1558			1189
v/s Ratio Prot		0.30			0.37							0.27
v/s Ratio Perm									c0.73			
v/c Ratio		0.64			0.37				0.73			0.61
Uniform Delay, d1		36.3			0.0				0.0			38.5
Progression Factor		1.00			1.00				1.00			1.00
Incremental Delay, d2		1.1			0.2				3.1			1.1
Delay (s)		37.4			0.2				3.1			39.6
Level of Service		D			A				A			D
Approach Delay (s)		37.4			0.2			3.1			39.6	
Approach LOS		D			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			18.5			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.85									
Actuated Cycle Length (s)			180.0			Sum of lost time (s)			25.5			
Intersection Capacity Utilization			57.7%			ICU Level of Service			B			
Analysis Period (min)			15									

c Critical Lane Group

Intersection Sign configuration not allowed in HCM analysis.

HCM Unsignalized Intersection Capacity Analysis

41: Old Columbia Pike & Industrial Parkway

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑↑				↗		↑↑	
Traffic Volume (veh/h)	90	1330	130	25	1330	390	0	0	800	15	505	120
Future Volume (Veh/h)	90	1330	130	25	1330	390	0	0	800	15	505	120
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	90	1330	130	25	1330	390	0	0	800	15	505	120
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		175										
pX, platoon unblocked												
vC, conflicting volume	1330			1460			2441	2955	730	3220	3215	638
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1330			1460			2441	2955	730	3220	3215	638
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	83			95			0	100	0	0	0	71
cM capacity (veh/h)	515			459			0	11	365	0	7	419

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	NB 1	NB 2	SB 1	SB 2
Volume Total	755	795	25	532	532	656	400	400	268	372
Volume Left	90	0	25	0	0	0	0	0	15	0
Volume Right	0	130	0	0	0	390	400	400	0	120
cSH	515	1700	459	1700	1700	1700	365	365	0	11
Volume to Capacity	0.17	0.47	0.05	0.31	0.31	0.39	1.10	1.10	Err	33.96
Queue Length 95th (ft)	16	0	4	0	0	0	366	366	Err	Err
Control Delay (s)	5.0	0.0	13.3	0.0	0.0	0.0	109.7	109.7	Err	Err
Lane LOS	A		B				F	F	F	F
Approach Delay (s)	2.4		0.2				109.7		Err	
Approach LOS							F		F	

Intersection Summary

Average Delay		Err								
Intersection Capacity Utilization		106.1%		ICU Level of Service				G		
Analysis Period (min)		15								

HCM Signalized Intersection Capacity Analysis

102: FDA Blvd & Industrial Parkway

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔↑	↔↑		↔	↔
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)						
Lane Util. Factor						
Frt						
Flt Protected						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0
Turn Type					Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)						
Effective Green, g (s)						
Actuated g/C Ratio						
Clearance Time (s)						
Lane Grp Cap (vph)						
v/s Ratio Prot						
v/s Ratio Perm						
v/c Ratio						
Uniform Delay, d1						
Progression Factor						
Incremental Delay, d2						
Delay (s)						
Level of Service						
Approach Delay (s)		0.0	0.0		0.0	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			0.0		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.00			
Actuated Cycle Length (s)			40.0		Sum of lost time (s)	8.0
Intersection Capacity Utilization			0.0%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
 189: B-6 & Prosperity Dr

5/23/2016



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Volume (veh/h)	515	100	65	200	160	125
Future Volume (Veh/h)	515	100	65	200	160	125
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	515	100	65	200	160	125
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	979					
pX, platoon unblocked						
vC, conflicting volume				615	795	308
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				615	795	308
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				93	47	82
cM capacity (veh/h)				961	303	688
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	343	272	132	133	285	
Volume Left	0	0	65	0	160	
Volume Right	0	100	0	0	125	
cSH	1700	1700	961	1700	401	
Volume to Capacity	0.20	0.16	0.07	0.08	0.71	
Queue Length 95th (ft)	0	0	5	0	134	
Control Delay (s)	0.0	0.0	4.8	0.0	33.1	
Lane LOS				A	D	
Approach Delay (s)	0.0		2.4		33.1	
Approach LOS					D	
Intersection Summary						
Average Delay				8.6		
Intersection Capacity Utilization				51.4%	ICU Level of Service	A
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis
 190: Plum Orchard/B-6 & Broadbirch Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	125	975	175	45	840	45	375	175	375	125	25	75
Future Volume (vph)	125	975	175	45	840	45	375	175	375	125	25	75
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	125	975	175	45	840	45	375	175	375	125	25	75

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	613	663	465	465	925	225
Volume Left (vph)	125	0	45	0	375	125
Volume Right (vph)	0	175	0	45	375	75
Hadj (s)	0.14	-0.15	0.08	-0.03	-0.13	-0.05
Departure Headway (s)	9.0	8.8	9.0	8.9	8.4	9.5
Degree Utilization, x	1.00	1.00	1.00	1.00	1.00	0.59
Capacity (veh/h)	613	663	465	465	925	369
Control Delay (s)	74.6	73.3	74.4	73.8	72.8	25.5
Approach Delay (s)	73.9		74.1		72.8	25.5
Approach LOS	F		F		F	D

Intersection Summary

Delay	70.4
Level of Service	F
Intersection Capacity Utilization	131.2%
ICU Level of Service	H
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
 191: B-5 & Plum Orchard/Plum Orchard Dr

