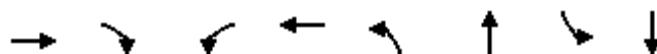


Queues
201: Taylorsville Rd &

AM Peak
5/9/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	65	815	283	87	130	489	22	929
v/c Ratio	0.12	0.77	0.76	0.17	0.19	0.29	0.12	0.89
Control Delay	16.0	15.6	35.4	13.3	26.8	9.1	26.4	33.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	15.6	35.4	13.3	26.8	9.1	26.4	33.9
Queue Length 50th (ft)	17	189	91	17	24	40	7	165
Queue Length 95th (ft)	41	326	#199	45	48	73	26	#274
Internal Link Dist (ft)	420			514		400		70
Turn Bay Length (ft)			250				150	
Base Capacity (vph)	563	1063	382	530	674	1708	184	1043
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.77	0.74	0.16	0.19	0.29	0.12	0.89

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

201: Taylorsville Rd &

AM Peak

5/9/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	50	750	260	60	20	120	330	120	20	845	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	15	12	12	12	12	12	13	12	12	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		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	1.00		0.97	0.95		1.00	*0.97	
Frt		1.00	0.85	1.00	0.96		1.00	0.96		1.00	1.00	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1949	1838	1693	1715		3095	3064		1753	3573	
Flt Permitted		0.95	1.00	0.71	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1877	1838	1274	1715		3095	3064		1753	3573	
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)	11	54	815	283	65	22	130	359	130	22	918	11
RTOR Reduction (vph)	0	0	6	0	16	0	0	55	0	0	1	0
Lane Group Flow (vph)	0	65	809	283	71	0	130	434	0	22	928	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm	pm+ov		Perm			Prot			Prot		
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		15.5	26.6	15.5	15.5		11.1	25.7		0.8	15.4	
Effective Green, g (s)		17.5	30.6	17.5	17.5		13.1	27.7		2.8	17.4	
Actuated g/C Ratio		0.29	0.51	0.29	0.29		0.22	0.46		0.05	0.29	
Clearance Time (s)		6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0	5.0	5.0	5.0		5.0	5.0		3.0	5.0	
Lane Grp Cap (vph)		547	1060	372	500		676	1415		82	1036	
v/s Ratio Prot			c0.17		0.04		0.04	0.14		0.01	c0.26	
v/s Ratio Perm		0.03	0.27	0.22								
v/c Ratio		0.12	0.76	0.76	0.14		0.19	0.31		0.27	0.90	
Uniform Delay, d1		15.6	11.8	19.3	15.7		19.1	10.1		27.6	20.4	
Progression Factor		1.00	1.00	1.00	1.00		1.34	1.28		1.00	1.00	
Incremental Delay, d2		0.2	3.9	10.4	0.3		0.3	0.6		1.8	10.7	
Delay (s)		15.8	15.7	29.7	16.0		26.0	13.6		29.4	31.2	
Level of Service		B	B	C	B		C	B		C	C	
Approach Delay (s)		15.7			26.5			16.2			31.1	
Approach LOS		B			C			B			C	
Intersection Summary												
HCM Average Control Delay			22.4			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			94.5%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

Queues
203: SB ENTRANCE RAMP & Taylorsville Rd

AM Peak
5/9/2011



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	250	228	168	370	1620	397
v/c Ratio	0.38	0.14	0.45	0.16	0.91	0.40
Control Delay	22.3	0.2	9.5	5.1	19.9	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	0.2	9.5	5.1	19.9	1.7
Queue Length 50th (ft)	40	0	24	27	~243	9
Queue Length 95th (ft)	65	0	m50	m50	m#453	m15
Internal Link Dist (ft)	169			707	400	
Turn Bay Length (ft)			100			200
Base Capacity (vph)	915	1583	371	2382	1776	992
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.14	0.45	0.16	0.91	0.40

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

203: SB ENTRANCE RAMP & Taylorsville Rd

AM Peak
5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→	←	↑↑	↑↑	→
Volume (vph)	230	210	155	340	1490	365
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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)	3433	1583	1752	3539	3539	1583
Flt Permitted	0.95	1.00	0.12	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	224	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	228	168	370	1620	397
RTOR Reduction (vph)	0	0	0	0	0	206
Lane Group Flow (vph)	250	228	168	370	1620	191
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%
Turn Type		Free	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			6
Actuated Green, G (s)	9.6	60.0	38.4	38.4	26.9	26.9
Effective Green, g (s)	11.6	60.0	40.4	40.4	28.9	28.9
Actuated g/C Ratio	0.19	1.00	0.67	0.67	0.48	0.48
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)	664	1583	342	2383	1705	762
v/s Ratio Prot	c0.07		c0.06	0.10	c0.46	
v/s Ratio Perm		0.14	0.27			0.12
v/c Ratio	0.38	0.14	0.49	0.16	0.95	0.25
Uniform Delay, d1	21.1	0.0	10.9	3.6	14.9	9.2
Progression Factor	1.00	1.00	0.97	1.28	0.72	0.68
Incremental Delay, d2	0.4	0.2	1.1	0.1	8.1	0.4
Delay (s)	21.4	0.2	11.6	4.7	18.7	6.7
Level of Service	C	A	B	A	B	A
Approach Delay (s)	11.3			6.9	16.4	
Approach LOS	B			A	B	

Intersection Summary

HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues
208: NB EXIT RAMP &

AM Peak
5/9/2011



Lane Group	EBL	EBR	NBT	SBT	SBR
Lane Group Flow (vph)	261	76	1630	391	1446
v/c Ratio	0.39	0.21	0.69	0.17	0.92
Control Delay	22.2	7.0	8.5	5.4	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	7.0	8.5	5.4	19.7
Queue Length 50th (ft)	42	0	153	27	450
Queue Length 95th (ft)	67	27	260	m29	m#550
Internal Link Dist (ft)	171		299	91	
Turn Bay Length (ft)					
Base Capacity (vph)	889	466	2363	2340	1568
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	0.29	0.16	0.69	0.17	0.92

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

208: NB EXIT RAMP &

AM Peak
5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱		↱↱	↱↱	↰
Volume (vph)	240	70	0	1500	360	1330
Ideal Flow (vphpl)	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		0.95	0.95	1.00
Flt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	3335	1538		3539	3505	1568
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	3335	1538		3539	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	76	0	1630	391	1446
RTOR Reduction (vph)	0	61	0	0	0	0
Lane Group Flow (vph)	261	15	0	1630	391	1446
Heavy Vehicles (%)	5%	5%	2%	2%	3%	3%
Turn Type	Perm				Free	
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	9.9	9.9		38.1	38.1	60.0
Effective Green, g (s)	11.9	11.9		40.1	40.1	60.0
Actuated g/C Ratio	0.20	0.20		0.67	0.67	1.00
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)	661	305		2365	2343	1568
v/s Ratio Prot	0.08			0.46	0.11	
v/s Ratio Perm		0.01				c0.92
v/c Ratio	0.39	0.05		0.69	0.17	0.92
Uniform Delay, d1	20.9	19.5		6.1	3.7	0.0
Progression Factor	1.00	1.00		1.00	1.29	1.00
Incremental Delay, d2	0.4	0.1		1.7	0.1	6.4
Delay (s)	21.3	19.5		7.8	4.9	6.4
Level of Service	C	B		A	A	A
Approach Delay (s)	20.9			7.8	6.1	
Approach LOS	C			A	A	

Intersection Summary

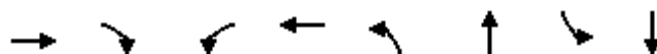
HCM Average Control Delay	8.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues

201: WOODSIDE RD &

5/9/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	142	261	163	87	630	858	11	386
v/c Ratio	0.31	0.22	0.56	0.20	0.69	0.46	0.05	0.44
Control Delay	19.4	2.0	27.0	16.0	25.8	6.6	24.3	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	2.0	27.0	16.0	25.8	6.6	24.3	20.2
Queue Length 50th (ft)	41	5	51	21	79	47	4	63
Queue Length 95th (ft)	77	32	97	48	#218	145	16	88
Internal Link Dist (ft)	420			514		400		70
Turn Bay Length (ft)								
Base Capacity (vph)	559	1183	356	532	908	1872	217	1051
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.22	0.46	0.16	0.69	0.46	0.05	0.37

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

201: WOODSIDE RD &

5/9/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	110	240	150	70	10	580	500	290	10	345	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	15	12	12	12	11	12	12	12	12	12
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		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	1.00		0.97	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.98		1.00	0.94		1.00	1.00	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1951	1838	1693	1749		2992	3015		1753	3491	
Flt Permitted		0.95	1.00	0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1861	1838	1188	1749		2992	3015		1753	3491	
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)	22	120	261	163	76	11	630	543	315	11	375	11
RTOR Reduction (vph)	0	0	82	0	8	0	0	113	0	0	4	0
Lane Group Flow (vph)	0	142	179	163	79	0	630	745	0	11	382	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm		pt+ov	Perm			Prot			Prot		
Protected Phases		4	4 5		8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		12.6	34.8	12.6	12.6		16.2	28.6		0.8	13.2	
Effective Green, g (s)		14.6	36.8	14.6	14.6		18.2	30.6		2.8	15.2	
Actuated g/C Ratio		0.24	0.61	0.24	0.24		0.30	0.51		0.05	0.25	
Clearance Time (s)		6.0		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	3.0	
Lane Grp Cap (vph)		453	1127	289	426		908	1538		82	884	
v/s Ratio Prot			0.10		0.04		c0.21	c0.25		0.01	0.11	
v/s Ratio Perm		0.08		c0.14								
v/c Ratio		0.31	0.16	0.56	0.18		0.69	0.48		0.13	0.43	
Uniform Delay, d1		18.6	5.0	19.9	18.0		18.4	9.6		27.4	18.8	
Progression Factor		1.00	1.00	1.00	1.00		0.97	0.93		1.00	1.00	
Incremental Delay, d2		0.4	0.1	2.5	0.2		2.0	0.9		0.7	1.5	
Delay (s)		19.0	5.0	22.4	18.2		19.8	9.8		28.2	20.3	
Level of Service		B	A	C	B		B	A		C	C	
Approach Delay (s)		10.0			21.0			14.1			20.5	
Approach LOS		A			C			B			C	
Intersection Summary												
HCM Average Control Delay			15.1				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			60.0				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			51.4%				ICU Level of Service			A		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

203: SB ENTRANCE RAMP &

5/9/2011



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	848	668	109	641	522	277
v/c Ratio	0.70	0.42	0.21	0.35	0.40	0.17
Control Delay	19.9	0.8	9.3	8.4	13.7	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	0.8	9.3	8.4	13.7	0.2
Queue Length 50th (ft)	127	0	17	71	54	0
Queue Length 95th (ft)	178	0	33	84	83	0
Internal Link Dist (ft)	169			254	400	
Turn Bay Length (ft)			100			200
Base Capacity (vph)	1316	1583	520	1818	1320	1583
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.42	0.21	0.35	0.40	0.17
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

203: SB ENTRANCE RAMP &

5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→	←	→→	→→	←
Volume (vph)	780	615	100	590	480	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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)	3433	1583	1752	3539	3539	1583
Flt Permitted	0.95	1.00	0.40	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	742	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	848	668	109	641	522	277
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	848	668	109	641	522	277
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%
Turn Type		Free	pm+pt			Free
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			Free
Actuated Green, G (s)	19.2	60.0	28.8	28.8	18.8	60.0
Effective Green, g (s)	21.2	60.0	30.8	30.8	20.8	60.0
Actuated g/C Ratio	0.35	1.00	0.51	0.51	0.35	1.00
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)	1213	1583	482	1817	1227	1583
v/s Ratio Prot	c0.25		0.02	0.18	0.15	
v/s Ratio Perm		c0.42	0.09			0.17
v/c Ratio	0.70	0.42	0.23	0.35	0.43	0.17
Uniform Delay, d1	16.7	0.0	10.0	8.7	15.0	0.0
Progression Factor	1.00	1.00	0.84	0.85	0.81	1.00
Incremental Delay, d2	1.8	0.8	0.2	0.5	1.0	0.2
Delay (s)	18.4	0.8	8.6	7.9	13.2	0.2
Level of Service	B	A	A	A	B	A
Approach Delay (s)	10.7			8.0	8.7	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues

