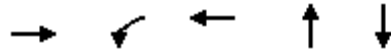


## Queues

### 7: N. Delaware Ave & Shackamaxon Ave

05/18/2007



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	2635	16	626	45	101
v/c Ratio	0.76	0.21	0.18	0.15	0.26
Control Delay	7.2	12.2	4.8	27.5	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.2	12.2	4.8	27.5	16.7
Queue Length 50th (ft)	145	3	38	18	20
Queue Length 95th (ft)	153	3	49	48	63
Internal Link Dist (ft)	690		321	53	1237
Turn Bay Length (ft)		80			
Base Capacity (vph)	3455	77	3458	299	390
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.76	0.21	0.18	0.15	0.26

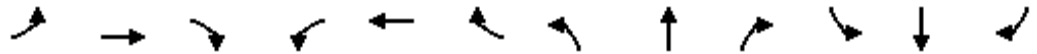
#### Intersection Summary

\* In the Synchro Analysis for this intersection, Delaware Avenue is layed out as an east-west roadway.

# HCM Signalized Intersection Capacity Analysis

## 7: N. Delaware Ave & Shackamaxon Ave

05/18/2007



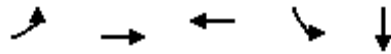
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑		↑	↑↑↑			↑			↑	
Volume (vph)	0	2390	7	4	551	0	25	0	4	27	0	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	13	12	13	11	12	12	12	12	12	16	16	16
Total Lost time (s)		4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor		0.91		1.00	0.91			1.00			1.00	
Frt		1.00		1.00	1.00			0.98			0.92	
Flt Protected		1.00		0.95	1.00			0.96			0.98	
Satd. Flow (prot)		4937		1662	4940			1696			1854	
Flt Permitted		1.00		0.06	1.00			0.79			0.86	
Satd. Flow (perm)		4937		111	4940			1391			1634	
Peak-hour factor, PHF	0.92	0.91	0.75	0.25	0.88	0.92	0.67	0.92	0.50	0.61	0.92	0.65
Adj. Flow (vph)	0	2626	9	16	626	0	37	0	8	44	0	57
RTOR Reduction (vph)	0	0	0	0	0	0	0	5	0	0	45	0
Lane Group Flow (vph)	0	2635	0	16	626	0	0	40	0	0	56	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Parking (#/hr)			10			10				10		10
Turn Type				Perm			Perm			Perm		
Protected Phases					8			2			2	
Permitted Phases		4		8			2			2		
Actuated Green, G (s)		62.0		62.0	62.0			17.0			17.0	
Effective Green, g (s)		63.0		63.0	63.0			19.0			19.0	
Actuated g/C Ratio		0.70		0.70	0.70			0.21			0.21	
Clearance Time (s)		5.0		5.0	5.0			6.0			6.0	
Lane Grp Cap (vph)		3456		78	3458			294			345	
v/s Ratio Prot					0.13							
v/s Ratio Perm		c0.53		0.14				0.03			c0.03	
v/c Ratio		0.76		0.21	0.18			0.14			0.16	
Uniform Delay, d1		8.7		4.7	4.6			28.8			29.0	
Progression Factor		0.65		1.00	1.00			1.00			1.00	
Incremental Delay, d2		1.4		5.9	0.1			1.0			1.0	
Delay (s)		7.0		10.6	4.8			29.8			30.0	
Level of Service		A		B	A			C			C	
Approach Delay (s)		7.0			4.9			29.8			30.0	
Approach LOS		A			A			C			C	

Intersection Summary		
HCM Average Control Delay	7.6	HCM Level of Service
HCM Volume to Capacity ratio	0.62	A
Actuated Cycle Length (s)	90.0	Sum of lost time (s)
Intersection Capacity Utilization	56.5%	8.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		B

# Queues

## 8: N. Delaware Ave & Frankford Ave

05/18/2007



Lane Group	EBL	EBT	WBT	SBL	SBT
Lane Group Flow (vph)	434	2117	637	138	197
v/c Ratio	0.82	0.68	0.25	0.47	0.29
Control Delay	22.4	17.1	8.9	35.3	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	17.1	8.9	35.3	1.0
Queue Length 50th (ft)	173	367	44	67	0
Queue Length 95th (ft)	m175	m393	60	125	0
Internal Link Dist (ft)		1382	690		19
Turn Bay Length (ft)	320				
Base Capacity (vph)	527	3129	2554	294	690
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.82	0.68	0.25	0.47	0.29

### Intersection Summary

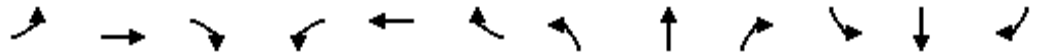
m Volume for 95th percentile queue is metered by upstream signal.

\* In the Synchro Analysis for this intersection, Delaware Avenue is layed out as an east-west roadway.

# HCM Signalized Intersection Capacity Analysis

## 8: N. Delaware Ave & Frankford Ave

05/18/2007



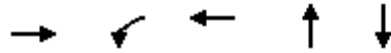
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑		↖	↑↑↑			↕		↖	↗	
Volume (vph)	399	1948	0	0	532	65	0	0	0	127	0	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	13	12	15
Total Lost time (s)	4.0	4.0			4.0					4.0	4.0	
Lane Util. Factor	1.00	0.91			0.91					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)	1719	4693			4857					1510	1538	
Flt Permitted	0.35	1.00			1.00					0.76	1.00	
Satd. Flow (perm)	626	4693			4857					1203	1538	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.94	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	434	2117	0	0	566	71	0	0	0	138	0	197
RTOR Reduction (vph)	0	0	0	0	18	0	0	0	0	0	149	0
Lane Group Flow (vph)	434	2117	0	0	619	0	0	0	0	138	48	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Parking (#/hr)		10								10		10
Turn Type	pm+pt			Perm			Perm			Perm		
Protected Phases	7	4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	58.0	58.0			45.0					20.0	20.0	
Effective Green, g (s)	57.0	60.0			47.0					22.0	22.0	
Actuated g/C Ratio	0.63	0.67			0.52					0.24	0.24	
Clearance Time (s)	3.0	6.0			6.0					6.0	6.0	
Lane Grp Cap (vph)	506	3129			2536					294	376	
v/s Ratio Prot	c0.09	0.45			0.13							0.03
v/s Ratio Perm	c0.46									c0.11		
v/c Ratio	0.86	0.68			0.24					0.47	0.13	
Uniform Delay, d1	10.1	9.1			11.8					29.0	26.5	
Progression Factor	2.04	1.80			0.78					1.00	1.00	
Incremental Delay, d2	6.6	0.4			0.2					5.3	0.7	
Delay (s)	27.1	16.8			9.4					34.3	27.2	
Level of Service	C	B			A					C	C	
Approach Delay (s)		18.5			9.4			0.0			30.1	
Approach LOS		B			A			A			C	