5/23/2016

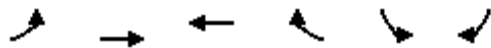


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Traffic Volume (veh/h)	170	75	190	400	525	650
Future Volume (Veh/h)	170	75	190	400	525	650
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	170	75	190	400	525	650
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	1283					
pX, platoon unblocked						
vC, conflicting volume			245		988	208
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			245		988	208
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		0	22
cM capacity (veh/h)			1321		235	833
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	245	590	1175			
Volume Left	0	190	525			
Volume Right	75	0	650			
cSH	1700	1321	389			
Volume to Capacity	0.14	0.14	3.02			
Queue Length 95th (ft)	0	13	Err			
Control Delay (s)	0.0	3.7	Err			
Lane LOS		A	F			
Approach Delay (s)	0.0	3.7	Err			
Approach LOS			F			
Intersection Summary						
Average Delay			5846.3			
Intersection Capacity Utilization			124.1%	ICU Level of Service	H	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

192: FDA Blvd & B-5

5/23/2016

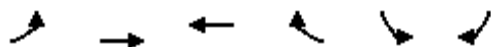


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (veh/h)	675	900	305	500	175	90
Future Volume (Veh/h)	675	900	305	500	175	90
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	675	900	305	500	175	90
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)	942					
pX, platoon unblocked						
vC, conflicting volume	805			2355	402	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	805			2355	402	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	17			0	85	
cM capacity (veh/h)	815			5	597	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	975	600	203	602	265	
Volume Left	675	0	0	0	175	
Volume Right	0	0	0	500	90	
cSH	815	1700	1700	1700	8	
Volume to Capacity	0.83	0.35	0.12	0.35	34.28	
Queue Length 95th (ft)	235	0	0	0	Err	
Control Delay (s)	26.8	0.0	0.0	0.0	Err	
Lane LOS	D					F
Approach Delay (s)	16.6	0.0				Err
Approach LOS					F	
Intersection Summary						
Average Delay			1011.7			
Intersection Capacity Utilization			94.2%	ICU Level of Service	F	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

195: B-6 & B-7

5/23/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	40	125	250	95	100	35
Future Volume (vph)	40	125	250	95	100	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	40	125	250	95	100	35

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	165	345	135
Volume Left (vph)	40	0	100
Volume Right (vph)	0	95	35
Hadj (s)	0.08	-0.13	0.03
Departure Headway (s)	4.7	4.3	5.1
Degree Utilization, x	0.22	0.42	0.19
Capacity (veh/h)	720	800	652
Control Delay (s)	9.0	10.4	9.3
Approach Delay (s)	9.0	10.4	9.3
Approach LOS	A	B	A

Intersection Summary			
Delay		9.8	
Level of Service		A	
Intersection Capacity Utilization	45.4%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 40: Old Columbia Pike & Tech Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗			↕		↖	↗	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	40	45	10	150	85	1000	0	100	60	665	210	35
Future Volume (vph)	40	45	10	150	85	1000	0	100	60	665	210	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	40	45	10	150	85	1000	0	100	60	665	210	35

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total (vph)	95	150	1085	160	665	245
Volume Left (vph)	40	150	0	0	665	0
Volume Right (vph)	10	0	1000	60	0	35
Hadj (s)	0.06	0.53	-0.61	-0.19	0.53	-0.07
Departure Headway (s)	8.5	7.9	6.7	7.9	7.8	7.2
Degree Utilization, x	0.22	0.33	1.00	0.35	1.00	0.49
Capacity (veh/h)	411	449	1085	445	665	494
Control Delay (s)	13.9	13.5	63.6	15.1	68.8	15.7
Approach Delay (s)	13.9	57.5		15.1	54.5	
Approach LOS	B	F		C	F	

Intersection Summary

Delay	51.8
Level of Service	F
Intersection Capacity Utilization	122.0%
ICU Level of Service	H
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
 49: Old Columbia Pike/Prosperity Dr & Tech Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔↔			↔↔			↔↔	
Traffic Volume (veh/h)	295	995	120	340	1960	90	105	230	145	60	180	120
Future Volume (Veh/h)	295	995	120	340	1960	90	105	230	145	60	180	120
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	295	995	120	340	1960	90	105	230	145	60	180	120
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		177										
pX, platoon unblocked												
vC, conflicting volume	2050			1115			3188	4375	558	4032	4390	698
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2050			1115			3188	4375	558	4032	4390	698
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	0			45			0	0	69	0	0	69
cM capacity (veh/h)	270			622			0	0	473	0	0	383
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2			
Volume Total	792	618	830	980	580	220	260	150	210			
Volume Left	295	0	340	0	0	105	0	60	0			
Volume Right	0	120	0	0	90	0	145	0	120			
cSH	270	1700	622	1700	1700	0	0	0	0			
Volume to Capacity	1.09	0.36	0.55	0.58	0.34	Err	Err	Err	Err			
Queue Length 95th (ft)	304	0	83	0	0	Err	Err	Err	Err			
Control Delay (s)	122.1	0.0	15.1	0.0	0.0	Err	Err	Err	Err			
Lane LOS	F		C			F	F	F	F			
Approach Delay (s)	68.6		5.3			Err		Err				
Approach LOS						F		F				
Intersection Summary												
Average Delay				Err								
Intersection Capacity Utilization			124.6%		ICU Level of Service					H		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 50: Tech Rd & Broadbirch Dr