208: NB EXIT RAMP &

5/9/2011



Lane Group	EBL	EBR	NBT	SBT	SBR
Lane Group Flow (vph)	359	65	685	832	391
v/c Ratio	0.47	0.16	0.30	0.37	0.25
Control Delay	21.4	6.2	5.8	7.3	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	6.2	5.8	7.3	0.4
Queue Length 50th (ft)	58	0	48	75	0
Queue Length 95th (ft)	83	23	89	88	0
Internal Link Dist (ft)	170		287	82	
Turn Bay Length (ft)					
Base Capacity (vph)	1223	605	2248	2227	1568
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	0.29	0.11	0.30	0.37	0.25
Intersection Summary					

HCM Signalized Intersection Capacity Analysis

208: NB EXIT RAMP &

5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱		↱↱	↱↱	↰
Volume (vph)	330	60	0	630	765	360
Ideal Flow (vphpl)	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		0.95	0.95	1.00
Flt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	3335	1538		3539	3505	1568
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	3335	1538		3539	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	65	0	685	832	391
RTOR Reduction (vph)	0	50	0	0	0	0
Lane Group Flow (vph)	359	15	0	685	832	391
Heavy Vehicles (%)	5%	5%	2%	2%	3%	3%
Turn Type	Perm					Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	11.9	11.9		36.1	36.1	60.0
Effective Green, g (s)	13.9	13.9		38.1	38.1	60.0
Actuated g/C Ratio	0.23	0.23		0.64	0.64	1.00
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)	773	356		2247	2226	1568
v/s Ratio Prot	c0.11			0.19	c0.24	
v/s Ratio Perm		0.01				0.25
v/c Ratio	0.46	0.04		0.30	0.37	0.25
Uniform Delay, d1	19.8	17.9		5.0	5.2	0.0
Progression Factor	1.00	1.00		1.00	1.18	1.00
Incremental Delay, d2	0.4	0.0		0.4	0.4	0.4
Delay (s)	20.3	17.9		5.3	6.6	0.4
Level of Service	C	B		A	A	A
Approach Delay (s)	19.9			5.3	4.6	
Approach LOS	B			A	A	

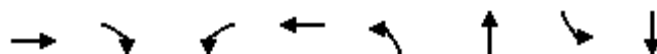
Intersection Summary

HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
201: Taylorsville Rd &

AM Peak
5/9/2011



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	65	815	283	87	130	495	22	919
v/c Ratio	0.12	0.77	0.76	0.17	0.19	0.29	0.12	0.88
Control Delay	16.0	15.5	35.4	13.3	27.1	9.0	26.4	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	15.5	35.4	13.3	27.1	9.0	26.4	33.0
Queue Length 50th (ft)	17	189	91	17	24	39	7	163
Queue Length 95th (ft)	41	325	#199	45	48	73	26	#270
Internal Link Dist (ft)	420			514		400		70
Turn Bay Length (ft)			250				150	
Base Capacity (vph)	563	1063	382	530	674	1707	184	1043
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.77	0.74	0.16	0.19	0.29	0.12	0.88

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

201: Taylorsville Rd &

AM Peak
5/9/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	50	750	260	60	20	120	345	110	20	835	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	15	12	12	12	12	12	13	12	12	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		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	1.00		0.97	0.95		1.00	*0.97	
Frt		1.00	0.85	1.00	0.96		1.00	0.96		1.00	1.00	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1949	1838	1693	1715		3095	3075		1753	3573	
Flt Permitted		0.95	1.00	0.71	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1877	1838	1274	1715		3095	3075		1753	3573	
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)	11	54	815	283	65	22	130	375	120	22	908	11
RTOR Reduction (vph)	0	0	7	0	16	0	0	46	0	0	1	0
Lane Group Flow (vph)	0	65	808	283	71	0	130	449	0	22	918	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm	pm+ov		Perm			Prot			Prot		
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4		4	8								
Actuated Green, G (s)		15.5	26.6	15.5	15.5		11.1	25.7		0.8	15.4	
Effective Green, g (s)		17.5	30.6	17.5	17.5		13.1	27.7		2.8	17.4	
Actuated g/C Ratio		0.29	0.51	0.29	0.29		0.22	0.46		0.05	0.29	
Clearance Time (s)		6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0	5.0	5.0	5.0		5.0	5.0		3.0	5.0	
Lane Grp Cap (vph)		547	1060	372	500		676	1420		82	1036	
v/s Ratio Prot			c0.17		0.04		0.04	0.15		0.01	c0.26	
v/s Ratio Perm		0.03	0.27	0.22								
v/c Ratio		0.12	0.76	0.76	0.14		0.19	0.32		0.27	0.89	
Uniform Delay, d1		15.6	11.8	19.3	15.7		19.1	10.2		27.6	20.3	
Progression Factor		1.00	1.00	1.00	1.00		1.36	1.20		1.00	1.00	
Incremental Delay, d2		0.2	3.9	10.4	0.3		0.3	0.6		1.8	9.9	
Delay (s)		15.8	15.7	29.7	16.0		26.2	12.8		29.4	30.2	
Level of Service		B	B	C	B		C	B		C	C	
Approach Delay (s)		15.7			26.5			15.6			30.2	
Approach LOS		B			C			B			C	
Intersection Summary												
HCM Average Control Delay			21.9			HCM Level of Service				C		
HCM Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			94.2%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

Queues
203: SB ENTRANCE RAMP & Taylorsville Rd

AM Peak
5/9/2011



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	266	234	147	359	1620	386
v/c Ratio	0.39	0.15	0.40	0.15	0.91	0.39
Control Delay	22.2	0.2	8.8	5.2	20.2	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	0.2	8.8	5.2	20.2	1.7
Queue Length 50th (ft)	43	0	20	26	~249	9
Queue Length 95th (ft)	69	0	m45	m50	m#457	m14
Internal Link Dist (ft)	169			707	400	
Turn Bay Length (ft)			100			200
Base Capacity (vph)	915	1583	364	2365	1772	986
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.15	0.40	0.15	0.91	0.39

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

203: SB ENTRANCE RAMP & Taylorsville Rd

AM Peak
5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↕↕	↕↕	↱
Volume (vph)	245	215	135	330	1490	355
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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)	3433	1583	1752	3539	3539	1583
Flt Permitted	0.95	1.00	0.12	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	225	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	266	234	147	359	1620	386
RTOR Reduction (vph)	0	0	0	0	0	201
Lane Group Flow (vph)	266	234	147	359	1620	185
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%
Turn Type		Free	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			6
Actuated Green, G (s)	9.9	60.0	38.1	38.1	26.8	26.8
Effective Green, g (s)	11.9	60.0	40.1	40.1	28.8	28.8
Actuated g/C Ratio	0.20	1.00	0.67	0.67	0.48	0.48
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)	681	1583	336	2365	1699	760
v/s Ratio Prot	c0.08		c0.05	0.10	c0.46	
v/s Ratio Perm		0.15	0.24			0.12
v/c Ratio	0.39	0.15	0.44	0.15	0.95	0.24
Uniform Delay, d1	20.9	0.0	10.9	3.7	15.0	9.2
Progression Factor	1.00	1.00	1.04	1.27	0.72	0.67
Incremental Delay, d2	0.4	0.2	0.9	0.1	8.5	0.4
Delay (s)	21.3	0.2	12.2	4.8	19.2	6.6
Level of Service	C	A	B	A	B	A
Approach Delay (s)	11.4			6.9	16.8	
Approach LOS	B			A	B	
Intersection Summary						
HCM Average Control Delay			14.3		HCM Level of Service	B
HCM Volume to Capacity ratio			0.74			
Actuated Cycle Length (s)			60.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			65.7%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

Queues
208: NB EXIT RAMP &

AM Peak
5/9/2011



Lane Group	EBL	EBR	NBT	SBT	SBR
Lane Group Flow (vph)	261	76	1609	408	1446
v/c Ratio	0.39	0.21	0.68	0.17	0.92
Control Delay	22.2	7.0	8.4	5.5	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.2	7.0	8.4	5.5	19.7
Queue Length 50th (ft)	42	0	149	30	451
Queue Length 95th (ft)	67	27	253	m31	m#548
Internal Link Dist (ft)	171		299	91	
Turn Bay Length (ft)					
Base Capacity (vph)	889	466	2363	2340	1568
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	0.29	0.16	0.68	0.17	0.92

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

208: NB EXIT RAMP &

AM Peak
5/9/2011

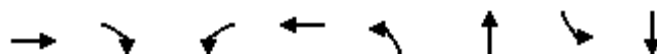


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	←
Volume (vph)	240	70	0	1480	375	1330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	1.00		0.95	0.95	1.00
Flt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	3335	1538		3539	3505	1568
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	3335	1538		3539	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	76	0	1609	408	1446
RTOR Reduction (vph)	0	61	0	0	0	0
Lane Group Flow (vph)	261	15	0	1609	408	1446
Heavy Vehicles (%)	5%	5%	2%	2%	3%	3%
Turn Type	Perm				Free	
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	9.9	9.9		38.1	38.1	60.0
Effective Green, g (s)	11.9	11.9		40.1	40.1	60.0
Actuated g/C Ratio	0.20	0.20		0.67	0.67	1.00
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)	661	305		2365	2343	1568
v/s Ratio Prot	0.08			0.45	0.12	
v/s Ratio Perm		0.01				c0.92
v/c Ratio	0.39	0.05		0.68	0.17	0.92
Uniform Delay, d1	20.9	19.5		6.1	3.7	0.0
Progression Factor	1.00	1.00		1.00	1.31	1.00
Incremental Delay, d2	0.4	0.1		1.6	0.1	6.3
Delay (s)	21.3	19.5		7.7	5.0	6.3
Level of Service	C	B		A	A	A
Approach Delay (s)	20.9			7.7	6.0	
Approach LOS	C			A	A	

Intersection Summary

HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	142	261	163	87	630	880	11	381
v/c Ratio	0.31	0.22	0.56	0.20	0.70	0.47	0.05	0.43
Control Delay	19.4	2.0	27.0	16.0	26.1	6.9	24.3	20.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	2.0	27.0	16.0	26.1	6.9	24.3	20.1
Queue Length 50th (ft)	41	5	51	21	82	57	4	63
Queue Length 95th (ft)	77	32	97	48	#218	154	16	88
Internal Link Dist (ft)	420			514		400		70
Turn Bay Length (ft)								
Base Capacity (vph)	559	1184	356	532	906	1867	217	1051
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.22	0.46	0.16	0.70	0.47	0.05	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

