

## **APPENDIX P**

### **2009 Total Future Capacity Analyses with Improvements Impact on Fort Lincoln Area**

HCM Signalized Intersection Capacity Analysis  
1: Eastern Avenue & Bladensburg Road

2921 Fort Lincoln Phase 2  
7/6/2006



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	10	10	10	11	12	12	11	11	11	15	13	13
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		1.00	1.00		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>	1.00	0.94		1.00	1.00		0.85	1.00	0.99	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		1.00	0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1652	1632		1709	1863		1583	1711	3363	1943	3436	
Flt Permitted	0.34	1.00		0.26	1.00		1.00	0.09	1.00	0.58	1.00	
Satd. Flow (perm)	587	1632		475	1863		1583	160	3363	1177	3436	
Volume (vph)	152	269	161	52	367	70	120	238	26	50	910	493
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)	165	292	175	57	399	76	130	259	28	54	989	536
RTOR Reduction (vph)	0	22	0	0	0	47	0	8	0	0	72	0
Lane Group Flow (vph)	165	445	0	57	399	29	130	279	0	54	1453	0
Confl. Peds. (#/hr)				2	2			3		4	4	3
Turn Type	Perm		Perm		Perm	pm+pt		pm+pt				
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	37.0	37.0		37.0	37.0	37.0	50.0	44.0		48.0	43.0	
Effective Green, g (s)	38.0	38.0		38.0	38.0	38.0	51.0	45.0		49.0	44.0	
Actuated g/C Ratio	0.38	0.38		0.38	0.38	0.38	0.51	0.45		0.49	0.44	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)	223	620		181	708	602	175	1513		615	1512	
v/s Ratio Prot		0.27			0.21		c0.04	0.08		0.00	c0.42	
v/s Ratio Perm	c0.28			0.12		0.02	0.33			0.04		
v/c Ratio	0.74	0.72		0.31	0.56	0.05	0.74	0.18		0.09	0.96	
Uniform Delay, d1	26.7	26.4		21.8	24.5	19.6	22.3	16.5		13.4	27.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	2.35	1.16		1.00	1.00	
Incremental Delay, d2	19.7	7.0		4.5	3.2	0.2	22.0	0.2		0.3	15.5	
Delay (s)	46.4	33.4		26.3	27.7	19.7	74.4	19.3		13.7	42.7	
Level of Service	D	C		C	C	B	E	B		B	D	
Approach Delay (s)		36.8			26.4			36.5			41.7	
Approach LOS		D			C			D			D	
Intersection Summary												
HCM Average Control Delay		37.5										
HCM Volume to Capacity ratio		0.85										
Actuated Cycle Length (s)		100.0										
Intersection Capacity Utilization		88.8%										
Analysis Period (min)		15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
2: South Dakota Avenue & Bladensburg Road

2921 Fort Lincoln Phase 2  
7/6/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	11	11	11	12	12	12	11	11	11	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0		4.0			4.0	4.0		4.0	4.0	
Total Lost time (s)	1.00	0.95		0.91			1.00	0.95		1.00	0.95	
Lane Util. Factor	1.00	1.00		1.00			1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00			1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00			1.00	1.00		1.00	1.00	
Fr <sub>t</sub>	1.00	1.00		1.00			1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		1.00			0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3402		5055			1711	3365		1703	3038	
Flt Permitted	0.09	1.00		0.63			0.13	1.00		0.50	1.00	
Satd. Flow (perm)	167	3402		3206			240	3365		901	3038	
Volume (vph)	93	948	32	84	1794	35	145	263	27	66	672	411
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)	101	1030	35	91	1950	38	158	286	29	72	730	447
RTOR Reduction (vph)	0	2	0	0	2	0	0	8	0	0	85	0
Lane Group Flow (vph)	101	1063	0	0	2077	0	158	307	0	72	1092	0
Conf. Peds. (#/hr)	59	7	7		59	47		15	15		47	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	18	18
Turn Type	custom			Perm			pm+pt			pm+pt		
Protected Phases	5	2	5		6		3	8		7	4	
Permitted Phases		2			6			8			4	
Actuated Green, G (s)	46.0	50.0			41.0		34.0	28.0		34.0	28.0	
Effective Green, g (s)	48.0	52.0			43.0		36.0	30.0		36.0	30.0	
Actuated g/C Ratio	0.48	0.52			0.43		0.36	0.30		0.36	0.30	
Clearance Time (s)	4.0				6.0		4.0	6.0		4.0	6.0	
Lane Grp Cap (vph)	157	1769			1379		175	1010		372	911	
v/s Ratio Prot	0.03	c0.31					c0.05	0.09		0.01	c0.36	
v/s Ratio Perm	0.28				c0.65		0.27			0.06		
v/c Ratio	0.64	0.60			1.51		0.90	0.30		0.19	1.20	
Uniform Delay, d1	22.1	16.8			28.5		48.7	27.0		21.4	35.0	
Progression Factor	1.00	1.00			0.50		1.32	1.24		1.12	0.87	
Incremental Delay, d2	18.5	1.5			228.2		45.9	0.8		0.5	94.3	
Delay (s)	40.6	18.3			242.4		110.3	34.2		24.4	124.8	
Level of Service	D	B			F		F	C		C	F	
Approach Delay (s)		20.2			242.4			59.7			119.0	
Approach LOS		C			F			E			F	
<b>Intersection Summary</b>												
HCM Average Control Delay		141.8			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.31										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		125.9%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