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	170	1120	1170	550	675	525
Future Volume (vph)	170	1120	1170	550	675	525
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	170	1120	1170	550	675	525
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	170	1120	780	940	850	350
Volume Left (vph)	170	0	0	0	675	0
Volume Right (vph)	0	1120	0	550	0	0
Hadj (s)	0.53	-0.67	0.03	-0.38	0.43	0.03
Departure Headway (s)	9.3	8.1	8.2	7.8	8.7	8.3
Degree Utilization, x	0.44	1.00	1.00	1.00	1.00	0.81
Capacity (veh/h)	382	1120	780	940	850	427
Control Delay (s)	18.1	70.1	70.6	68.6	73.1	36.9
Approach Delay (s)	63.2		69.5		62.6	
Approach LOS	F		F		F	

Intersection Summary

Delay	65.6
Level of Service	F
Intersection Capacity Utilization	126.0%
ICU Level of Service	H
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis
 51: Tech Rd & Industrial Parkway

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	675	1290	25	5	1140	900	150	210	15	345	50	300
Future Volume (vph)	675	1290	25	5	1140	900	150	210	15	345	50	300
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	675	1290	25	5	1140	900	150	210	15	345	50	300

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	1320	670	575	1470	255	120	370	325
Volume Left (vph)	675	0	5	0	150	0	345	0
Volume Right (vph)	0	25	0	900	0	15	0	300
Hadj (s)	0.29	0.01	0.04	-0.39	0.33	-0.05	0.50	-0.61
Departure Headway (s)	10.3	10.0	10.1	9.6	11.5	11.2	10.7	9.6
Degree Utilization, x	1.00	1.00	1.00	1.00	0.82	0.37	1.00	0.87
Capacity (veh/h)	1320	670	575	1470	308	308	370	365
Control Delay (s)	80.3	79.1	79.2	77.3	49.3	19.4	82.0	50.1
Approach Delay (s)	79.9		77.9		39.8		67.1	
Approach LOS	F		F		E		F	

Intersection Summary

Delay	74.4
Level of Service	F
Intersection Capacity Utilization	161.6%
ICU Level of Service	H
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis

14: US 29 & MD 193 Eastbound

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗					↑↑↑	↗		↑↑↑	
Traffic Volume (vph)	440	1690	220	0	0	0	0	4060	250	0	2935	0
Future Volume (vph)	440	1690	220	0	0	0	0	4060	250	0	2935	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0	5.0	5.0					6.0	6.0		6.0	
Lane Util. Factor	1.00	0.91	1.00					0.86	1.00		0.86	
Frt	1.00	1.00	0.85					1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)	1770	5085	1583					6408	1583		6408	
Flt Permitted	0.95	1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)	1770	5085	1583					6408	1583		6408	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	478	1837	239	0	0	0	0	4413	272	0	3190	0
RTOR Reduction (vph)	0	0	36	0	0	0	0	0	40	0	0	0
Lane Group Flow (vph)	478	1837	203	0	0	0	0	4413	232	0	3190	0
Turn Type	Perm	NA	Perm					NA	Perm		NA	
Protected Phases		4						5			2	
Permitted Phases	4		4						5			
Actuated Green, G (s)	59.0	59.0	59.0					97.0	97.0		108.0	
Effective Green, g (s)	61.0	61.0	61.0					97.0	97.0		108.0	
Actuated g/C Ratio	0.34	0.34	0.34					0.54	0.54		0.60	
Clearance Time (s)	7.0	7.0	7.0					6.0	6.0		6.0	
Vehicle Extension (s)	5.0	5.0	5.0					0.2	0.2		0.2	
Lane Grp Cap (vph)	599	1723	536					3453	853		3844	
v/s Ratio Prot		c0.36						c0.69			c0.50	
v/s Ratio Perm	0.27		0.13						0.15			
v/c Ratio	0.80	1.07	0.38					1.28	0.27		0.83	
Uniform Delay, d1	53.9	59.5	45.1					41.5	22.4		28.7	
Progression Factor	1.05	1.05	1.07					1.00	1.00		0.28	
Incremental Delay, d2	7.8	41.1	0.9					127.5	0.8		1.2	
Delay (s)	64.7	103.6	49.3					169.0	23.2		9.2	
Level of Service	E	F	D					F	C		A	
Approach Delay (s)		91.2			0.0			160.5			9.2	
Approach LOS		F			A			F			A	