201: WOODSIDE RD &

PM Peak
5/9/2011

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	110	240	150	70	10	580	520	290	10	340	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	15	12	12	12	11	12	12	12	12	12
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		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	1.00		0.97	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.98		1.00	0.95		1.00	1.00	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1951	1838	1693	1749		2992	3020		1753	3491	
Flt Permitted		0.95	1.00	0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1861	1838	1188	1749		2992	3020		1753	3491	
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)	22	120	261	163	76	11	630	565	315	11	370	11
RTOR Reduction (vph)	0	0	84	0	8	0	0	104	0	0	4	0
Lane Group Flow (vph)	0	142	177	163	79	0	630	776	0	11	377	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm		pt+ov	Perm			Prot			Prot		
Protected Phases		4	4 5		8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		12.6	34.8	12.6	12.6		16.2	28.6		0.8	13.2	
Effective Green, g (s)		14.6	36.8	14.6	14.6		18.2	30.6		2.8	15.2	
Actuated g/C Ratio		0.24	0.61	0.24	0.24		0.30	0.51		0.05	0.25	
Clearance Time (s)		6.0		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	3.0	
Lane Grp Cap (vph)		453	1127	289	426		908	1540		82	884	
v/s Ratio Prot			0.10		0.04		c0.21	c0.26		0.01	0.11	
v/s Ratio Perm		0.08		c0.14								
v/c Ratio		0.31	0.16	0.56	0.18		0.69	0.50		0.13	0.43	
Uniform Delay, d1		18.6	5.0	19.9	18.0		18.4	9.7		27.4	18.8	
Progression Factor		1.00	1.00	1.00	1.00		0.98	0.93		1.00	1.00	
Incremental Delay, d2		0.4	0.1	2.5	0.2		2.0	1.0		0.7	1.5	
Delay (s)		19.0	5.0	22.4	18.2		20.0	10.1		28.2	20.3	
Level of Service		B	A	C	B		B	B		C	C	
Approach Delay (s)		9.9			21.0			14.2			20.5	
Approach LOS		A			C			B			C	
Intersection Summary												
HCM Average Control Delay			15.2			HCM Level of Service				B		
HCM Volume to Capacity ratio			0.57									
Actuated Cycle Length (s)			60.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			52.0%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

Queues
203: SB ENTRANCE RAMP &

PM Peak
5/9/2011



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	870	685	103	641	522	272
v/c Ratio	0.71	0.43	0.20	0.36	0.41	0.17
Control Delay	19.9	0.9	9.4	8.6	13.9	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	0.9	9.4	8.6	13.9	0.2
Queue Length 50th (ft)	127	0	18	73	54	0
Queue Length 95th (ft)	184	0	32	85	84	0
Internal Link Dist (ft)	169			254	400	
Turn Bay Length (ft)			100			200
Base Capacity (vph)	1321	1583	514	1803	1312	1583
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.66	0.43	0.20	0.36	0.40	0.17
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

203: SB ENTRANCE RAMP &

PM Peak
5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	800	630	95	590	480	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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)	3433	1583	1752	3539	3539	1583
Flt Permitted	0.95	1.00	0.40	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	739	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	870	685	103	641	522	272
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	870	685	103	641	522	272
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%
Turn Type		Free	pm+pt			Free
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			Free
Actuated Green, G (s)	19.5	60.0	28.5	28.5	18.5	60.0
Effective Green, g (s)	21.5	60.0	30.5	30.5	20.5	60.0
Actuated g/C Ratio	0.36	1.00	0.51	0.51	0.34	1.00
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)	1230	1583	477	1799	1209	1583
v/s Ratio Prot	c0.25		0.02	0.18	0.15	
v/s Ratio Perm		c0.43	0.09			0.17
v/c Ratio	0.71	0.43	0.22	0.36	0.43	0.17
Uniform Delay, d1	16.5	0.0	10.1	8.9	15.3	0.0
Progression Factor	1.00	1.00	0.86	0.86	0.81	1.00
Incremental Delay, d2	1.9	0.9	0.2	0.6	1.1	0.2
Delay (s)	18.4	0.9	8.9	8.2	13.4	0.2
Level of Service	B	A	A	A	B	A
Approach Delay (s)	10.7			8.3	8.9	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues
208: NB EXIT RAMP &

PM Peak
5/9/2011



Lane Group	EBL	EBR	NBT	SBT	SBR
Lane Group Flow (vph)	359	65	679	848	359
v/c Ratio	0.47	0.16	0.30	0.38	0.23
Control Delay	21.4	6.2	5.8	7.3	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	6.2	5.8	7.3	0.3
Queue Length 50th (ft)	58	0	48	77	0
Queue Length 95th (ft)	83	23	88	88	0
Internal Link Dist (ft)	170		287	82	
Turn Bay Length (ft)					
Base Capacity (vph)	1223	605	2248	2227	1568
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	0.29	0.11	0.30	0.38	0.23
Intersection Summary					

HCM Signalized Intersection Capacity Analysis

208: NB EXIT RAMP &

PM Peak
5/9/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱		↱↱	↱↱	↰
Volume (vph)	330	60	0	625	780	330
Ideal Flow (vphpl)	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		0.95	0.95	1.00
Flt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	3335	1538		3539	3505	1568
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	3335	1538		3539	3505	1568
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	65	0	679	848	359
RTOR Reduction (vph)	0	50	0	0	0	0
Lane Group Flow (vph)	359	15	0	679	848	359
Heavy Vehicles (%)	5%	5%	2%	2%	3%	3%
Turn Type	Perm				Free	
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	11.9	11.9		36.1	36.1	60.0
Effective Green, g (s)	13.9	13.9		38.1	38.1	60.0
Actuated g/C Ratio	0.23	0.23		0.64	0.64	1.00
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)	773	356		2247	2226	1568
v/s Ratio Prot	c0.11			0.19	c0.24	
v/s Ratio Perm		0.01				0.23
v/c Ratio	0.46	0.04		0.30	0.38	0.23
Uniform Delay, d1	19.8	17.9		4.9	5.3	0.0
Progression Factor	1.00	1.00		1.00	1.17	1.00
Incremental Delay, d2	0.4	0.0		0.3	0.5	0.3
Delay (s)	20.3	17.9		5.3	6.6	0.3
Level of Service	C	B		A	A	A
Approach Delay (s)	19.9			5.3	4.8	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	7.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Map of the Scudder Falls Bridge area. The map shows the Delaware River on the left and the Scudder Falls Bridge on the right. The bridge is labeled "SCUDDER FALLS BRIDGE" and "1.25". The map also shows the "NORTHERN PROJECT LIMIT" and "SOUTHERN PROJECT LIMIT". The map includes the Delaware River, Route 1, and various landmarks like the Scudder Falls Dam and the Scudder Falls Bridge. The map is oriented vertically with the river on the left and the bridge on the right.

Taylorsville Road 2003 Existing



HCM Signalized Intersection Capacity Analysis
201: WOODSIDE RD & TAYLORSVILLE RD

1/23/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	15	15	15	12	12	12	11	13	13	11	15	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.87			0.99		1.00	0.97		1.00	1.00	
Flt Protected		1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1883			1703		1542	1688		1695	2029	
Flt Permitted		1.00			0.31		0.16	1.00		0.50	1.00	
Satd. Flow (perm)		1878			541		258	1688		896	2029	
Volume (vph)	7	25	692	175	30	8	75	213	48	7	676	1
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)	8	27	752	190	33	9	82	232	52	8	735	1
RTOR Reduction (vph)	0	35	0	0	2	0	0	11	0	0	0	0
Lane Group Flow (vph)	0	752	0	0	230	0	82	273	0	8	736	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.5			30.5		23.2	23.2		23.2	23.2	
Effective Green, g (s)		32.5			32.5		25.2	25.2		25.2	25.2	
Actuated g/C Ratio		0.49			0.49		0.38	0.38		0.38	0.38	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		929			268		99	647		344	778	
v/s Ratio Prot								0.16			c0.36	
v/s Ratio Perm		0.40			c0.43		0.32			0.01		
v/c Ratio		0.81			0.86		0.83	0.42		0.02	0.95	
Uniform Delay, d1		14.0			14.6		18.3	14.9		12.6	19.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.0			24.6		44.7	0.9		0.1	20.6	
Delay (s)		20.0			39.2		63.0	15.8		12.7	40.2	
Level of Service		B			D		E	B		B	D	
Approach Delay (s)		20.0			39.2			26.4			39.9	
Approach LOS		B			D			C			D	
Intersection Summary												
HCM Average Control Delay		30.1					HCM Level of Service			C		
HCM Volume to Capacity ratio		0.90										
Actuated Cycle Length (s)		65.7					Sum of lost time (s)			8.0		
Intersection Capacity Utilization		114.4%					ICU Level of Service			H		
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
208: NB EXIT RAMP & TAYLORSVILLE RD

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↑↑	↑↑	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	127	17	0	1106	224	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	138	18	0	1202	243	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	845	122	243			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	845	122	243			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	53	98	100			
cM capacity (veh/h)	296	897	1320			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	138	18	601	601	122	122
Volume Left	138	0	0	0	0	0
Volume Right	0	18	0	0	0	0
cSH	296	897	1700	1700	1700	1700
Volume to Capacity	0.47	0.02	0.35	0.35	0.07	0.07
Queue Length 95th (ft)	59	2	0	0	0	0
Control Delay (s)	27.3	9.1	0.0	0.0	0.0	0.0
Lane LOS	D	A				
Approach Delay (s)	25.2		0.0		0.0	
Approach LOS	D					

Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			44.3%	ICU Level of Service		A
Analysis Period (min)			15			

Study period (hrs): 0.25

Major Street: Approach		Northbound				Southbound			
Movement		1	2	3		4	5	6	
		L	T	R		L	T	R	
Volume		66	336				1259	270	
Peak-Hour Factor, PHF		0.92	0.92				0.92	0.92	
Hourly Flow Rate, HFR		71	365				1368	293	
Percent Heavy Vehicles		2	--	--			--	--	
Median Type/Storage		Undivided				/			
RT Channelized?								No	
Lanes		0	2				2	1	
Configuration		LT T					T	R	
Upstream Signal?		No					No		

Minor Street: Approach		Westbound				Eastbound			
Movement		7	8	9		10	11	12	
		L	T	R		L	T	R	
Volume									
Peak Hour Factor, PHF									
Hourly Flow Rate, HFR									
Percent Heavy Vehicles									
Percent Grade (%)		0					0		
Flared Approach: Exists?/Storage						/		/	
Lanes									
Configuration									

[illegible]

HCS+: Unsignalized Intersections Release 5.21

Phone:
E-Mail:

Fax:

TWO-WAY STOP CONTROL (TWSC) ANALYSIS _____

Analyst: Jason Wiggins
Agency/Co.: DMJM+HARRIS
Date Performed: 2/17/2004
Analysis Time Period: AM Peak
Intersection: I-95 SB On Ramp
Jurisdiction: Bucks County
Units: U. S. Customary
Analysis Year: 2003 Existing
Project ID: Scudder Falls
East/West Street: SB On Ramp
North/South Street: Taylorsville Road
Intersection Orientation: NS

Study period (hrs): 0.25

Vehicle Volumes and Adjustments _____

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	66	336			1259	270
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	18	91			342	73
Hourly Flow Rate, HFR	71	365			1368	293
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	2			2	1
Configuration	LT	T			T	R
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
------------------------	--------	--------	--------	---------	---------	---------

Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments _____

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data							
	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn Through							
S5 Left-Turn Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1							
t(c,hv)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)	2							
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00							
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1							
2-stage								

Follow-Up Time Calculations								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20							
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)	2							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
 Arrival Type
 Effective Green, g (sec)
 Cycle Length, C (sec)
 Rp (from Exhibit 16-11)
 Proportion vehicles arriving on green P
 g(q1)
 g(q2)
 g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)

alpha
 beta
 Travel time, t(a) (sec)
 Smoothing Factor, F
 Proportion of conflicting flow, f
 Max platooned flow, V(c,max)
 Min platooned flow, V(c,min)
 Duration of blocked period, t(p)
 Proportion time blocked, p

	0.000	0.000
--	-------	-------

Computation 3-Platoon Event Periods Result

p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
---	--------------------------------	-------------------------------------	-----------------

p(1)
 p(4)
 p(7)
 p(8)
 p(9)
 p(10)
 p(11)
 p(12)