Intersection Summary		
HCM Average Control Delay	18.0	HCM Level of Service B
HCM Volume to Capacity ratio	0.71	
Actuated Cycle Length (s)	90.0	Sum of lost time (s) 8.0
Intersection Capacity Utilization	62.2%	ICU Level of Service B
Analysis Period (min)	15	
c Critical Lane Group		

## Queues

### 9: N. Delaware Ave & Columbia Ave

05/18/2007



Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	2305	18	728	131	239
v/c Ratio	1.08	0.22	0.34	0.36	0.62
Control Delay	56.2	15.7	8.7	27.5	33.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	56.2	15.7	8.7	27.5	33.6
Queue Length 50th (ft)	~804	4	94	56	107
Queue Length 95th (ft)	#948	16	121	98	168
Internal Link Dist (ft)	288		550	50	623
Turn Bay Length (ft)		105			
Base Capacity (vph)	2139	80	2139	364	383
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.08	0.23	0.34	0.36	0.62

#### Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

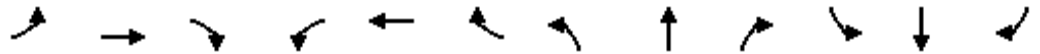
Queue shown is maximum after two cycles.

\* In the Synchro Analysis for this intersection, Delaware Avenue is layed out as an east-west roadway.

# HCM Signalized Intersection Capacity Analysis

## 9: N. Delaware Ave & Columbia Ave

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑			↕			↕	
Volume (vph)	0	2139	5	16	633	0	73	0	37	135	10	53
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			4.0			4.0	
Lane Util. Factor		0.95		1.00	0.95			1.00			1.00	
Frt		1.00		1.00	1.00			0.95			0.96	
Flt Protected		1.00		0.95	1.00			0.97			0.97	
Satd. Flow (prot)		3437		1719	3438			1672			1687	
Flt Permitted		1.00		0.07	1.00			0.72			0.73	
Satd. Flow (perm)		3437		129	3438			1241			1273	
Peak-hour factor, PHF	0.93	0.93	0.93	0.87	0.87	0.87	0.84	0.84	0.84	0.83	0.83	0.83
Adj. Flow (vph)	0	2300	5	18	728	0	87	0	44	163	12	64
RTOR Reduction (vph)	0	0	0	0	0	0	0	5	0	0	15	0
Lane Group Flow (vph)	0	2305	0	18	728	0	0	126	0	0	224	0
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Turn Type				Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases				8			2			6		
Actuated Green, G (s)		55.0		55.0	55.0			24.0			24.0	
Effective Green, g (s)		56.0		56.0	56.0			26.0			26.0	
Actuated g/C Ratio		0.62		0.62	0.62			0.29			0.29	
Clearance Time (s)		5.0		5.0	5.0			6.0			6.0	
Lane Grp Cap (vph)		2139		80	2139			359			368	
v/s Ratio Prot		c0.67			0.21							
v/s Ratio Perm				0.14				0.10			c0.18	
v/c Ratio		1.08		0.22	0.34			0.35			0.61	
Uniform Delay, d1		17.0		7.5	8.1			25.3			27.6	
Progression Factor		0.65		0.99	1.00			1.00			1.00	
Incremental Delay, d2		42.0		6.4	0.4			2.7			7.3	
Delay (s)		53.1		13.8	8.6			28.0			34.9	
Level of Service		D		B	A			C			C	
Approach Delay (s)		53.1			8.7			28.0			34.9	
Approach LOS		D			A			C			C	

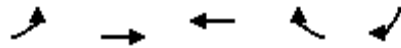
### Intersection Summary

HCM Average Control Delay	41.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# Queues

## 10: N. Delaware Ave & Aramingo Ave

05/18/2007



Lane Group	EBL	EBT	WBT	WBR	SBR
Lane Group Flow (vph)	130	1867	333	1189	325
v/c Ratio	0.09	0.77	0.16	0.83	0.21
Control Delay	6.0	21.1	8.2	7.9	0.3
Queue Delay	0.0	0.0	0.0	0.6	0.0
Total Delay	6.0	21.1	8.2	8.5	0.3
Queue Length 50th (ft)	14	591	40	45	0
Queue Length 95th (ft)	m14	m540	48	41	0
Internal Link Dist (ft)		566	626		
Turn Bay Length (ft)					
Base Capacity (vph)	1421	2438	2123	1432	1516
Starvation Cap Reductn	0	0	0	57	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.09	0.77	0.16	0.86	0.21

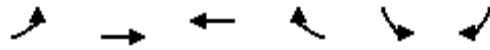
### Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 10: N. Delaware Ave & Aramingo Ave