Intersection Summary

HCM 2000 Control Delay	97.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

15: US 29 & MD 193 Westbound

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑↑↑↑	↗		↑↑↑↑			↑↑↑↑	
Traffic Volume (vph)	0	0	0	200	1605	190	0	4500	0	0	2735	290
Future Volume (vph)	0	0	0	200	1605	190	0	4500	0	0	2735	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)				5.0	5.0	5.0		6.0			6.0	
Lane Util. Factor				1.00	0.86	1.00		0.86			0.86	
Fr _t				1.00	1.00	0.85		1.00			0.99	
Fl _t Protected				0.95	1.00	1.00		1.00			1.00	
Satd. Flow (prot)				1770	6408	1583		6408			6316	
Fl _t Permitted				0.95	1.00	1.00		1.00			1.00	
Satd. Flow (perm)				1770	6408	1583		6408			6316	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	217	1745	207	0	4891	0	0	2973	315
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	9	0
Lane Group Flow (vph)	0	0	0	217	1745	170	0	4891	0	0	3279	0
Turn Type				Perm	NA	Perm		NA			NA	
Protected Phases					4			2			5	
Permitted Phases				4		4						
Actuated Green, G (s)				58.0	58.0	58.0		109.0			109.0	
Effective Green, g (s)				60.0	60.0	60.0		109.0			109.0	
Actuated g/C Ratio				0.33	0.33	0.33		0.61			0.61	
Clearance Time (s)				7.0	7.0	7.0		6.0			6.0	
Vehicle Extension (s)				6.0	6.0	6.0		0.2			0.2	
Lane Grp Cap (vph)				590	2136	527		3880			3824	
v/s Ratio Prot					c0.27			c0.76			0.52	
v/s Ratio Perm				0.12		0.11						
v/c Ratio				0.37	0.82	0.32		1.26			0.86	
Uniform Delay, d ₁				45.6	55.0	44.8		35.5			29.1	
Progression Factor				0.66	0.71	0.54		0.29			1.26	
Incremental Delay, d ₂				1.1	3.0	1.0		117.5			0.3	
Delay (s)				31.0	42.1	25.0		127.7			36.9	
Level of Service				C	D	C		F			D	
Approach Delay (s)		0.0			39.3			127.7			36.9	
Approach LOS		A			D			F			D	

Intersection Summary

HCM 2000 Control Delay	80.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Gas Sta./West Crossover & MD 193 Eastbound

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑↑							↑	↑	↑		
Traffic Volume (vph)	0	2001	0	0	0	0	0	0	0	84	0	0	
Future Volume (vph)	0	2001	0	0	0	0	0	0	0	84	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12	
Total Lost time (s)		5.0								6.5	6.5		
Lane Util. Factor		0.91								0.95	0.95		
Frt		1.00								1.00	1.00		
Flt Protected		1.00								0.95	0.95		
Satd. Flow (prot)		5085								1681	1681		
Flt Permitted		1.00								0.95	0.95		
Satd. Flow (perm)		5085								1681	1681		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	2175	0	0	0	0	0	0	0	91	0	0	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	29	29	0	
Lane Group Flow (vph)	0	2175	0	0	0	0	0	0	0	16	17	0	
Turn Type		NA								Free	Perm	NA	
Protected Phases		2										4	
Permitted Phases										Free	4		
Actuated Green, G (s)		159.9									6.6	6.6	
Effective Green, g (s)		160.9									7.6	7.6	
Actuated g/C Ratio		0.89									0.04	0.04	
Clearance Time (s)		6.0									7.5	7.5	
Vehicle Extension (s)		0.2									3.0	3.0	
Lane Grp Cap (vph)		4545									70	70	
v/s Ratio Prot		0.43											
v/s Ratio Perm											0.01	0.01	
v/c Ratio		0.48									0.23	0.25	
Uniform Delay, d1		1.8									83.4	83.4	
Progression Factor		1.00									0.33	0.33	
Incremental Delay, d2		0.4									0.9	1.0	
Delay (s)		2.1									28.0	28.2	
Level of Service		A									C	C	
Approach Delay (s)		2.1			0.0			0.0				28.1	
Approach LOS		A			A			A				C	
Intersection Summary													
HCM 2000 Control Delay			3.2									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.47										
Actuated Cycle Length (s)			180.0									Sum of lost time (s)	11.5
Intersection Capacity Utilization			76.7%									ICU Level of Service	D
Analysis Period (min)			15										
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis

18: US 29 & Lorain Ave

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↕↕↕		↗	↕↕↕	
Traffic Volume (veh/h)	20	0	20	5	0	35	35	4495	10	30	3210	55
Future Volume (Veh/h)	20	0	20	5	0	35	35	4495	10	30	3210	55
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	20	0	20	5	0	35	35	4495	10	30	3210	55
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume												
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol												
tC, single (s)												
tC, 2 stage (s)												
tF (s)												
p0 queue free %												
cM capacity (veh/h)												
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	40	40	35	1798	1798	909	30	1284	1284	697		
Volume Left	20	5	35	0	0	0	30	0	0	0		
Volume Right	20	35	0	0	0	10	0	0	0	55		
cSH	0	0	324	1700	1700	1700	27	1700	1700	1700		
Volume to Capacity	Err	Err	0.11	1.06	1.06	0.53	1.11	0.76	0.76	0.41		
Queue Length 95th (ft)	Err	Err	9	0	0	0	89	0	0	0		
Control Delay (s)	Err	Err	17.4	0.0	0.0	0.0	422.4	0.0	0.0	0.0		
Lane LOS	F	F	C				F					
Approach Delay (s)	Err	Err	0.1				3.8					
Approach LOS	F	F										
Intersection Summary												
Average Delay												
Intersection Capacity Utilization												
Analysis Period (min)												