Computation 4 and 5
 Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
----------	--------	--------	--------	--------	--------	---------	---------	---------

V c,x	1661
s	
Px	
V c,u,x	

C r,x
 C plat,x

Two-Stage Process	7	8	10	11
-------------------	---	---	----	----

V(c,x)
s
P(x)
V(c,u,x)

C(r,x)
C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St. 9 12

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 2: LT from Major St. 4 1

Conflicting Flows 1661
Potential Capacity 384
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity 384
Probability of Queue free St. 1.00 0.82
Maj L-Shared Prob Q free St. 0.82

Step 3: TH from Minor St. 8 11

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Cap. Adj. factor due to Impeding mvmnt 0.82 0.82
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Maj. L, Min T Impedance factor
Maj. L, Min T Adj. Imp Factor.
Cap. Adj. factor due to Impeding mvmnt 0.82 0.82
Movement Capacity

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St. 8 11

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Cap. Adj. factor due to Impeding mvmnt 0.82 0.82
 Movement Capacity

Result for 2 stage process:

a
 y
 C t
 Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Part 1 - First Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Maj. L, Min T Impedance factor
 Maj. L, Min T Adj. Imp Factor.
 Cap. Adj. factor due to Impeding mvmnt 0.82 0.82
 Movement Capacity

Results for Two-stage process:

a
 y
 C t

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph)
 Movement Capacity (vph)
 Shared Lane Capacity (vph)

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

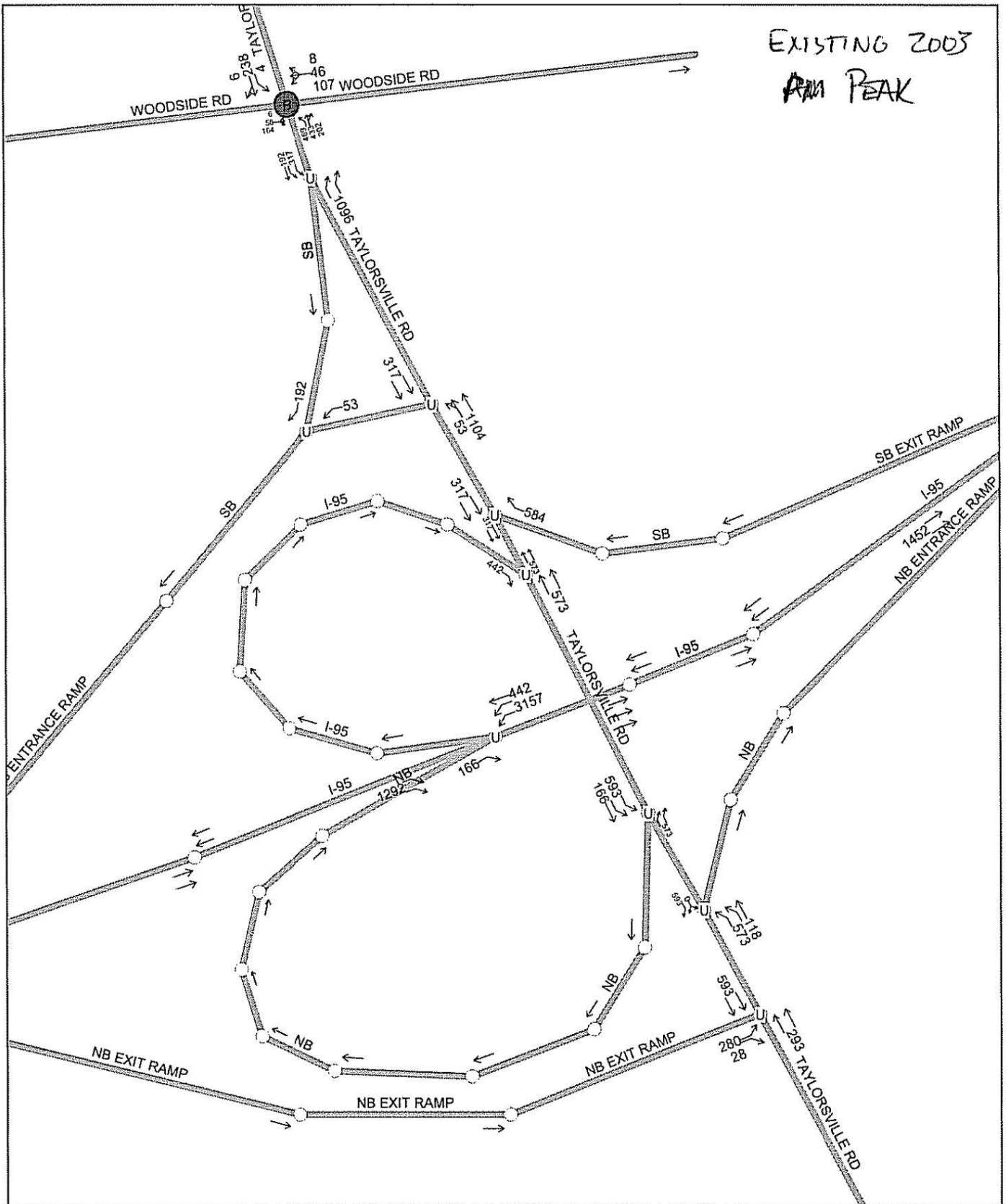
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	71							
C(m) (vph)	384							
v/c	0.18							
95% queue length	0.67							
Control Delay	16.5							
LOS	C							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.82	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.82	
d(M,LT), Delay for stream 1 or 4	16.5	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		



HCM Signalized Intersection Capacity Analysis
201: WOODSIDE RD & TAYLORSVILLE RD

1/23/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	15	15	15	12	12	12	11	13	13	11	15	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.90			0.99		1.00	0.95		1.00	1.00	
Flt Protected		1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1931			1764		1694	1815		1728	2061	
Flt Permitted		0.99			0.58		0.59	1.00		0.27	1.00	
Satd. Flow (perm)		1916			1055		1047	1815		488	2061	
Volume (vph)	6	58	164	107	46	8	469	433	202	4	238	6
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)	7	63	178	116	50	9	510	471	220	4	259	7
RTOR Reduction (vph)	0	127	0	0	3	0	0	20	0	0	1	0
Lane Group Flow (vph)	0	121	0	0	172	0	510	671	0	4	265	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	15.9			15.9			34.5			34.5		
Effective Green, g (s)	17.9			17.9			36.5			36.5		
Actuated g/C Ratio	0.29			0.29			0.58			0.58		
Clearance Time (s)	6.0			6.0			6.0			6.0		
Vehicle Extension (s)	5.0			5.0			5.0			5.0		
Lane Grp Cap (vph)	550			303			612			285		
v/s Ratio Prot							0.37			0.13		
v/s Ratio Perm	0.06			0.16			0.49			0.01		
v/c Ratio	0.22			0.57			0.83			0.01		
Uniform Delay, d1	16.9			19.0			10.5			5.4		
Progression Factor	1.00			1.00			1.00			1.00		
Incremental Delay, d2	0.4			4.0			10.5			0.0		
Delay (s)	17.4			22.9			21.0			5.5		
Level of Service	B			C			C			A		
Approach Delay (s)	17.4			22.9			14.8			6.3		
Approach LOS	B			C			B			A		
Intersection Summary												
HCM Average Control Delay	14.7			HCM Level of Service					B			
HCM Volume to Capacity ratio	0.75											
Actuated Cycle Length (s)	62.4			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	74.8%			ICU Level of Service					D			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
208: NB EXIT RAMP & TAYLORSVILLE RD

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	280	28	0	293	593	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	304	30	0	318	645	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	804	322	645			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	804	322	645			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	3	95	100			
cM capacity (veh/h)	315	665	936			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	304	30	159	159	322	322
Volume Left	304	0	0	0	0	0
Volume Right	0	30	0	0	0	0
cSH	315	665	1700	1700	1700	1700
Volume to Capacity	0.97	0.05	0.09	0.09	0.19	0.19
Queue Length 95th (ft)	251	4	0	0	0	0
Control Delay (s)	80.0	10.7	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	73.7		0.0		0.0	
Approach LOS	F					

Intersection Summary						
Average Delay			19.0			
Intersection Capacity Utilization			38.6%	ICU Level of Service		A
Analysis Period (min)			15			

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jason Wiggins
 Agency/Co.: DMJM+HARRIS
 Date Performed: 2/17/2004
 Analysis Time Period: PM Peak
 Intersection: I-95 SB On Ramp
 Jurisdiction: Bucks County
 Units: U. S. Customary
 Analysis Year: 2003 Existing
 Project ID: Scudder Falls
 East/West Street: SB On Ramp
 North/South Street: Taylorsville Road
 Intersection Orientation: NS

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Northbound				Southbound	
		1 L	2 T	3 R	4 L	5 T	6 R
Volume		53	1104			317	192
Peak-Hour Factor, PHF		0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR		57	1199			344	208
Percent Heavy Vehicles		2	--	--		--	--
Median Type/Storage		Undivided /					
RT Channelized?							No
Lanes		0	2			2	1
Configuration		LT T				T	R
Upstream Signal?		No				No	

Minor Street:	Approach Movement	Westbound				Eastbound	
		7 L	8 T	9 R	10 L	11 T	12 R
Volume							
Peak Hour Factor, PHF							
Hourly Flow Rate, HFR							
Percent Heavy Vehicles							
Percent Grade (%)		0				0	
Flared Approach: Exists?/Storage		/					/
Lanes							
Configuration							

Delay, Queue Length, and Level of Service

Approach Movement	NB	SB	Westbound				Eastbound	
	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	57							
C(m) (vph)	1014							
v/c	0.06							
95% queue length	0.18							
Control Delay	8.8							
LOS	A							
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.21

Phone:
E-Mail:

Fax:

TWO-WAY STOP CONTROL (TWSC) ANALYSIS

Analyst: Jason Wiggins
 Agency/Co.: DMJM+HARRIS
 Date Performed: 2/17/2004
 Analysis Time Period: PM Peak
 Intersection: I-95 SB On Ramp
 Jurisdiction: Bucks County
 Units: U. S. Customary
 Analysis Year: 2003 Existing
 Project ID: Scudder Falls
 East/West Street: SB On Ramp
 North/South Street: Taylorsville Road
 Intersection Orientation: NS

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	53	1104			317	192
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	14	300			86	52
Hourly Flow Rate, HFR	57	1199			344	208
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	2			2	1
Configuration		LT T			T	R
Upstream Signal?		No			No	
Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R

Volume
 Peak Hour Factor, PHF
 Peak-15 Minute Volume
 Hourly Flow Rate, HFR
 Percent Heavy Vehicles
 Percent Grade (%) 0 0
 Flared Approach: Exists?/Storage / /
 RT Channelized?
 Lanes
 Configuration

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data							
	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn Through							
S5 Left-Turn Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1							
t(c,hv)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)	2							
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00							
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1							
2-stage								

Follow-Up Time Calculations								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20							
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)	2							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
 Arrival Type
 Effective Green, g (sec)
 Cycle Length, C (sec)
 Rp (from Exhibit 16-11)
 Proportion vehicles arriving on green P
 g(q1)
 g(q2)
 g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)

alpha
 beta
 Travel time, t(a) (sec)
 Smoothing Factor, F
 Proportion of conflicting flow, f
 Max platooned flow, V(c,max)
 Min platooned flow, V(c,min)
 Duration of blocked period, t(p)
 Proportion time blocked, p

	0.000	0.000
--	-------	-------

Computation 3-Platoon Event Periods Result

p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
---	--------------------------------	-------------------------------------	-----------------

p(1)
 p(4)
 p(7)
 p(8)
 p(9)
 p(10)
 p(11)
 p(12)