05/18/2007



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	127	1830	250	892	0	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	4.0	6.0		4.0
Lane Util. Factor	0.97	0.95	0.95	1.00		0.88
Frt	1.00	1.00	1.00	0.85		0.85
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	3433	3539	3539	1583		2787
Flt Permitted	0.51	1.00	1.00	1.00		1.00
Satd. Flow (perm)	1851	3539	3539	1583		2787
Peak-hour factor, PHF	0.98	0.98	0.75	0.75	0.85	0.85
Adj. Flow (vph)	130	1867	333	1189	0	325
RTOR Reduction (vph)	0	0	0	179	0	242
Lane Group Flow (vph)	130	1867	333	1010	0	83
Turn Type	pm+pt		pm+ov		pm+ov	
Protected Phases	5	2	6	7	7	5
Permitted Phases	2			6		7
Actuated Green, G (s)	62.0	62.0	52.0	68.0		21.0
Effective Green, g (s)	63.0	62.0	54.0	68.0		23.0
Actuated g/C Ratio	0.70	0.69	0.60	0.76		0.26
Clearance Time (s)	5.0	6.0	6.0	6.0		5.0
Lane Grp Cap (vph)	1401	2438	2123	1302		712
v/s Ratio Prot	0.01	c0.53	0.09	c0.14		0.01
v/s Ratio Perm	0.06			0.50		0.02
v/c Ratio	0.09	0.77	0.16	0.78		0.12
Uniform Delay, d1	4.3	9.2	7.9	6.5		25.7
Progression Factor	1.53	2.18	1.00	1.00		1.00
Incremental Delay, d2	0.0	0.2	0.2	4.6		0.3
Delay (s)	6.6	20.3	8.1	11.1		26.0
Level of Service	A	C	A	B		C
Approach Delay (s)		19.4	10.4		26.0	
Approach LOS		B	B		C	

### Intersection Summary

HCM Average Control Delay	16.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 11: Penn St & N. Delaware Ave

05/18/2007



Lane Group	WBL	NBT	SBL	SBT
Lane Group Flow (vph)	247	3097	54	852
v/c Ratio	0.61	0.95	0.68	0.26
Control Delay	38.9	20.4	56.4	4.2
Queue Delay	0.0	20.2	0.0	0.0
Total Delay	38.9	40.7	56.4	4.2
Queue Length 50th (ft)	126	490	12	41
Queue Length 95th (ft)	89	#641	#91	51
Internal Link Dist (ft)	171	483		1382
Turn Bay Length (ft)			95	
Base Capacity (vph)	407	3265	80	3285
Starvation Cap Reductn	0	295	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.61	1.04	0.68	0.26

### Intersection Summary

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

# HCM Signalized Intersection Capacity Analysis

## 11: Penn St & N. Delaware Ave

05/18/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T		T	T
Volume (vph)	86	23	2702	147	49	775
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	16	12	12	12	12	12
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.91		1.00	0.91
Frt	0.97		0.99		1.00	1.00
Flt Protected	0.96		1.00		0.95	1.00
Satd. Flow (prot)	1917		4657		1719	4693
Flt Permitted	0.96		1.00		0.06	1.00
Satd. Flow (perm)	1917		4657		115	4693
Peak-hour factor, PHF	0.44	0.44	0.92	0.92	0.91	0.91
Adj. Flow (vph)	195	52	2937	160	54	852
RTOR Reduction (vph)	2	0	7	0	0	0
Lane Group Flow (vph)	245	0	3090	0	54	852
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%
Parking (#/hr)		10	10	10		10
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	17.0		61.0		61.0	61.0
Effective Green, g (s)	19.0		63.0		63.0	63.0
Actuated g/C Ratio	0.21		0.70		0.70	0.70
Clearance Time (s)	6.0		6.0		6.0	6.0
Lane Grp Cap (vph)	405		3260		81	3285
v/s Ratio Prot	c0.13		c0.66			0.18
v/s Ratio Perm					0.47	
v/c Ratio	0.60		0.95		0.67	0.26
Uniform Delay, d1	32.1		12.0		7.6	4.9
Progression Factor	1.00		1.00		1.27	0.81
Incremental Delay, d2	6.5		7.6		35.5	0.2
Delay (s)	38.6		19.6		45.1	4.2
Level of Service	D		B		D	A
Approach Delay (s)	38.6		19.6			6.7
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay		18.0	HCM Level of Service B
HCM Volume to Capacity ratio		0.87	
Actuated Cycle Length (s)		90.0	Sum of lost time (s) 8.0
Intersection Capacity Utilization		68.3%	ICU Level of Service C
Analysis Period (min)		15	
c Critical Lane Group			

Queues

12: Spring Garden St. & N. Delaware Ave

05/18/2007



Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	1120	496	451	2085	961
v/c Ratio	0.91	0.49	1.18	0.75	0.66
Control Delay	38.4	9.7	137.4	16.7	24.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	38.4	9.7	137.4	16.7	24.7
Queue Length 50th (ft)	280	102	~285	288	138
Queue Length 95th (ft)	#461	214	#512	343	181
Internal Link Dist (ft)				1261	483
Turn Bay Length (ft)	160		215		
Base Capacity (vph)	1235	1016	382	2767	1706
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.91	0.49	1.18	0.75	0.56

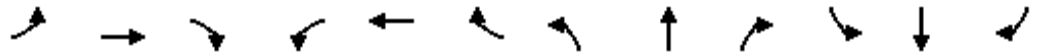
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 12: Spring Garden St. & N. Delaware Ave