HCM Signalized Intersection Capacity Analysis

19: US 29 & Southwood Ave

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	170	25	70	4480	3270	140
Future Volume (vph)	170	25	70	4480	3270	140
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	5.5	5.5	5.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	5085	5054	
Flt Permitted	0.95	1.00	0.03	1.00	1.00	
Satd. Flow (perm)	1770	1583	56	5085	5054	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	185	27	76	4870	3554	152
RTOR Reduction (vph)	0	23	0	0	2	0
Lane Group Flow (vph)	185	4	76	4870	3704	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	4		1	6	2	
Permitted Phases		4	6			
Actuated Green, G (s)	25.2	25.2	141.8	141.8	124.4	
Effective Green, g (s)	26.2	26.2	143.8	143.8	126.4	
Actuated g/C Ratio	0.15	0.15	0.80	0.80	0.70	
Clearance Time (s)	6.5	6.5	7.5	6.5	6.5	
Vehicle Extension (s)	5.0	5.0	4.0	0.2	0.2	
Lane Grp Cap (vph)	257	230	158	4062	3549	
v/s Ratio Prot	c0.10		0.03	c0.96	0.73	
v/s Ratio Perm		0.00	0.35			
v/c Ratio	0.72	0.02	0.48	1.20	1.04	
Uniform Delay, d1	73.4	65.9	58.3	18.1	26.8	
Progression Factor	1.00	1.00	1.85	1.00	1.09	
Incremental Delay, d2	11.4	0.1	0.3	89.8	25.7	
Delay (s)	84.8	65.9	108.1	107.8	55.0	
Level of Service	F	E	F	F	E	
Approach Delay (s)	82.4			107.8	55.0	
Approach LOS	F			F	E	

Intersection Summary

HCM 2000 Control Delay	85.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	15.5
Intersection Capacity Utilization	104.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

20: US 29 & Burnt Mills Shopping Ctr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↑↑↑		↕	↑↑↑	
Traffic Volume (vph)	5	0	5	110	0	45	0	4400	150	105	3290	0
Future Volume (vph)	5	0	5	110	0	45	0	4400	150	105	3290	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.5			7.5			7.0		7.5	7.0	
Lane Util. Factor		1.00			1.00			0.91		1.00	0.91	
Frt		0.93			0.96			1.00		1.00	1.00	
Flt Protected		0.98			0.97			1.00		0.95	1.00	
Satd. Flow (prot)		1638			1671			4891		1711	4916	
Flt Permitted		0.86			0.78			1.00		0.03	1.00	
Satd. Flow (perm)		1447			1355			4891		52	4916	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	0	5	110	0	45	0	4400	150	105	3290	0
RTOR Reduction (vph)	0	9	0	0	63	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	92	0	0	4548	0	105	3290	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)		17.1			17.1			130.1		148.4	148.4	
Effective Green, g (s)		17.1			17.1			130.1		148.4	148.4	
Actuated g/C Ratio		0.10			0.10			0.72		0.82	0.82	
Clearance Time (s)		7.5			7.5			7.0		7.5	7.0	
Vehicle Extension (s)		3.0			3.0			0.2		3.0	0.2	
Lane Grp Cap (vph)		137			128			3535		142	4052	
v/s Ratio Prot								c0.93		0.04	c0.67	
v/s Ratio Perm		0.00			c0.07					0.56		
v/c Ratio		0.01			0.72			1.29		0.74	0.81	
Uniform Delay, d1		73.8			79.1			25.0		68.6	8.4	
Progression Factor		1.00			1.00			0.44		0.91	0.92	
Incremental Delay, d2		0.0			17.3			129.2		10.1	1.0	
Delay (s)		73.8			96.4			140.3		72.5	8.7	
Level of Service		E			F			F		E	A	
Approach Delay (s)		73.8			96.4			140.3			10.6	
Approach LOS		E			F			F			B	

Intersection Summary

HCM 2000 Control Delay	85.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	113.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

21: US 29 & Lockwood Dr

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖		↗	↖↗	↔			↕		↖	↗↕	
Traffic Volume (vph)	30	0	10	620	5	10	0	4600	5	5	3035	5
Future Volume (vph)	30	0	10	620	5	10	0	4600	5	5	3035	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	5.0		5.0	5.0	5.0			4.0		4.0	4.0	
Lane Util. Factor	1.00		1.00	0.91	0.91			0.91		1.00	0.91	
Frt	1.00		0.85	1.00	0.99			1.00		1.00	1.00	
Flt Protected	0.95		1.00	0.95	0.96			1.00		0.95	1.00	
Satd. Flow (prot)	1770		1583	3221	1608			5085		1770	5084	
Flt Permitted	0.24		1.00	0.95	0.96			1.00		0.03	1.00	
Satd. Flow (perm)	453		1583	3221	1608			5085		53	5084	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	0	11	674	5	11	0	5000	5	5	3299	5
RTOR Reduction (vph)	0	0	9	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	33	0	2	472	218	0	0	5005	0	5	3304	0
Turn Type	Perm		Perm	Perm	NA			NA		Perm	NA	
Protected Phases					8			6			2	
Permitted Phases	4		4	8						2		
Actuated Green, G (s)	28.0		28.0	28.0	28.0			138.0		138.0	138.0	
Effective Green, g (s)	30.0		30.0	30.0	30.0			141.0		141.0	141.0	
Actuated g/C Ratio	0.17		0.17	0.17	0.17			0.78		0.78	0.78	
Clearance Time (s)	7.0		7.0	7.0	7.0			7.0		7.0	7.0	
Vehicle Extension (s)	5.0		5.0	5.0	5.0			0.2		0.2	0.2	
Lane Grp Cap (vph)	75		263	536	268			3983		41	3982	
v/s Ratio Prot								c0.98			0.65	
v/s Ratio Perm	0.07		0.00	c0.15	0.14					0.09		
v/c Ratio	0.44		0.01	0.88	0.81			1.26		0.12	0.83	
Uniform Delay, d1	67.4		62.6	73.3	72.3			19.5		4.7	12.1	
Progression Factor	1.00		1.00	1.00	1.00			0.96		0.28	0.20	
Incremental Delay, d2	8.4		0.0	16.6	18.9			115.7		3.2	1.1	
Delay (s)	75.8		62.6	89.8	91.2			134.4		4.5	3.6	
Level of Service	E		E	F	F			F		A	A	
Approach Delay (s)		72.5			90.3			134.4			3.6	
Approach LOS		E			F			F			A	