Computation 4 and 5
 Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R

V c, x	552
s	
Px	
V c, u, x	

C r, x
 C plat, x

Two-Stage Process	7	8	10	11
-------------------	---	---	----	----

V(c,x)
s
P(x)
V(c,u,x)

C(r,x)
C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St. 9 12

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 2: LT from Major St. 4 1

Conflicting Flows 552
Potential Capacity 1014
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity 1014
Probability of Queue free St. 1.00 0.94
Maj L-Shared Prob Q free St. 0.94

Step 3: TH from Minor St. 8 11

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Cap. Adj. factor due to Impeding mvmnt 0.94 0.94
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Maj. L, Min T Impedance factor
Maj. L, Min T Adj. Imp Factor.
Cap. Adj. factor due to Impeding mvmnt 0.94 0.94
Movement Capacity

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St. 8 11

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Cap. Adj. factor due to Impeding mvmnt 0.94 0.94
 Movement Capacity

Result for 2 stage process:

a
 y
 C t
 Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Part 1 - First Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Maj. L, Min T Impedance factor
 Maj. L, Min T Adj. Imp Factor.
 Cap. Adj. factor due to Impeding mvmnt 0.94 0.94
 Movement Capacity

Results for Two-stage process:

a
 y
 C t

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph)
 Movement Capacity (vph)
 Shared Lane Capacity (vph)

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

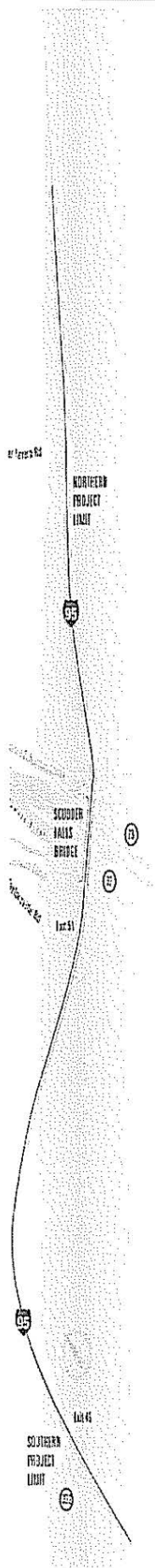
Worksheet 10-Delay, Queue Length, and Level of Service

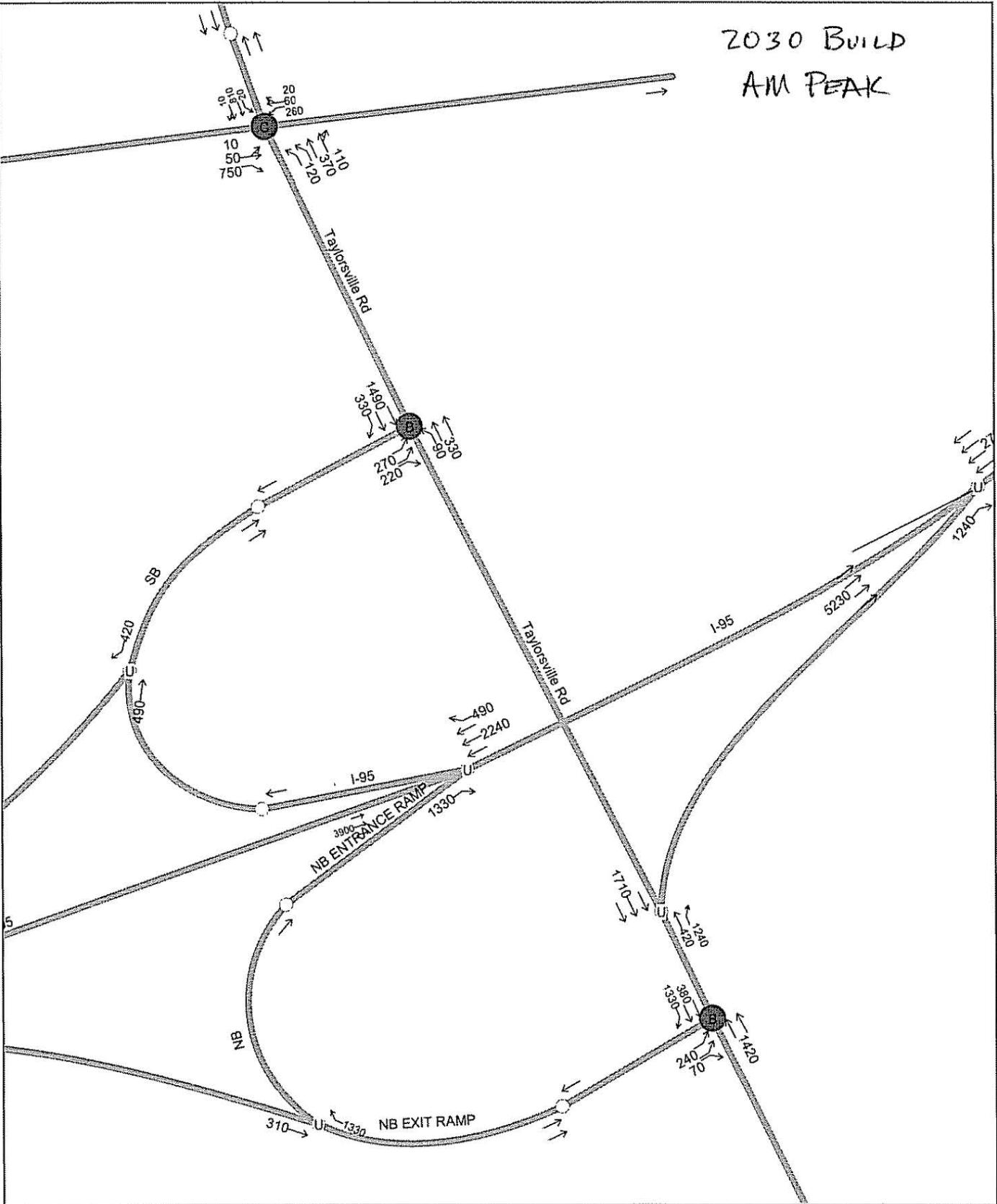
Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	57							
C(m) (vph)	1014							
v/c	0.06							
95% queue length	0.18							
Control Delay	8.8							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.94	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.94	
d(M,LT), Delay for stream 1 or 4	8.8	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		

Taylorsville Road 2030 Build





HCM Signalized Intersection Capacity Analysis

201: Taylorsville Rd &

1/23/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	15	12	12	12	12	12	13	12	12	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		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	1.00		0.97	0.95		1.00	*0.97	
Frt		1.00	0.85	1.00	0.96		1.00	0.97		1.00	1.00	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1949	1838	1693	1715		3095	3081		1753	3573	
Flt Permitted		0.95	1.00	0.71	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1877	1838	1274	1715		3095	3081		1753	3573	
Volume (vph)	10	50	750	260	60	20	120	370	110	20	810	10
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)	11	54	815	283	65	22	130	402	120	22	880	11
RTOR Reduction (vph)	0	0	8	0	16	0	0	41	0	0	1	0
Lane Group Flow (vph)	0	65	807	283	71	0	130	481	0	22	890	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm	pm+ov		Perm			Prot			Prot		
Protected Phases		4	5		8		5	2		1	6	
Permitted Phases	4	4		8								
Actuated Green, G (s)		15.4	26.6	15.4	15.4		11.2	25.8		0.8	15.4	
Effective Green, g (s)		17.4	30.6	17.4	17.4		13.2	27.8		2.8	17.4	
Actuated g/C Ratio		0.29	0.51	0.29	0.29		0.22	0.46		0.05	0.29	
Clearance Time (s)		6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0	5.0	5.0	5.0		5.0	5.0		3.0	5.0	
Lane Grp Cap (vph)		544	1060	369	497		681	1428		82	1036	
v/s Ratio Prot			c0.17		0.04		0.04	0.16		0.01	c0.25	
v/s Ratio Perm		0.03	0.27	0.22								
v/c Ratio		0.12	0.76	0.77	0.14		0.19	0.34		0.27	0.86	
Uniform Delay, d1		15.7	11.8	19.4	15.8		19.1	10.2		27.6	20.1	
Progression Factor		1.00	1.00	1.00	1.00		1.43	1.23		1.00	1.00	
Incremental Delay, d2		0.2	3.9	10.8	0.3		0.3	0.6		1.8	7.9	
Delay (s)		15.9	15.6	30.2	16.1		27.6	13.2		29.4	28.0	
Level of Service		B	B	C	B		C	B		C	C	
Approach Delay (s)		15.7			26.9			16.1			28.1	
Approach LOS		B			C			B			C	

Intersection Summary

HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	65	815	283	87	130	522	22	891
v/c Ratio	0.12	0.76	0.77	0.17	0.19	0.31	0.12	0.86
Control Delay	16.0	15.4	33.7	13.3	28.6	9.5	26.4	31.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	15.4	33.7	13.3	28.6	9.5	26.4	31.0
Queue Length 50th (ft)	17	189	91	17	25	37	7	156
Queue Length 95th (ft)	41	325	#199	45	51	76	26	#257
Internal Link Dist (ft)	420			514		400		70
Turn Bay Length (ft)			250				150	
Base Capacity (vph)	564	1067	382	530	681	1710	184	1038
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.76	0.74	0.16	0.19	0.31	0.12	0.86

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
203: SB ENTRANCE RAMP & Taylorsville Rd

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←	→	←	↑↑	↑↑	←
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Flt	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)	3433	1583	1752	3539	3539	1583
Flt Permitted	0.95	1.00	0.12	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	224	3539	3539	1583
Volume (vph)	270	220	90	330	1490	330
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	293	239	98	359	1620	359
RTOR Reduction (vph)	0	0	0	0	0	186
Lane Group Flow (vph)	293	239	98	359	1620	173
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%
Turn Type		Free	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			6
Actuated Green, G (s)	10.1	60.0	37.9	37.9	26.9	26.9
Effective Green, g (s)	12.1	60.0	39.9	39.9	28.9	28.9
Actuated g/C Ratio	0.20	1.00	0.66	0.66	0.48	0.48
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)	692	1583	327	2353	1705	762
v/s Ratio Prot	c0.09		c0.03	0.10	c0.46	
v/s Ratio Perm		0.15	0.16			0.11
v/c Ratio	0.42	0.15	0.30	0.15	0.95	0.23
Uniform Delay, d1	20.9	0.0	10.6	3.7	14.9	9.0
Progression Factor	1.00	1.00	1.69	1.63	0.72	0.64
Incremental Delay, d2	0.4	0.2	0.4	0.1	8.4	0.4
Delay (s)	21.3	0.2	18.3	6.2	19.0	6.2
Level of Service	C	A	B	A	B	A
Approach Delay (s)	11.8			8.8	16.7	
Approach LOS	B			A	B	

Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Queues

203: SB ENTRANCE RAMP & Taylorsville Rd

1/23/2007



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	293	239	98	359	1620	359
v/c Ratio	0.42	0.15	0.27	0.15	0.91	0.37
Control Delay	21.4	0.2	8.5	6.8	20.2	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	0.2	8.5	6.8	20.2	1.7
Queue Length 50th (ft)	48	0	17	33	~234	8
Queue Length 95th (ft)	74	0	m34	69	m#467	m13
Internal Link Dist (ft)	169			707	400	
Turn Bay Length (ft)			100			200
Base Capacity (vph)	915	1583	366	2352	1775	973
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.15	0.27	0.15	0.91	0.37