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔		↔				↔	↑↑↑		↔	↑↑↑	
Volume (vph)	1053	0	466	0	0	0	419	1939	0	0	609	275
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	4.0			4.0	
Lane Util. Factor	0.97		1.00				1.00	0.91			0.91	
Frt	1.00		0.85				1.00	1.00			0.95	
Flt Protected	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (prot)	3433		1583				1770	5085			4848	
Flt Permitted	0.95		1.00				0.95	1.00			1.00	
Satd. Flow (perm)	3433		1583				1770	5085			4848	
Peak-hour factor, PHF	0.94	0.94	0.94	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	1120	0	496	0	0	0	451	2085	0	0	662	299
RTOR Reduction (vph)	0	0	29	0	0	0	0	0	0	0	98	0
Lane Group Flow (vph)	1120	0	467	0	0	0	451	2085	0	0	863	0
Turn Type	custom		custom				Prot			Prot		
Protected Phases			4 5				5	2		1	6	
Permitted Phases	4		4									
Actuated Green, G (s)	28.1		50.1				16.0	43.5			21.5	
Effective Green, g (s)	30.1		52.1				18.0	45.5			23.5	
Actuated g/C Ratio	0.36		0.62				0.22	0.54			0.28	
Clearance Time (s)	6.0						6.0	6.0			6.0	
Vehicle Extension (s)	3.0						3.0	3.0			3.0	
Lane Grp Cap (vph)	1236		987				381	2768			1363	
v/s Ratio Prot			0.29				c0.25	c0.41			0.18	
v/s Ratio Perm	c0.33											
v/c Ratio	0.91		0.47				1.18	0.75			0.63	
Uniform Delay, d1	25.4		8.4				32.8	14.7			26.3	
Progression Factor	1.00		1.00				1.00	1.00			1.00	
Incremental Delay, d2	9.6		0.4				106.3	2.0			1.0	
Delay (s)	35.0		8.8				139.1	16.7			27.3	
Level of Service	D		A				F	B			C	
Approach Delay (s)		27.0			0.0			38.4			27.3	
Approach LOS		C			A			D			C	

### Intersection Summary

HCM Average Control Delay	32.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	83.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

# Queues

## 13: Callowhill St. & Columbus Blvd

05/18/2007



Lane Group	EBL	EBR	NBT	SBT
Lane Group Flow (vph)	40	107	3085	1151
v/c Ratio	0.17	0.35	0.78	0.29
Control Delay	36.6	11.0	7.5	3.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	36.6	11.0	7.5	3.1
Queue Length 50th (ft)	20	0	279	53
Queue Length 95th (ft)	42	28	335	65
Internal Link Dist (ft)	147		1206	1261
Turn Bay Length (ft)				
Base Capacity (vph)	236	304	3955	3955
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.17	0.35	0.78	0.29

### Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 13: Callowhill St. & Columbus Blvd

05/18/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	30	80	0	2838	1070	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.91	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	1770	1583		5085	5085	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	1770	1583		5085	5085	
Peak-hour factor, PHF	0.75	0.75	0.92	0.92	0.93	0.93
Adj. Flow (vph)	40	107	0	3085	1151	0
RTOR Reduction (vph)	0	93	0	0	0	0
Lane Group Flow (vph)	40	14	0	3085	1151	0
Turn Type	Perm					
Protected Phases	4			2	6	
Permitted Phases	4					
Actuated Green, G (s)	10.0	10.0		68.0	68.0	
Effective Green, g (s)	12.0	12.0		70.0	70.0	
Actuated g/C Ratio	0.13	0.13		0.78	0.78	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)	236	211		3955	3955	
v/s Ratio Prot	c0.02			c0.61	0.23	
v/s Ratio Perm		0.01				
v/c Ratio	0.17	0.07		0.78	0.29	
Uniform Delay, d1	34.6	34.1		5.7	2.9	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	0.6		1.6	0.2	
Delay (s)	36.1	34.7		7.2	3.1	
Level of Service	D	C		A	A	
Approach Delay (s)	35.1			7.2	3.1	
Approach LOS	D			A	A	

### Intersection Summary

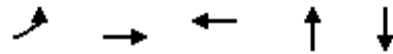
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 14: Race St & Columbus Blvd

05/18/2007



Lane Group	EBL	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	327	220	2	2484	1238
v/c Ratio	0.89	0.47	0.02	0.73	0.36
Control Delay	60.9	9.0	42.5	11.4	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	60.9	9.0	42.5	11.4	6.9
Queue Length 50th (ft)	167	2	1	247	83
Queue Length 95th (ft)	#377	65	8	471	165
Internal Link Dist (ft)		497	85	1197	1206
Turn Bay Length (ft)					
Base Capacity (vph)	369	469	186	3420	3420
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.89	0.47	0.01	0.73	0.36

### Intersection Summary

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

# HCM Signalized Intersection Capacity Analysis

## 14: Race St & Columbus Blvd

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	301	2	201	2	0	0	0	2285	0	0	1139	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0			6.0			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	1586			1770			5085			5085	
Flt Permitted	0.95	1.00			1.00			1.00			1.00	
Satd. Flow (perm)	1770	1586			1863			5085			5085	
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)	327	2	218	2	0	0	0	2484	0	0	1238	0
RTOR Reduction (vph)	0	177	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	327	43	0	0	2	0	0	2484	0	0	1238	0
Turn Type	Split		Perm									
Protected Phases	4	4			8			2			6	
Permitted Phases				8								
Actuated Green, G (s)	16.0	16.0			1.2			56.2			56.2	
Effective Green, g (s)	18.0	16.0			1.2			58.2			58.2	
Actuated g/C Ratio	0.20	0.18			0.01			0.64			0.64	
Clearance Time (s)	6.0	6.0			6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)	349	278			24			3238			3238	
v/s Ratio Prot	c0.18	0.03						c0.49			0.24	
v/s Ratio Perm					c0.00							
v/c Ratio	0.94	0.15			0.08			0.77			0.38	
Uniform Delay, d1	36.1	32.0			44.6			11.8			8.0	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	32.0	0.3			1.5			1.8			0.3	
Delay (s)	68.1	32.2			46.1			13.6			8.3	
Level of Service	E	C			D			B			A	
Approach Delay (s)		53.7			46.1			13.6			8.3	
Approach LOS		D			D			B			A	

### Intersection Summary

HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	91.4	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

# Queues

## 15: Penn's Landing & Columbus Blvd

05/18/2007



Lane Group	WBL	NBT	SBL	SBT
Lane Group Flow (vph)	395	2111	9	1410
v/c Ratio	0.84	0.75	0.08	0.42
Control Delay	42.9	17.3	41.0	7.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	42.9	17.3	41.0	7.4
Queue Length 50th (ft)	169	312	5	119
Queue Length 95th (ft)	211	372	20	145
Internal Link Dist (ft)	281	402		1197
Turn Bay Length (ft)			200	
Base Capacity (vph)	469	2823	118	3390
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.84	0.75	0.08	0.42

### Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 15: Penn's Landing & Columbus Blvd

05/18/2007



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵		↑↑↑		↵	↑↑↑
Volume (vph)	56	240	1893	7	8	1311
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.91		1.00	0.91
Frt	0.89		1.00		1.00	1.00
Flt Protected	0.99		1.00		0.95	1.00
Satd. Flow (prot)	1643		5082		1770	5085
Flt Permitted	0.99		1.00		0.95	1.00
Satd. Flow (perm)	1643		5082		1770	5085
Peak-hour factor, PHF	0.75	0.75	0.90	0.90	0.93	0.93
Adj. Flow (vph)	75	320	2103	8	9	1410
RTOR Reduction (vph)	67	0	0	0	0	0
Lane Group Flow (vph)	328	0	2111	0	9	1410
Turn Type					Prot	
Protected Phases	8		2		1	6
Permitted Phases						
Actuated Green, G (s)	20.0		48.0		4.0	58.0
Effective Green, g (s)	22.0		50.0		6.0	60.0
Actuated g/C Ratio	0.24		0.56		0.07	0.67
Clearance Time (s)	6.0		6.0		6.0	6.0
Lane Grp Cap (vph)	402		2823		118	3390
v/s Ratio Prot	c0.20		c0.42		0.01	c0.28
v/s Ratio Perm						
v/c Ratio	0.82		0.75		0.08	0.42
Uniform Delay, d1	32.1		15.2		39.4	6.9
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	16.5		1.9		1.3	0.4
Delay (s)	48.6		17.1		40.7	7.3
Level of Service	D		B		D	A
Approach Delay (s)	48.6		17.1			7.5
Approach LOS	D		B			A

### Intersection Summary

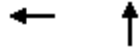
HCM Average Control Delay	16.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 16: Callowhill St. & 3rd St.

05/18/2007



Lane Group	WBT	NBT
Lane Group Flow (vph)	2682	500
v/c Ratio	0.59	0.46
Control Delay	11.8	26.5
Queue Delay	0.0	0.0
Total Delay	11.8	26.5
Queue Length 50th (ft)	214	118
Queue Length 95th (ft)	242	158
Internal Link Dist (ft)	309	280
Turn Bay Length (ft)		
Base Capacity (vph)	4515	1092
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.59	0.46

### Intersection Summary

# HCM Signalized Intersection Capacity Analysis

## 16: Callowhill St. & 3rd St.

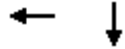
05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑↑			↑↑				
Volume (vph)	0	0	0	0	2452	42	92	343	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0			4.0				
Lane Util. Factor					0.81			0.95				
Frt					1.00			1.00				
Flt Protected					1.00			0.99				
Satd. Flow (prot)					7525			3502				
Flt Permitted					1.00			0.99				
Satd. Flow (perm)					7525			3502				
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	2637	45	106	394	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	3	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	2679	0	0	499	0	0	0	0
Turn Type								Perm				
Protected Phases					6			8				
Permitted Phases							8					
Actuated Green, G (s)					52.0			26.0				
Effective Green, g (s)					54.0			28.0				
Actuated g/C Ratio					0.60			0.31				
Clearance Time (s)					6.0			6.0				
Lane Grp Cap (vph)					4515			1090				
v/s Ratio Prot					0.36							
v/s Ratio Perm								0.14				
v/c Ratio					0.59			0.46				
Uniform Delay, d1					11.2			24.9				
Progression Factor					1.00			1.00				
Incremental Delay, d2					0.6			1.4				
Delay (s)					11.8			26.3				
Level of Service					B			C				
Approach Delay (s)		0.0			11.8			26.3			0.0	
Approach LOS		A			B			C			A	
<b>Intersection Summary</b>												
HCM Average Control Delay			14.0					HCM Level of Service			B	
HCM Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			90.0					Sum of lost time (s)			8.0	
Intersection Capacity Utilization			47.8%					ICU Level of Service			A	
Analysis Period (min)			15									
c Critical Lane Group												

Queues  
17: 4th St &

05/18/2007



Lane Group	WBT	SBT
Lane Group Flow (vph)	2842	555
v/c Ratio	0.63	0.53
Control Delay	4.9	27.7
Queue Delay	0.1	0.0
Total Delay	5.0	27.7
Queue Length 50th (ft)	65	135
Queue Length 95th (ft)	70	156
Internal Link Dist (ft)	367	1136
Turn Bay Length (ft)		
Base Capacity (vph)	4525	1045
Starvation Cap Reductn	7	0
Spillback Cap Reductn	371	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.68	0.53
<b>Intersection Summary</b>		

# HCM Signalized Intersection Capacity Analysis

17: 4th St &

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					←←←←						↑↑	
Volume (vph)	0	0	0	158	2485	0	0	0	0	0	283	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0						4.0	
Lane Util. Factor					0.81						0.95	
Frt					1.00						0.95	
Flt Protected					1.00						1.00	
Satd. Flow (prot)					7522						3356	
Flt Permitted					1.00						1.00	
Satd. Flow (perm)					7522						3356	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92	0.78	0.78	0.78
Adj. Flow (vph)	0	0	0	170	2672	0	0	0	0	0	363	192
RTOR Reduction (vph)	0	0	0	0	13	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	0	0	0	2829	0	0	0	0	0	554	0
Turn Type					Perm							
Protected Phases						8						6
Permitted Phases					8							
Actuated Green, G (s)						52.0						26.0
Effective Green, g (s)						54.0						28.0
Actuated g/C Ratio						0.60						0.31
Clearance Time (s)						6.0						6.0
Lane Grp Cap (vph)						4513						1044
v/s Ratio Prot												c0.16
v/s Ratio Perm						0.38						
v/c Ratio						0.63						0.53
Uniform Delay, d1						11.5						25.6
Progression Factor						0.38						1.00
Incremental Delay, d2						0.6						1.9
Delay (s)						4.9						27.5
Level of Service						A						C
Approach Delay (s)		0.0				4.9		0.0				27.5
Approach LOS		A				A		A				C

## Intersection Summary

HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 18: Callowhill St. & 5th St.