Intersection Summary

HCM 2000 Control Delay	82.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	114.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

22: US 29 & Burnt Mills Ave

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↑↑↑		↕	↑↑↑	
Traffic Volume (vph)	35	20	30	5	5	5	45	4590	5	10	3010	30
Future Volume (vph)	35	20	30	5	5	5	45	4590	5	10	3010	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		6.5			6.5		6.5	4.0		6.5	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.91		1.00	0.91	
Frt		0.95			0.95		1.00	1.00		1.00	1.00	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1738			1750		1770	5085		1770	5078	
Flt Permitted		0.86			0.91		0.03	1.00		0.03	1.00	
Satd. Flow (perm)		1526			1621		53	5085		55	5078	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	22	33	5	5	5	49	4989	5	11	3272	33
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	93	0	0	15	0	49	4994	0	11	3305	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		1	6		5	2	
Permitted Phases	4			8			6			2		
Actuated Green, G (s)		17.1			17.1		144.6	138.5		137.2	134.8	
Effective Green, g (s)		18.1			18.1		146.6	141.5		139.2	137.8	
Actuated g/C Ratio		0.10			0.10		0.81	0.79		0.77	0.77	
Clearance Time (s)		7.5			7.5		7.5	7.0		7.5	7.0	
Vehicle Extension (s)		4.0			4.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)		153			163		110	3997		74	3887	
v/s Ratio Prot							c0.02	c0.98		0.00	0.65	
v/s Ratio Perm		c0.06			0.01		0.34			0.11		
v/c Ratio		0.61			0.09		0.45	1.25		0.15	0.85	
Uniform Delay, d1		77.6			73.5		35.0	19.2		53.2	14.2	
Progression Factor		1.00			1.00		1.47	0.72		0.60	0.19	
Incremental Delay, d2		7.7			0.3		0.3	112.4		0.5	1.4	
Delay (s)		85.2			73.8		51.7	126.2		32.6	4.0	
Level of Service		F			E		D	F		C	A	
Approach Delay (s)		85.2			73.8			125.5			4.1	
Approach LOS		F			E			F			A	

Intersection Summary

HCM 2000 Control Delay	77.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

23: US 29 & Prelude Dr

5/23/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	85	45	45	4560	3060	20
Future Volume (vph)	85	45	45	4560	3060	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	5.5	5.5	7.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91	
Frt	1.00	0.85	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	5085	5080	
Flt Permitted	0.95	1.00	0.03	1.00	1.00	
Satd. Flow (perm)	1770	1583	51	5085	5080	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	49	49	4957	3326	22
RTOR Reduction (vph)	0	44	0	0	0	0
Lane Group Flow (vph)	92	5	49	4957	3348	0
Turn Type	Perm	Perm	pm+pt	NA	NA	
Protected Phases			1	6	2	
Permitted Phases	4	4	6			
Actuated Green, G (s)	15.6	15.6	150.9	150.9	138.1	
Effective Green, g (s)	16.6	16.6	150.9	153.9	141.1	
Actuated g/C Ratio	0.09	0.09	0.84	0.86	0.78	
Clearance Time (s)	6.5	6.5	7.0	7.0	7.0	
Vehicle Extension (s)	4.0	4.0	3.0	0.2	0.2	
Lane Grp Cap (vph)	163	145	98	4347	3982	
v/s Ratio Prot			0.02	c0.97	0.66	
v/s Ratio Perm	c0.05	0.00	0.40			
v/c Ratio	0.56	0.03	0.50	1.14	0.84	
Uniform Delay, d1	78.2	74.4	36.1	13.0	12.3	
Progression Factor	1.00	1.00	1.43	0.74	1.16	
Incremental Delay, d2	5.3	0.1	0.4	63.4	2.3	
Delay (s)	83.6	74.5	51.9	73.1	16.6	
Level of Service	F	E	D	E	B	
Approach Delay (s)	80.4			72.9	16.6	
Approach LOS	F			E	B	

Intersection Summary

HCM 2000 Control Delay	50.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	17.5
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