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

208: NB EXIT RAMP &

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←	→	←	↑↑	↑↑	→
Ideal Flow (vphpl)	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		0.95	0.95	1.00
Flt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	3335	1538		3539	3505	1568
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	3335	1538		3539	3505	1568
Volume (vph)	240	70	0	1420	380	1330
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	76	0	1543	413	1446
RTOR Reduction (vph)	0	61	0	0	0	0
Lane Group Flow (vph)	261	15	0	1543	413	1446
Heavy Vehicles (%)	5%	5%	2%	2%	3%	3%
Turn Type	Perm					Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	9.7	9.7		38.3	38.3	60.0
Effective Green, g (s)	11.7	11.7		40.3	40.3	60.0
Actuated g/C Ratio	0.19	0.19		0.67	0.67	1.00
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)	650	300		2377	2354	1568
v/s Ratio Prot	0.08			0.44	0.12	
v/s Ratio Perm		0.01				c0.92
v/c Ratio	0.40	0.05		0.65	0.18	0.92
Uniform Delay, d1	21.1	19.6		5.7	3.7	0.0
Progression Factor	1.00	1.00		1.00	1.27	1.00
Incremental Delay, d2	0.4	0.1		1.4	0.1	6.4
Delay (s)	21.5	19.7		7.1	4.7	6.4
Level of Service	C	B		A	A	A
Approach Delay (s)	21.1			7.1	6.0	
Approach LOS	C			A	A	

Intersection Summary

HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	0.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

208: NB EXIT RAMP &

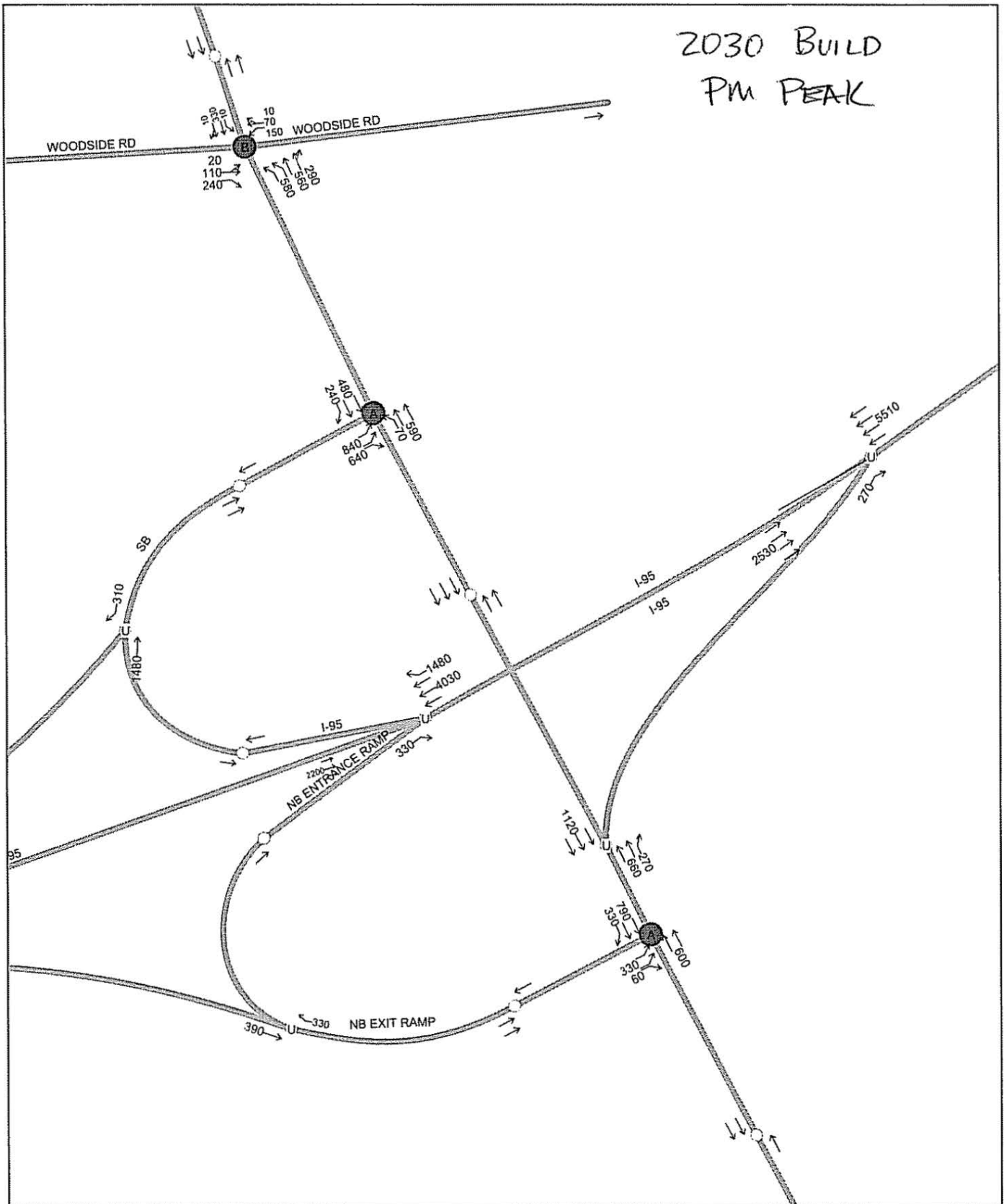
1/23/2007



Lane Group	EBL	EBR	NBT	SBT	SBR
Lane Group Flow (vph)	261	76	1543	413	1446
v/c Ratio	0.40	0.21	0.65	0.18	0.92
Control Delay	21.5	6.5	7.8	5.2	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.5	6.5	7.8	5.2	19.7
Queue Length 50th (ft)	42	0	138	27	450
Queue Length 95th (ft)	68	27	231	m31	m#551
Internal Link Dist (ft)	171		299	91	
Turn Bay Length (ft)					
Base Capacity (vph)	889	466	2375	2352	1568
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	0.29	0.16	0.65	0.18	0.92

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
201: WOODSIDE RD &

1/23/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	15	12	12	12	11	12	12	12	12	12
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		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	1.00		0.97	0.95		1.00	0.95	
Frt		1.00	0.85	1.00	0.98		1.00	0.95		1.00	1.00	
Flt Protected		0.99	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1951	1838	1693	1749		2992	3028		1753	3490	
Flt Permitted		0.95	1.00	0.67	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1860	1838	1188	1749		2992	3028		1753	3490	
Volume (vph)	20	110	240	150	70	10	580	560	290	10	330	10
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)	22	120	261	163	76	11	630	609	315	11	359	11
RTOR Reduction (vph)	0	0	92	0	8	0	0	89	0	0	4	0
Lane Group Flow (vph)	0	142	169	163	79	0	630	835	0	11	366	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm		pt+ov	Perm			Prot			Prot		
Protected Phases		4	4 5		8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)		12.3	34.0	12.3	12.3		15.7	28.9		0.8	14.0	
Effective Green, g (s)		14.3	36.0	14.3	14.3		17.7	30.9		2.8	16.0	
Actuated g/C Ratio		0.24	0.60	0.24	0.24		0.30	0.52		0.05	0.27	
Clearance Time (s)		6.0		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	3.0	
Lane Grp Cap (vph)		443	1103	283	417		883	1559		82	931	
v/s Ratio Prot			0.09		0.04		c0.21	c0.28		0.01	0.10	
v/s Ratio Perm		0.08		c0.14								
v/c Ratio		0.32	0.15	0.58	0.19		0.71	0.54		0.13	0.39	
Uniform Delay, d1		18.8	5.3	20.2	18.2		18.9	9.7		27.4	18.0	
Progression Factor		1.00	1.00	1.00	1.00		0.93	0.79		1.00	1.00	
Incremental Delay, d2		0.4	0.1	2.8	0.2		2.3	1.1		0.7	1.2	
Delay (s)		19.3	5.4	23.0	18.4		19.9	8.8		28.2	19.3	
Level of Service		B	A	C	B		B	A		C	B	
Approach Delay (s)		10.3			21.4			13.3			19.5	
Approach LOS		B			C			B			B	

Intersection Summary

HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	142	261	163	87	630	924	11	370
v/c Ratio	0.32	0.22	0.58	0.21	0.71	0.49	0.05	0.39
Control Delay	18.8	2.0	23.7	15.7	27.7	6.4	25.0	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	2.0	23.7	15.7	27.7	6.4	25.0	18.4
Queue Length 50th (ft)	42	4	51	22	94	45	4	54
Queue Length 95th (ft)	77	30	97	48	#218	175	16	85
Internal Link Dist (ft)	420			514		400		70
Turn Bay Length (ft)								
Base Capacity (vph)	561	1169	356	532	883	1878	204	1051
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.22	0.46	0.16	0.71	0.49	0.05	0.35

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
203: SB ENTRANCE RAMP &

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→	←	↑↑	↑↑	→
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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)	3433	1583	1752	3539	3539	1583
Flt Permitted	0.95	1.00	0.40	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	745	3539	3539	1583
Volume (vph)	840	640	70	590	480	240
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	913	696	76	641	522	261
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	913	696	76	641	522	261
Heavy Vehicles (%)	2%	2%	3%	2%	2%	2%
Turn Type	Free pm+pt			Free		
Protected Phases	4		5	2	6	
Permitted Phases		Free	2			Free
Actuated Green, G (s)	20.2	60.0	27.8	27.8	19.1	60.0
Effective Green, g (s)	22.2	60.0	29.8	29.8	21.1	60.0
Actuated g/C Ratio	0.37	1.00	0.50	0.50	0.35	1.00
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)	1270	1583	449	1758	1245	1583
v/s Ratio Prot	c0.27		0.01	0.18	0.15	
v/s Ratio Perm		c0.44	0.07			0.16
v/c Ratio	0.72	0.44	0.17	0.36	0.42	0.16
Uniform Delay, d1	16.2	0.0	10.1	9.3	14.8	0.0
Progression Factor	1.00	1.00	0.73	0.71	0.82	1.00
Incremental Delay, d2	2.0	0.9	0.2	0.6	1.0	0.2
Delay (s)	18.2	0.9	7.6	7.2	13.1	0.2
Level of Service	B	A	A	A	B	A
Approach Delay (s)	10.7			7.2	8.8	
Approach LOS	B			A	A	

Intersection Summary

HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Queues

203: SB ENTRANCE RAMP &

1/23/2007



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group Flow (vph)	913	696	76	641	522	261
v/c Ratio	0.72	0.44	0.15	0.36	0.38	0.16
Control Delay	18.8	0.9	7.8	7.6	13.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	0.9	7.8	7.6	13.3	0.2
Queue Length 50th (ft)	138	0	8	48	54	0
Queue Length 95th (ft)	196	0	25	70	84	0
Internal Link Dist (ft)	169			254	400	
Turn Bay Length (ft)			100			200
Base Capacity (vph)	1361	1583	504	1804	1450	1583
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.44	0.15	0.36	0.36	0.16

Intersection Summary

HCM Signalized Intersection Capacity Analysis

208: NB EXIT RAMP &

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←←	→		↑↑	↑↑	↗
Ideal Flow (vphpl)	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		0.95	0.95	1.00
Frt	1.00	0.85		1.00	1.00	0.85
Flt Protected	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	3335	1538		3539	3505	1568
Flt Permitted	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	3335	1538		3539	3505	1568
Volume (vph)	330	60	0	600	790	330
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	359	65	0	652	859	359
RTOR Reduction (vph)	0	50	0	0	0	0
Lane Group Flow (vph)	359	15	0	652	859	359
Heavy Vehicles (%)	5%	5%	2%	2%	3%	3%
Turn Type	Perm					Free
Protected Phases	4			2	6	
Permitted Phases		4				Free
Actuated Green, G (s)	11.4	11.4		36.6	36.6	60.0
Effective Green, g (s)	13.4	13.4		38.6	38.6	60.0
Actuated g/C Ratio	0.22	0.22		0.64	0.64	1.00
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)	745	343		2277	2255	1568
v/s Ratio Prot	c0.11			0.18	c0.25	
v/s Ratio Perm		0.01				0.23
v/c Ratio	0.48	0.04		0.29	0.38	0.23
Uniform Delay, d1	20.3	18.3		4.7	5.1	0.0
Progression Factor	1.00	1.00		1.00	0.99	1.00
Incremental Delay, d2	0.5	0.1		0.3	0.5	0.3
Delay (s)	20.8	18.3		5.0	5.5	0.3
Level of Service	C	B		A	A	A
Approach Delay (s)	20.4			5.0	3.9	
Approach LOS	C			A	A	