05/18/2007



Lane Group	WBT	NBL	NBT
Lane Group Flow (vph)	3039	96	1061
v/c Ratio	0.69	0.17	0.96
Control Delay	15.9	22.9	51.3
Queue Delay	6.7	0.0	0.0
Total Delay	22.6	22.9	51.3
Queue Length 50th (ft)	404	38	310
Queue Length 95th (ft)	452	76	#446
Internal Link Dist (ft)	369		252
Turn Bay Length (ft)			
Base Capacity (vph)	4436	553	1101
Starvation Cap Reductn	1367	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.99	0.17	0.96

### Intersection Summary

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

# HCM Signalized Intersection Capacity Analysis

## 18: Callowhill St. & 5th St.

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑↑↑		↖	↑↑				
Volume (vph)	0	0	0	0	2423	404	86	955	0	0	0	0
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				
Lane Util. Factor					0.81		1.00	0.95				
Fr <sub>t</sub>					0.98		1.00	1.00				
Fl <sub>t</sub> Protected					1.00		0.95	1.00				
Satd. Flow (prot)					7383		1770	3539				
Fl <sub>t</sub> Permitted					1.00		0.95	1.00				
Satd. Flow (perm)					7383		1770	3539				
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	2605	434	96	1061	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	4	0	2	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	3035	0	94	1061	0	0	0	0
Turn Type							Perm					
Protected Phases					8			2				
Permitted Phases							2					
Actuated Green, G (s)					52.0		26.0	26.0				
Effective Green, g (s)					54.0		28.0	28.0				
Actuated g/C Ratio					0.60		0.31	0.31				
Clearance Time (s)					6.0		6.0	6.0				
Lane Grp Cap (vph)					4430		551	1101				
v/s Ratio Prot					c0.41			c0.30				
v/s Ratio Perm							0.05					
v/c Ratio					0.69		0.17	0.96				
Uniform Delay, d <sub>1</sub>					12.2		22.6	30.5				
Progression Factor					1.24		1.00	1.00				
Incremental Delay, d <sub>2</sub>					0.7		0.7	19.7				
Delay (s)					15.8		23.2	50.2				
Level of Service					B		C	D				
Approach Delay (s)		0.0			15.8			47.9			0.0	
Approach LOS		A			B			D			A	

### Intersection Summary

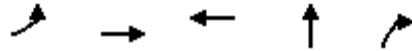
HCM Average Control Delay	24.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues

19: Spring Garden St. & 5th St

05/18/2007



Lane Group	EBL	EBT	WBT	NBT	NBR
Lane Group Flow (vph)	180	1213	1012	1252	362
v/c Ratio	0.93	0.64	0.66	1.07	0.71
Control Delay	67.5	11.9	6.3	71.3	25.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	67.5	11.9	6.3	71.3	25.4
Queue Length 50th (ft)	31	148	64	~274	98
Queue Length 95th (ft)	#108	207	108	#389	#210
Internal Link Dist (ft)		356	392	1122	
Turn Bay Length (ft)	155				30
Base Capacity (vph)	193	1887	1525	1166	511
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.93	0.64	0.66	1.07	0.71

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 19: Spring Garden St. & 5th St

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑			↑↑			↔↑	↗			
Volume (vph)	176	1189	0	0	876	106	292	898	344	0	0	0
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			4.0	6.0			
Lane Util. Factor	1.00	0.95			0.95			0.95	1.00			
Frt	1.00	1.00			0.98			1.00	0.85			
Flt Protected	0.95	1.00			1.00			0.99	1.00			
Satd. Flow (prot)	1770	3539			3482			3496	1583			
Flt Permitted	0.14	1.00			1.00			0.99	1.00			
Satd. Flow (perm)	268	3539			3482			3496	1583			
Peak-hour factor, PHF	0.98	0.98	0.98	0.97	0.97	0.97	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	180	1213	0	0	903	109	307	945	362	0	0	0
RTOR Reduction (vph)	0	0	0	0	15	0	0	0	36	0	0	0
Lane Group Flow (vph)	180	1213	0	0	997	0	0	1252	326	0	0	0
Turn Type	pm+pt							Split		Perm		
Protected Phases	7	4			8		2	2				
Permitted Phases	4								2			
Actuated Green, G (s)	30.0	30.0			24.0			18.0	18.0			
Effective Green, g (s)	31.0	32.0			26.0			20.0	18.0			
Actuated g/C Ratio	0.52	0.53			0.43			0.33	0.30			
Clearance Time (s)	5.0	6.0			6.0			6.0	6.0			
Lane Grp Cap (vph)	189	1887			1509			1165	475			
v/s Ratio Prot	0.03	c0.34			0.29			c0.36				
v/s Ratio Perm	c0.46								0.21			
v/c Ratio	0.95	0.64			0.66			1.07	0.69			
Uniform Delay, d1	14.9	9.9			13.5			20.0	18.5			
Progression Factor	1.00	1.00			0.31			1.00	1.00			
Incremental Delay, d2	54.1	1.7			2.1			48.9	7.8			
Delay (s)	69.0	11.6			6.3			68.9	26.3			
Level of Service	E	B			A			E	C			
Approach Delay (s)		19.1			6.3			59.3			0.0	
Approach LOS		B			A			E			A	

### Intersection Summary

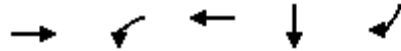
HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 20: Spring Garden St. &