24: US 29 & Stewart La

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↑↑↑	↗	↖	↑↑↑	↗
Traffic Volume (vph)	40	55	10	90	20	30	35	4860	430	690	3275	45
Future Volume (vph)	40	55	10	90	20	30	35	4860	430	690	3275	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)		6.5	6.5	6.5	6.5		7.5	4.0	4.0	7.5	4.0	4.0
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	0.91	1.00	1.00	0.91	1.00
Frt		1.00	0.85	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1825	1583	1770	1695		1770	5085	1583	1770	5085	1583
Flt Permitted		0.84	1.00	0.61	1.00		0.05	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)		1563	1583	1133	1695		91	5085	1583	83	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	60	11	98	22	33	38	5283	467	750	3560	49
RTOR Reduction (vph)	0	0	10	0	30	0	0	0	0	0	0	12
Lane Group Flow (vph)	0	103	1	98	25	0	38	5283	467	750	3560	37
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)		13.5	13.5	13.5	13.5		87.2	82.0	82.0	122.0	109.3	109.3
Effective Green, g (s)		14.5	14.5	14.5	14.5		87.2	85.0	85.0	122.0	112.3	112.3
Actuated g/C Ratio		0.10	0.10	0.10	0.10		0.58	0.57	0.57	0.81	0.75	0.75
Clearance Time (s)		7.5	7.5	7.5	7.5		7.5	7.0	7.0	7.5	7.0	7.0
Vehicle Extension (s)		3.0	3.0	5.0	5.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		151	153	109	163		111	2881	897	433	3806	1185
v/s Ratio Prot					0.01		0.01	c1.04		c0.38	0.70	
v/s Ratio Perm		0.07	0.00	c0.09			0.19		0.29	1.03		0.02
v/c Ratio		0.68	0.01	0.90	0.15		0.34	1.83	0.52	1.73	0.94	0.03
Uniform Delay, d1		65.5	61.2	67.0	62.1		61.3	32.5	20.0	53.4	15.8	4.9
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		12.0	0.0	57.6	0.9		1.8	376.6	2.2	339.0	5.7	0.0
Delay (s)		77.5	61.3	124.6	63.1		63.2	409.1	22.1	392.4	21.5	4.9
Level of Service		E	E	F	E		E	F	C	F	C	A
Approach Delay (s)		75.9			102.5			375.6			85.2	
Approach LOS		E			F			F			F	

Intersection Summary

HCM 2000 Control Delay	246.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.71		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	158.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

26: US 29 & Industrial Parkway

5/23/2016



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1285	165	3665	1265	285	2725
Future Volume (vph)	1285	165	3665	1265	285	2725
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12
Total Lost time (s)	6.0	5.0	4.0	4.0	6.0	4.0
Lane Util. Factor	0.97	1.00	0.91	0.88	1.00	0.91
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)	3433	1583	5085	2787	1770	5085
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1583	5085	2787	1770	5085
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1397	179	3984	1375	310	2962
RTOR Reduction (vph)	0	0	0	6	0	0
Lane Group Flow (vph)	1397	179	3984	1369	310	2962
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	4	5	6	4	5	2
Permitted Phases		4		6		
Actuated Green, G (s)	42.0	61.0	99.0	141.0	19.0	124.0
Effective Green, g (s)	43.0	63.0	102.0	147.0	19.0	127.0
Actuated g/C Ratio	0.24	0.35	0.57	0.82	0.11	0.71
Clearance Time (s)	7.0	6.0	7.0	7.0	6.0	7.0
Vehicle Extension (s)	4.0	5.0	5.0	4.0	5.0	5.0
Lane Grp Cap (vph)	820	554	2881	2337	186	3587
v/s Ratio Prot	c0.41	0.04	c0.78	0.15	c0.18	0.58
v/s Ratio Perm		0.08		0.34		
v/c Ratio	1.70	0.32	1.38	0.59	1.67	0.83
Uniform Delay, d1	68.5	42.9	39.0	5.8	80.5	18.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	321.9	0.5	174.5	0.4	322.5	2.3
Delay (s)	390.4	43.3	213.5	6.2	403.0	21.0
Level of Service	F	D	F	A	F	C
Approach Delay (s)	351.0		160.3			57.2
Approach LOS	F		F			E

Intersection Summary

HCM 2000 Control Delay	156.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.50		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	136.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

28: US 29 & Tech Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑	↗	↘	↔		↘	↑↑↑	↗	↘	↑↑↑	↗
Traffic Volume (vph)	25	605	140	560	805	820	280	3025	525	280	2310	150
Future Volume (vph)	25	605	140	560	805	820	280	3025	525	280	2310	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	0.91	0.91		0.97	0.91	1.00	1.00	0.91	1.00
Frt	1.00	1.00	0.85	1.00	0.92		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)	1770	1863	1583	1610	3134		3433	5085	1583	1770	5085	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.04	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1610	3134		3433	5085	1583	80	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	658	152	609	875	891	304	3288	571	304	2511	163
RTOR Reduction (vph)	0	0	45	0	105	0	0	0	160	0	0	40
Lane Group Flow (vph)	27	658	107	609	1661	0	304	3288	411	304	2511	123
Turn Type	Split	NA	pm+ov	Split	NA		Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	3	3	6	4	4		6	2		1	5	
Permitted Phases			3						2	5		5
Actuated Green, G (s)	10.0	10.0	28.0	30.0	30.0		18.0	93.0	93.0	114.0	93.0	93.0
Effective Green, g (s)	11.0	11.0	34.0	31.0	31.0		21.0	96.0	96.0	114.0	96.0	96.0
Actuated g/C Ratio	0.06	0.06	0.19	0.18	0.18		0.12	0.55	0.55	0.65	0.55	0.55
Clearance Time (s)	5.0	5.0	7.0	5.0	5.0		7.0	7.0	7.0	4.0	7.0	7.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	0.2	0.2	4.0	0.2	0.2
Lane Grp Cap (vph)	111	117	307	285	555		411	2789	868	254	2789	868
v/s Ratio Prot	0.02	c0.35	0.04	0.38	c0.53		0.09	c0.65		c0.14	0.49	
v/s Ratio Perm			0.03						0.26	0.63		0.08
v/c Ratio	0.24	5.62	0.35	2.14	2.99		0.74	1.18	0.47	1.20	0.90	0.14
Uniform Delay, d1	78.0	82.0	60.9	72.0	72.0		74.4	39.5	24.1	64.6	35.2	19.3
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	1.6	2099.3	0.9	523.2	902.0		11.3	84.6	1.9	120.3	5.2	0.3
Delay (s)	79.6	2181.3	61.9	595.2	974.0		85.7	124.1	25.9	184.9	40.5	19.7
Level of Service	E	F	E	F	F		F	F	C	F	D	B
Approach Delay (s)		1728.6			876.9			107.8			54.1	
Approach LOS		F			F			F			D	