Intersection Summary

HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBR	NBT	SBT	SBR
Lane Group Flow (vph)	359	65	652	859	359
v/c Ratio	0.48	0.16	0.29	0.38	0.23
Control Delay	20.4	5.8	5.5	6.0	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.4	5.8	5.5	6.0	0.3
Queue Length 50th (ft)	58	0	44	65	0
Queue Length 95th (ft)	84	23	82	68	0
Internal Link Dist (ft)	170		287	82	
Turn Bay Length (ft)					
Base Capacity (vph)	1223	605	2278	2256	1568
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	0.29	0.11	0.29	0.38	0.23

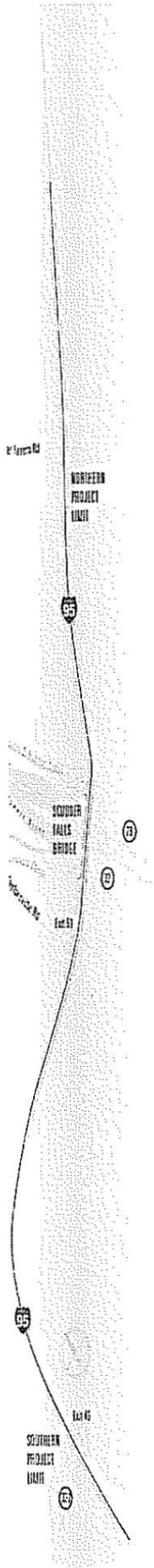
Intersection Summary

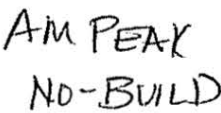
Technical Memorandum No. 28 – Point of Access Study



Contract C-393A, Capital Project No. CP0301A, Account No. 7161-06-012
I-95/Scudder Falls Bridge Improvement Project

Taylorsville Road 2030 No Build





HCM Signalized Intersection Capacity Analysis
201: WOODSIDE RD & TAYLORSVILLE RD

1/23/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	15	15	15	12	12	12	11	13	13	11	15	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.87			1.00		1.00	0.97		1.00	1.00	
Flt Protected		1.00			0.96		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1887			1706		1542	1679		1695	2026	
Flt Permitted		0.99			0.27		0.15	1.00		0.24	1.00	
Satd. Flow (perm)		1879			473		250	1679		431	2026	
Volume (vph)	10	40	750	250	50	10	110	360	100	10	730	10
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)	11	43	815	272	54	11	120	391	109	11	793	11
RTOR Reduction (vph)	0	31	0	0	2	0	0	14	0	0	1	0
Lane Group Flow (vph)	0	838	0	0	335	0	120	486	0	11	803	0
Heavy Vehicles (%)	1%	1%	1%	5%	5%	5%	12%	12%	12%	4%	4%	4%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		34.0			34.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)		36.0			36.0		26.0	26.0		26.0	26.0	
Actuated g/C Ratio		0.51			0.51		0.37	0.37		0.37	0.37	
Clearance Time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)		966			243		93	624		160	753	
v/s Ratio Prot								0.29			0.40	
v/s Ratio Perm		0.45			0.71		0.48			0.03		
v/c Ratio		0.87			1.38		1.29	0.78		0.07	1.07	
Uniform Delay, d1		14.9			17.0		22.0	19.4		14.2	22.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.1			194.1		189.8	7.1		0.4	52.1	
Delay (s)		24.0			211.1		211.8	26.5		14.6	74.1	
Level of Service		C			F		F	C		B	E	
Approach Delay (s)		24.0			211.1			62.4			73.3	
Approach LOS		C			F			E			E	
Intersection Summary												
HCM Average Control Delay		72.1					HCM Level of Service			E		
HCM Volume to Capacity ratio		1.34										
Actuated Cycle Length (s)		70.0					Sum of lost time (s)		8.0			
Intersection Capacity Utilization		127.6%					ICU Level of Service		H			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
208: NB EXIT RAMP & TAYLORSVILLE RD

1/23/2007

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations				 	 	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	240	70	0	1330	380	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	261	76	0	1446	413	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1136	207	413			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1136	207	413			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	0	90	100			
cM capacity (veh/h)	191	791	1142			
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	261	76	723	723	207	207
Volume Left	261	0	0	0	0	0
Volume Right	0	76	0	0	0	0
cSH	191	791	1700	1700	1700	1700
Volume to Capacity	1.36	0.10	0.43	0.43	0.12	0.12
Queue Length 95th (ft)	379	8	0	0	0	0
Control Delay (s)	241.2	10.0	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	189.0		0.0		0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			29.0			
Intersection Capacity Utilization			56.7%		ICU Level of Service	B
Analysis Period (min)			15			

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jason Wiggins
 Agency/Co.: DMJM+HARRIS
 Date Performed: 04/20/04
 Analysis Time Period: AM Peak
 Intersection: I-95 SB On Ramp
 Jurisdiction: Bucks County
 Units: U. S. Customary
 Analysis Year: 2030 No-Build
 Project ID: Scudder Falls
 East/West Street: SB On Ramp
 North/South Street: Taylorsville Road
 Intersection Orientation: NS

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Northbound				Southbound	
		1 L	2 T	3 R	 	4 L	5 T 6 R
Volume		90	570				1400 330
Peak-Hour Factor, PHF		0.92	0.92				0.92 0.92
Hourly Flow Rate, HFR		97	619				1521 358
Percent Heavy Vehicles		2	--	--			-- --
Median Type/Storage		Undivided				/	
RT Channelized?							No
Lanes		0	2				2 1
Configuration			LT T				T R
Upstream Signal?			No				No

Minor Street:	Approach Movement	Westbound				Eastbound	
		7 L	8 T	9 R	 	10 L	11 T 12 R
Volume							
Peak Hour Factor, PHF							
Hourly Flow Rate, HFR							
Percent Heavy Vehicles							
Percent Grade (%)			0			0	
Flared Approach: Exists?/Storage					/		/
Lanes							
Configuration							

Delay, Queue Length, and Level of Service

Approach Movement	NB	SB	Westbound				Eastbound	
	1	4		7	8	9		10 11 12
Lane Config	LT							
v (vph)	97							
C(m) (vph)	316							
v/c	0.31							
95% queue length	1.27							
Control Delay	21.4							
LOS	C							
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.21

Phone:
E-Mail:

Fax:

TWO-WAY STOP CONTROL (TWSC) ANALYSIS

Analyst: Jason Wiggins
 Agency/Co.: DMJM+HARRIS
 Date Performed: 04/20/04
 Analysis Time Period: AM Peak
 Intersection: I-95 SB On Ramp
 Jurisdiction: Bucks County
 Units: U. S. Customary
 Analysis Year: 2030 No-Build
 Project ID: Scudder Falls
 East/West Street: SB On Ramp
 North/South Street: Taylorsville Road
 Intersection Orientation: NS

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	90	570			1400	330
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	24	155			380	90
Hourly Flow Rate, HFR	97	619			1521	358
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	2			2	1
Configuration	LT T				T	R
Upstream Signal?	No				No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
------------------------	--------	--------	--------	---------	---------	---------

Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data							
	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1							
t(c,hv)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)	2							
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00							
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1							
2-stage								

Follow-Up Time Calculations								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20							
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)	2							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
 Arrival Type
 Effective Green, g (sec)
 Cycle Length, C (sec)
 Rp (from Exhibit 16-11)
 Proportion vehicles arriving on green P
 g(q1)
 g(q2)
 g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)

alpha
 beta
 Travel time, t(a) (sec)
 Smoothing Factor, F
 Proportion of conflicting flow, f
 Max platooned flow, V(c,max)
 Min platooned flow, V(c,min)
 Duration of blocked period, t(p)
 Proportion time blocked, p

	0.000	0.000
--	-------	-------

Computation 3-Platoon Event Periods Result

p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
---	--------------------------------	-------------------------------------	-----------------

p(1)
 p(4)
 p(7)
 p(8)
 p(9)
 p(10)
 p(11)
 p(12)

Computation 4 and 5
 Single-Stage Process

Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R

V c, x 1879
 s
 Px
 V c, u, x

C r, x
 C plat, x

Two-Stage Process

7	8	10	11
---	---	----	----

V(c,x)
s
P(x)
V(c,u,x)

C(r,x)
C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St. 9 12

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 2: LT from Major St. 4 1

Conflicting Flows 1879
Potential Capacity 316
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity 316
Probability of Queue free St. 1.00 0.69
Maj L-Shared Prob Q free St. 0.69

Step 3: TH from Minor St. 8 11

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Cap. Adj. factor due to Impeding mvmnt 0.69 0.69
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Maj. L, Min T Impedance factor
Maj. L, Min T Adj. Imp Factor.
Cap. Adj. factor due to Impeding mvmnt 0.69 0.69
Movement Capacity

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St. 8 11

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Cap. Adj. factor due to Impeding mvmnt 0.69 0.69
 Movement Capacity

Result for 2 stage process:

a
 y
 C t
 Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Part 1 - First Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Maj. L, Min T Impedance factor
 Maj. L, Min T Adj. Imp Factor.
 Cap. Adj. factor due to Impeding mvmnt 0.69 0.69
 Movement Capacity

Results for Two-stage process:

a
 y
 C t

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph)
 Movement Capacity (vph)
 Shared Lane Capacity (vph)