05/18/2007



Lane Group	EBT	WBL	WBT	SBT	SBR
Lane Group Flow (vph)	1818	68	992	329	93
v/c Ratio	1.03	0.36	0.47	0.67	0.22
Control Delay	44.9	12.2	4.9	27.8	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	12.2	4.9	27.8	10.9
Queue Length 50th (ft)	~244	6	50	106	10
Queue Length 95th (ft)	#493	m16	85	#190	41
Internal Link Dist (ft)	392		378	276	
Turn Bay Length (ft)		170			40
Base Capacity (vph)	1761	191	2123	491	414
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.03	0.36	0.47	0.67	0.22

### Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 20: Spring Garden St. &

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑						↖	↖
Volume (vph)	0	1576	97	63	913	0	0	0	0	65	237	86
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						4.0	6.0
Lane Util. Factor		0.95		1.00	0.95						1.00	1.00
Frt		0.99		1.00	1.00						1.00	0.85
Flt Protected		1.00		0.95	1.00						0.99	1.00
Satd. Flow (prot)		3509		1770	3539						1843	1583
Flt Permitted		1.00		0.12	1.00						0.99	1.00
Satd. Flow (perm)		3509		233	3539						1843	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)	0	1713	105	68	992	0	0	0	0	71	258	93
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	0	44
Lane Group Flow (vph)	0	1811	0	68	992	0	0	0	0	0	329	49
Turn Type				pm+pt						Perm		Perm
Protected Phases		4		3	8						6	
Permitted Phases				8						6		6
Actuated Green, G (s)		28.0		34.0	34.0						14.0	14.0
Effective Green, g (s)		30.0		34.0	36.0						16.0	14.0
Actuated g/C Ratio		0.50		0.57	0.60						0.27	0.23
Clearance Time (s)		6.0		4.0	6.0						6.0	6.0
Lane Grp Cap (vph)		1755		183	2123						491	369
v/s Ratio Prot		c0.52		0.01	c0.28							
v/s Ratio Perm				0.20							0.18	0.03
v/c Ratio		1.03		0.37	0.47						0.67	0.13
Uniform Delay, d1		15.0		29.2	6.7						19.6	18.2
Progression Factor		0.92		1.55	0.62						1.00	1.00
Incremental Delay, d2		28.2		4.7	0.6						7.1	0.7
Delay (s)		42.0		49.8	4.8						26.7	18.9
Level of Service		D		D	A						C	B
Approach Delay (s)		42.0			7.7			0.0			25.0	
Approach LOS		D			A			A			C	

### Intersection Summary

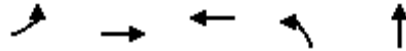
HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 21: Spring Garden St. & 3rd St.

05/18/2007



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	188	1453	1033	124	489
v/c Ratio	0.91	0.72	0.63	0.23	0.89
Control Delay	28.1	9.6	9.1	17.3	40.3
Queue Delay	0.0	0.1	0.0	0.0	0.0
Total Delay	28.1	9.7	9.1	17.3	40.3
Queue Length 50th (ft)	40	118	77	33	156
Queue Length 95th (ft)	m38	m115	m98	69	#320
Internal Link Dist (ft)		378	448		1140
Turn Bay Length (ft)	126				
Base Capacity (vph)	207	2005	1640	531	551
Starvation Cap Reductn	0	47	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.91	0.74	0.63	0.23	0.89

### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

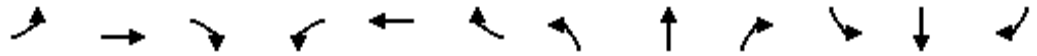
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 21: Spring Garden St. & 3rd St.

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	173	1337	0	0	851	99	114	282	167	0	0	0
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		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00				
Frt	1.00	1.00			0.98		1.00	0.94				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1770	3539			3484		1770	1759				
Flt Permitted	0.15	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	278	3539			3484		1770	1759				
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)	188	1453	0	0	925	108	124	307	182	0	0	0
RTOR Reduction (vph)	0	0	0	0	15	0	0	24	0	0	0	0
Lane Group Flow (vph)	188	1453	0	0	1018	0	124	465	0	0	0	0
Turn Type	pm+pt						Split					
Protected Phases	7	4			8		2	2				
Permitted Phases	4											
Actuated Green, G (s)	32.0	32.0			26.0		16.0	16.0				
Effective Green, g (s)	32.0	34.0			28.0		18.0	18.0				
Actuated g/C Ratio	0.53	0.57			0.47		0.30	0.30				
Clearance Time (s)	4.0	6.0			6.0		6.0	6.0				
Lane Grp Cap (vph)	198	2005			1626		531	528				
v/s Ratio Prot	0.03	c0.41			0.29		0.07	c0.26				
v/s Ratio Perm	c0.47											
v/c Ratio	0.95	0.72			0.63		0.23	0.88				
Uniform Delay, d1	14.3	9.6			12.1		15.8	20.0				
Progression Factor	1.72	0.95			0.61		1.00	1.00				
Incremental Delay, d2	10.5	0.2			1.7		1.0	18.7				
Delay (s)	35.1	9.3			9.1		16.8	38.7				
Level of Service	D	A			A		B	D				
Approach Delay (s)		12.2			9.1		34.3				0.0	
Approach LOS		B			A		C				A	

### Intersection Summary

HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 22: Spring Garden St. & 2nd St.

05/18/2007



Lane Group	EBT	WBL	WBT	SBT
Lane Group Flow (vph)	1833	97	783	885
v/c Ratio	1.11	0.51	0.39	0.84
Control Delay	76.2	16.9	8.0	27.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	76.2	16.9	8.0	27.4
Queue Length 50th (ft)	~397	14	73	145
Queue Length 95th (ft)	m#522	#35	105	#242
Internal Link Dist (ft)	448		1146	338
Turn Bay Length (ft)		67		
Base Capacity (vph)	1644	191	2005	1057
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.11	0.51	0.39	0.84

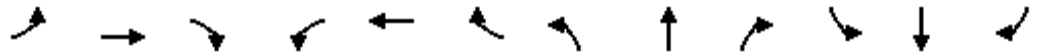
### Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 22: Spring Garden St. & 2nd St.