Intersection Summary

HCM 2000 Control Delay	399.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.84		
Actuated Cycle Length (s)	175.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	162.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

31: US 29 & Musgrove Rd

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	125	490	105	60	30	200	4410	165	25	2650	280
Future Volume (vph)	330	125	490	105	60	30	200	4410	165	25	2650	280
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		7.0	7.0		6.0	7.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	0.86		1.00	0.86	
Frt	1.00	1.00	0.85	1.00	0.95		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	1801	1531	1711	1711		3319	6161		1711	6105	
Flt Permitted	0.68	1.00	1.00	0.62	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1227	1801	1531	1108	1711		3319	6161		1711	6105	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	330	125	490	105	60	30	200	4410	165	25	2650	280
RTOR Reduction (vph)	0	0	158	0	10	0	0	3	0	0	10	0
Lane Group Flow (vph)	330	125	332	105	80	0	200	4572	0	25	2920	0
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		6	2		1	5	
Permitted Phases	4		4	8								
Actuated Green, G (s)	45.0	45.0	45.0	45.0	45.0		21.0	110.0		6.0	94.0	
Effective Green, g (s)	45.0	45.0	45.0	45.0	45.0		21.0	110.0		6.0	94.0	
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25		0.12	0.61		0.03	0.52	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		7.0	7.0		6.0	7.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	0.2		3.0	0.2	
Lane Grp Cap (vph)	306	450	382	277	427		387	3765		57	3188	
v/s Ratio Prot		0.07			0.05		0.06	c0.74		0.01	c0.48	
v/s Ratio Perm	c0.27		0.22	0.09								
v/c Ratio	1.08	0.28	0.87	0.38	0.19		0.52	1.21		0.44	0.92	
Uniform Delay, d1	67.5	54.4	64.7	55.9	53.1		74.7	35.0		85.3	39.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.20	0.93	
Incremental Delay, d2	73.9	0.3	18.4	0.9	0.2		4.9	99.1		11.5	2.8	
Delay (s)	141.4	54.7	83.1	56.8	53.3		79.6	134.1		114.0	39.4	
Level of Service	F	D	F	E	D		E	F		F	D	
Approach Delay (s)		99.7			55.2			131.8			40.0	
Approach LOS		F			E			F			D	

Intersection Summary

HCM 2000 Control Delay	96.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	114.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

32: Fairland Rd & US 29

5/23/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	620	470	90	80	250	135	135	4540	95	0	2785	0
Future Volume (vph)	620	470	90	80	250	135	135	4540	95	0	2785	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	7.0			7.0	
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.86			0.81	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00			1.00	
Flt Protected	0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)	1557	3219	1531	1557	3272	1531	1711	6175			7293	
Flt Permitted	0.95	0.98	1.00	0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (perm)	1557	3219	1531	1557	3272	1531	1711	6175			7293	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	620	470	90	80	250	135	135	4540	95	0	2785	0
RTOR Reduction (vph)	0	0	72	0	0	115	0	2	0	0	0	0
Lane Group Flow (vph)	353	737	18	72	258	20	135	4633	0	0	2785	0
Turn Type	Split	NA	Prot	Split	NA	Prot	Prot	NA			NA	
Protected Phases	3	3	3	4	4	4	1	6			2	
Permitted Phases												
Actuated Green, G (s)	36.5	36.5	36.5	17.2	17.2	17.2	16.4	102.3			77.4	
Effective Green, g (s)	36.5	36.5	36.5	17.2	17.2	17.2	16.4	102.3			77.4	
Actuated g/C Ratio	0.20	0.20	0.20	0.10	0.10	0.10	0.09	0.57			0.43	
Clearance Time (s)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	7.0			7.0	
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	0.2			0.2	
Lane Grp Cap (vph)	315	652	310	148	312	146	155	3509			3135	
v/s Ratio Prot	0.23	c0.23	0.01	0.05	c0.08	0.01	0.08	c0.75			0.38	
v/s Ratio Perm												
v/c Ratio	1.12	1.13	0.06	0.49	0.83	0.14	0.87	1.32			0.89	
Uniform Delay, d1	71.8	71.8	57.9	77.2	79.9	74.6	80.8	38.9			47.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.75	1.74			1.00	
Incremental Delay, d2	87.3	76.9	0.1	3.4	16.9	0.6	5.6	144.4			4.2	
Delay (s)	159.0	148.7	58.0	80.6	96.9	75.2	66.1	211.8			51.5	
Level of Service	F	F	E	F	F	E	E	F			D	
Approach Delay (s)		144.9			88.1			207.7			51.5	
Approach LOS		F			F			F			D	

Intersection Summary

HCM 2000 Control Delay	146.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.29		
Actuated Cycle Length (s)	180.0	Sum of lost time (s)	32.5
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group