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

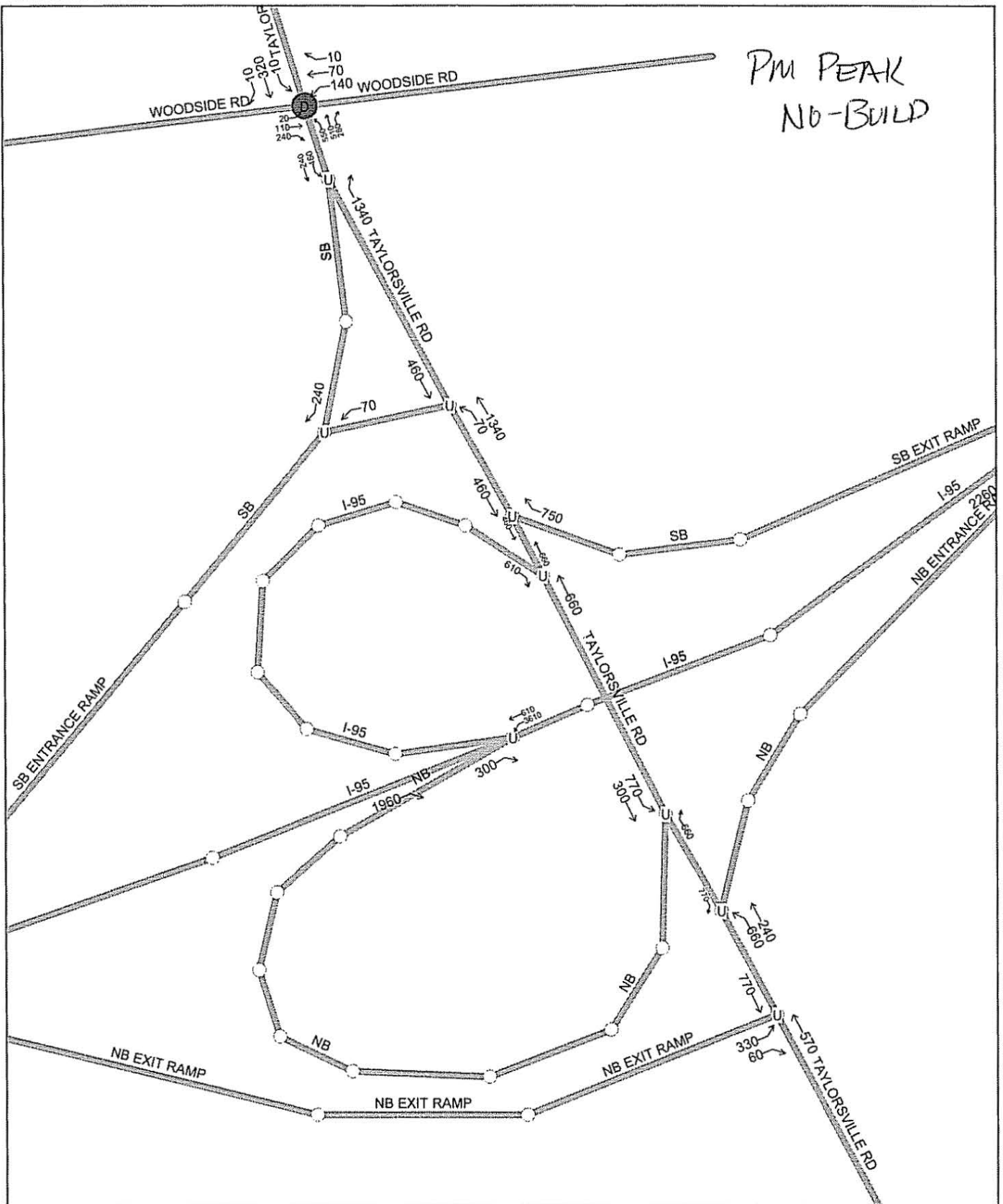
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	97							
C(m) (vph)	316							
v/c	0.31							
95% queue length	1.27							
Control Delay	21.4							
LOS	C							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.69	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.69	
d(M,LT), Delay for stream 1 or 4	21.4	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		



HCM Signalized Intersection Capacity Analysis 201: WOODSIDE RD & TAYLORSVILLE RD

1/23/2007

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	15	15	15	12	12	12	11	13	13	11	15	15
Grade (%)		-9%			3%			2%			-2%	
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.91			0.99		1.00	0.95		1.00	1.00	
Flt Protected		1.00			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1949			1767		1694	1804		1728	2060	
Flt Permitted		0.97			0.42		0.51	1.00		0.14	1.00	
Satd. Flow (perm)		1902			770		904	1804		264	2060	
Volume (vph)	20	110	240	140	70	10	550	510	280	10	320	10
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)	22	120	261	152	76	11	598	554	304	11	348	11
RTOR Reduction (vph)	0	111	0	0	3	0	0	33	0	0	2	0
Lane Group Flow (vph)	0	292	0	0	236	0	598	825	0	11	357	0
Turn Type	Perm				Perm				Perm			
Protected Phases			4				8				2	
Permitted Phases	4				8				2			
Actuated Green, G (s)			16.0				16.0		32.0		32.0	
Effective Green, g (s)			18.0				18.0		34.0		34.0	
Actuated g/C Ratio			0.30				0.30		0.57		0.57	
Clearance Time (s)			6.0				6.0		6.0		6.0	
Vehicle Extension (s)			5.0				5.0		5.0		5.0	
Lane Grp Cap (vph)			571				231		512		1022	
v/s Ratio Prot									0.46			
v/s Ratio Perm			0.15				0.31		0.66		0.04	
v/c Ratio			0.51				1.02		1.17		0.81	
Uniform Delay, d1			17.4				21.0		13.0		10.4	
Progression Factor			1.00				1.00		1.00		1.00	
Incremental Delay, d2			1.5				65.2		95.0		5.4	
Delay (s)			18.9				86.2		108.0		15.8	
Level of Service			B				F		F		B	
Approach Delay (s)			18.9				86.2		53.7			
Approach LOS			B				F		D			
Intersection Summary												
HCM Average Control Delay			44.2				HCM Level of Service		D			
HCM Volume to Capacity ratio			1.12									
Actuated Cycle Length (s)			60.0				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			94.9%				ICU Level of Service		F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
208: NB EXIT RAMP & TAYLORSVILLE RD

1/23/2007



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	330	60	0	570	770	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	359	65	0	620	837	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1147	418	837			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1147	418	837			
tC, single (s)	6.9	7.0	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.2			
p0 queue free %	0	89	100			
cM capacity (veh/h)	188	575	793			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	359	65	310	310	418	418
Volume Left	359	0	0	0	0	0
Volume Right	0	65	0	0	0	0
cSH	188	575	1700	1700	1700	1700
Volume to Capacity	1.91	0.11	0.18	0.18	0.25	0.25
Queue Length 95th (ft)	661	10	0	0	0	0
Control Delay (s)	469.6	12.1	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	399.2		0.0		0.0	
Approach LOS	F					

Intersection Summary						
Average Delay			90.0			
Intersection Capacity Utilization			46.2%	ICU Level of Service		A
Analysis Period (min)			15			

TWO-WAY STOP CONTROL SUMMARY

Analyst: Jason Wiggins
Agency/Co.: DMJM+HARRIS
Date Performed: 04/20/04
Analysis Time Period: PM Peak
Intersection: I-95 SB On Ramp
Jurisdiction: Bucks County
Units: U. S. Customary
Analysis Year: 2030 No-Build
Project ID: Scudder Falls
East/West Street: SB On Ramp
North/South Street: Taylorsville Road
Intersection Orientation: NS

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach Movement	Northbound				Southbound		
	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume	70	1340			460	240	
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92	
Hourly Flow Rate, HFR	76	1456			499	260	
Percent Heavy Vehicles	2	--	--		--	--	
Median Type/Storage	Undivided			/			
RT Channelized?						No	
Lanes	0	2			2	1	
Configuration	LT	T			T	R	
Upstream Signal?	No				No		

Minor Street:	Westbound				Eastbound		
Approach Movement	7	8	9		10	11	12
	L	T	R		L	T	R

Volume			
Peak Hour Factor, PHF			
Hourly Flow Rate, HFR			
Percent Heavy Vehicles			
Percent Grade (%)	0		0
Flared Approach: Exists?/Storage		/	/
Lanes			
Configuration			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT							

v (vph)	76
C(m) (vph)	848
v/c	0.09
95% queue length	0.29
Control Delay	9.7
LOS	A
Approach Delay	
Approach LOS	

HCS+: Unsignalized Intersections Release 5.21

Phone:
E-Mail:

Fax:

----- TWO-WAY STOP CONTROL(TWSC) ANALYSIS -----

Analyst: Jason Wiggins
Agency/Co.: DMJM+HARRIS
Date Performed: 04/20/04
Analysis Time Period: PM Peak
Intersection: I-95 SB On Ramp
Jurisdiction: Bucks County
Units: U. S. Customary
Analysis Year: 2030 No-Build
Project ID: Scudder Falls
East/West Street: SB On Ramp
North/South Street: Taylorsville Road
Intersection Orientation: NS

Study period (hrs): 0.25

----- Vehicle Volumes and Adjustments -----

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	70	1340			460	240
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Peak-15 Minute Volume	19	364			125	65
Hourly Flow Rate, HFR	76	1456			499	260
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	0	2			2	1
Configuration	LT T				T	R
Upstream Signal?	No				No	
Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R

----- Volume -----

Peak Hour Factor, PHF
Peak-15 Minute Volume
Hourly Flow Rate, HFR
Percent Heavy Vehicles
Percent Grade (%) 0 0
Flared Approach: Exists?/Storage / /
RT Channelized?
Lanes
Configuration

----- Pedestrian Volumes and Adjustments -----

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data							
	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	0	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	2	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(c,base)	4.1							
t(c,hv)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
P(hv)	2							
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Grade/100			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00							
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1							
2-stage								

Follow-Up Time Calculations								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
t(f,base)	2.20							
t(f,HV)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(HV)	2							
t(f)	2.2							

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal				
	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)
 Arrival Type
 Effective Green, g (sec)
 Cycle Length, C (sec)
 Rp (from Exhibit 16-11)
 Proportion vehicles arriving on green P
 g(q1)
 g(q2)
 g(q)

Computation 2-Proportion of TWSC Intersection Time blocked

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)

alpha
 beta
 Travel time, t(a) (sec)
 Smoothing Factor, F
 Proportion of conflicting flow, f
 Max platooned flow, V(c,max)
 Min platooned flow, V(c,min)
 Duration of blocked period, t(p)
 Proportion time blocked, p

	0.000	0.000
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Computation 3-Platoon Event Periods Result

p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
---	--------------------------------	-------------------------------------	-----------------

p(1)
 p(4)
 p(7)
 p(8)
 p(9)
 p(10)
 p(11)
 p(12)

Computation 4 and 5
 Single-Stage Process

Movement	1	4	7	8	9	10	11	12
----------	---	---	---	---	---	----	----	----

V c,x	759
s	
Px	
V c,u,x	

C r,x
 C plat,x

Two-Stage Process	7	8	10	11
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V(c,x)
s
P(x)
V(c,u,x)

C(r,x)
C(plat,x)

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St. 9 12

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 2: LT from Major St. 4 1

Conflicting Flows 759
Potential Capacity 848
Pedestrian Impedance Factor 1.00 1.00
Movement Capacity 848
Probability of Queue free St. 1.00 0.91
Maj L-Shared Prob Q free St. 0.91

Step 3: TH from Minor St. 8 11

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Cap. Adj. factor due to Impeding mvmnt 0.91 0.91
Movement Capacity
Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor 1.00 1.00
Maj. L, Min T Impedance factor
Maj. L, Min T Adj. Imp Factor.
Cap. Adj. factor due to Impeding mvmnt 0.91 0.91
Movement Capacity

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St. 8 11

Part 1 - First Stage
Conflicting Flows
Potential Capacity
Pedestrian Impedance Factor
Cap. Adj. factor due to Impeding mvmnt
Movement Capacity
Probability of Queue free St.

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Cap. Adj. factor due to Impeding mvmnt 0.91 0.91
 Movement Capacity

Result for 2 stage process:

a
 y
 C t
 Probability of Queue free St. 1.00 1.00

Step 4: LT from Minor St. 7 10

Part 1 - First Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 2 - Second Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor
 Cap. Adj. factor due to Impeding mvmnt
 Movement Capacity

Part 3 - Single Stage
 Conflicting Flows
 Potential Capacity
 Pedestrian Impedance Factor 1.00 1.00
 Maj. L, Min T Impedance factor
 Maj. L, Min T Adj. Imp Factor.
 Cap. Adj. factor due to Impeding mvmnt 0.91 0.91
 Movement Capacity

Results for Two-stage process:

a
 y
 C t

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R

Volume (vph)
 Movement Capacity (vph)
 Shared Lane Capacity (vph)

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT							
v (vph)	76							
C(m) (vph)	848							
v/c	0.09							
95% queue length	0.29							
Control Delay	9.7							
LOS	A							
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.91	1.00
v(i1), Volume for stream 2 or 5	0	
v(i2), Volume for stream 3 or 6	0	
s(i1), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.91	
d(M,LT), Delay for stream 1 or 4	9.7	
N, Number of major street through lanes	2	
d(rank,1) Delay for stream 2 or 5		