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑						↑↑	
Volume (vph)	0	1576	110	89	720	0	0	0	0	184	457	173
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						4.0	
Lane Util. Factor		0.95		1.00	0.95						0.95	
Frt		0.99		1.00	1.00						0.97	
Flt Protected		1.00		0.95	1.00						0.99	
Satd. Flow (prot)		3504		1770	3539						3388	
Flt Permitted		1.00		0.13	1.00						0.99	
Satd. Flow (perm)		3504		248	3539						3388	
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	1713	120	97	783	0	0	0	0	200	497	188
RTOR Reduction (vph)	0	9	0	0	0	0	0	0	0	0	41	0
Lane Group Flow (vph)	0	1824	0	97	783	0	0	0	0	0	844	0
Turn Type				pm+pt						Split		
Protected Phases		4		3	8					6	6	
Permitted Phases				8								
Actuated Green, G (s)		26.0		32.0	32.0						16.0	
Effective Green, g (s)		28.0		32.0	34.0						18.0	
Actuated g/C Ratio		0.47		0.53	0.57						0.30	
Clearance Time (s)		6.0		4.0	6.0						6.0	
Lane Grp Cap (vph)		1635		183	2005						1016	
v/s Ratio Prot		c0.52		0.02	c0.22						c0.25	
v/s Ratio Perm				0.26								
v/c Ratio		1.12		0.53	0.39						0.83	
Uniform Delay, d1		16.0		29.7	7.2						19.6	
Progression Factor		0.87		1.00	1.00						1.00	
Incremental Delay, d2		59.1		10.6	0.6						7.9	
Delay (s)		73.1		40.2	7.8						27.5	
Level of Service		E		D	A						C	
Approach Delay (s)		73.1			11.4			0.0			27.5	
Approach LOS		E			B			A			C	

### Intersection Summary

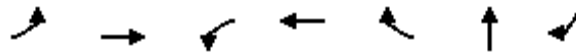
HCM Average Control Delay	46.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

# Queues

## 23: Richmond St & I95 Ramp

05/18/2007



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBR
Lane Group Flow (vph)	1132	1227	2	501	438	27	983
v/c Ratio	0.92	0.68	0.03	0.66	0.72	0.04	0.83
Control Delay	34.8	20.8	37.5	44.7	11.4	12.8	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.8	20.8	37.5	44.7	11.4	12.8	15.9
Queue Length 50th (ft)	289	295	1	111	0	5	338
Queue Length 95th (ft)	#421	371	8	149	96	23	573
Internal Link Dist (ft)		626		336		135	
Turn Bay Length (ft)	450		95				
Base Capacity (vph)	1235	1804	75	763	610	631	1190
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.92	0.68	0.03	0.66	0.72	0.04	0.83

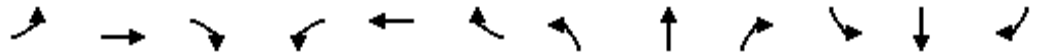
### Intersection Summary

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

# HCM Signalized Intersection Capacity Analysis

## 23: Richmond St & I95 Ramp

05/18/2007



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1041	1124	5	2	461	403	13	0	12	0	0	904
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0				5.0
Lane Util. Factor	0.97	0.95		1.00	0.91	1.00		1.00				1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.94				0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97				1.00
Satd. Flow (prot)	3433	3537		1770	5085	1583		1698				1583
Flt Permitted	0.24	1.00		0.27	1.00	1.00		0.92				1.00
Satd. Flow (perm)	857	3537		497	5085	1583		1598				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)	1132	1222	5	2	501	438	14	0	13	0	0	983
RTOR Reduction (vph)	0	0	0	0	0	372	0	8	0	0	0	3
Lane Group Flow (vph)	1132	1227	0	2	501	66	0	19	0	0	0	980
Turn Type	pm+pt			Perm		Perm	Perm			Perm		pt+ov
Protected Phases	5	2			6			8			4	4 5
Permitted Phases	2			6	6	6	8			4		
Actuated Green, G (s)	51.0	51.0		15.0	15.0	15.0		39.0				75.0
Effective Green, g (s)	51.0	51.0		15.0	15.0	15.0		39.0				75.0
Actuated g/C Ratio	0.51	0.51		0.15	0.15	0.15		0.39				0.75
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0				5.0
Lane Grp Cap (vph)	1236	1804		75	763	237		623				1187
v/s Ratio Prot	c0.28	0.35			0.10							c0.62
v/s Ratio Perm	c0.18			0.00		0.04		0.01				
v/c Ratio	0.92	0.68		0.03	0.66	0.28		0.03				0.83
Uniform Delay, d1	22.7	18.4		36.3	40.1	37.7		18.8				8.2
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00				1.00
Incremental Delay, d2	12.0	2.1		0.7	4.4	2.9		0.1				6.6
Delay (s)	34.8	20.5		36.9	44.5	40.6		18.9				14.8
Level of Service	C	C		D	D	D		B				B
Approach Delay (s)		27.3			42.6			18.9			14.8	
Approach LOS		C			D			B			B	

### Intersection Summary

HCM Average Control Delay	27.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 31: Laurel Ave & Frankford Ave

05/18/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	7	78	0	464	308	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.42	0.85	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	92	0	504	335	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				99		
pX, platoon unblocked	0.88					
vC, conflicting volume	839	167	335			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	746	167	335			
tC, single (s)	6.9	7.0	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	94	89	100			
cM capacity (veh/h)	300	838	1200			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	108	504	223	112
Volume Left	17	0	0	0
Volume Right	92	0	0	0
cSH	657	1200	1700	1700
Volume to Capacity	0.16	0.00	0.13	0.07
Queue Length 95th (ft)	15	0	0	0
Control Delay (s)	11.6	0.0	0.0	0.0
Lane LOS	B			
Approach Delay (s)	11.6	0.0	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization	36.3%		ICU Level of Service A
Analysis Period (min)		15	