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	10	11	11	11	11	11
Total Lost time (s)	4.0			4.0			4.0			4.0		
Lane Util. Factor	1.00			1.00			0.91			0.91		
Frpb, ped/bikes	1.00			1.00			1.00			1.00		
Flpb, ped/bikes	1.00			1.00			1.00			1.00		
Fr <sub>t</sub>	0.99			0.98			0.96			1.00		
Flt Protected	0.98			0.96			1.00			1.00		
Satd. Flow (prot)	1970			1748			4738			4861		
Flt Permitted	0.85			0.75			0.93			0.92		
Satd. Flow (perm)	1722			1364			4429			4457		
Volume (vph)	8	7	2	247	8	42	4	391	124	23	896	12
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)	9	8	2	268	9	46	4	425	135	25	974	13
RTOR Reduction (vph)	0	1	0	0	7	0	0	46	0	0	1	0
Lane Group Flow (vph)	0	18	0	0	316	0	0	518	0	0	1011	0
Conf. Peds. (#/hr)				3								
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	6	6
Turn Type	Perm		Perm			Perm		Perm		Perm		
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)	28.4			28.4			60.6			60.6		
Effective Green, g (s)	30.4			30.4			61.6			61.6		
Actuated g/C Ratio	0.30			0.30			0.62			0.62		
Clearance Time (s)	6.0			6.0			5.0			5.0		
Vehicle Extension (s)	3.0			3.0			1.0			1.0		
Lane Grp Cap (vph)	523			415			2728			2746		
v/s Ratio Prot												
v/s Ratio Perm	0.01			c0.23			0.12			c0.23		
v/c Ratio	0.03			0.76			0.19			0.37		
Uniform Delay, d1	24.5			31.5			8.4			9.5		
Progression Factor	1.00			0.67			1.00			1.54		
Incremental Delay, d2	0.0			5.5			0.2			0.0		
Delay (s)	24.5			26.7			8.5			14.7		
Level of Service	C			C			A			B		
Approach Delay (s)	24.5			26.7			8.5			14.7		
Approach LOS	C			C			A			B		
Intersection Summary												
HCM Average Control Delay	15.0			HCM Level of Service			B					
HCM Volume to Capacity ratio	0.50											
Actuated Cycle Length (s)	100.0			Sum of lost time (s)			8.0					
Intersection Capacity Utilization	61.8%			ICU Level of Service			B					
Analysis Period (min)	15											

c Critical Lane Group

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	12	12	14	12	12	12	14	12	12	12
Total Lost time (s)	4.0			4.0			4.0		4.0		4.0	4.0
Lane Util. Factor	0.95			1.00			1.00		1.00		1.00	0.88
Flt	0.99			1.00			1.00		0.85		1.00	0.85
Flt Protected	1.00			1.00			0.95		1.00		1.00	1.00
Satd. Flow (prot)	3521			1980			1770		1689		1862	2787
Flt Permitted	1.00			0.85			0.29		1.00		1.00	1.00
Satd. Flow (perm)	3521			1680			533		1689		1862	2787
Volume (vph)	0	1319	46	7	97	0	11	0	69	3	267	1740
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1434	50	8	105	0	12	0	75	3	290	1891
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	12	0	0	710
Lane Group Flow (vph)	0	1481	0	0	113	0	12	0	63	0	293	1181
Turn Type				Perm			custom		custom		Perm	custom
Protected Phases	2			9					9		4	
Permitted Phases			9			8		8		4		6
Actuated Green, G (s)	48.0			16.0			21.0		37.0		21.0	48.0
Effective Green, g (s)	49.0			17.0			22.0		39.0		22.0	49.0
Actuated g/C Ratio	0.49			0.17			0.22		0.39		0.22	0.49
Clearance Time (s)	5.0			5.0			5.0		5.0		5.0	5.0
Lane Grp Cap (vph)	1725			286			117		726		410	1366
v/s Ratio Prof	0.42								0.01			
v/s Ratio Perm				c0.07			0.02		0.02		0.16	c0.42
v/c Ratio	0.86			0.40			0.10		0.09		0.71	0.86
Uniform Delay, d1	22.5			36.9			31.1		19.3		36.1	22.6
Progression Factor	0.33			1.00			0.75		1.17		1.00	1.00
Incremental Delay, d2	5.0			4.1			1.7		0.2		10.2	7.5
Delay (s)	12.4			41.0			25.0		22.8		46.3	30.1
Level of Service	B			D			C		C		D	C
Approach Delay (s)	12.4			41.0			23.1				32.2	
Approach LOS	B			D			C				C	
<b>Intersection Summary</b>												
HCM Average Control Delay	24.7				HCM Level of Service				C			
HCM Volume to Capacity ratio	0.74											
Actuated Cycle Length (s)	100.0				Sum of lost time (s)				12.0			
Intersection Capacity Utilization	79.7%				ICU Level of Service				D			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
5: South Dakota Avenue & 33rd Place

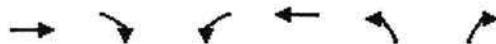
2921 Fort Lincoln Phase 2  
7/6/2006

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	11	12	11	12	12	12	15	12	12	12	12
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	0.95			0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.99		1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	1.00
Fr <sub>t</sub>	1.00	1.00			1.00	0.85		0.98		1.00	1.00	0.85
Fl <sub>t</sub> Protected	0.95	1.00			1.00	1.00		0.96		0.95	0.95	1.00
Satd. Flow (prot)	1770	3413			3536	1561		1929		1681	1579	1482
Fl <sub>t</sub> Permitted	0.07	1.00			0.90	1.00		0.96		0.95	0.95	1.00
Satd. Flow (perm)	126	3413			3202	1561		1929		1681	1579	1482
Volume (vph)	54	971	14	34	1687	126	7	1	2	392	5	107
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)	59	1055	15	37	1834	137	8	1	2	426	5	116
RTOR Reduction (vph)	0	1	0	0	0	60	0	2	0	0	0	95
Lane Group Flow (vph)	59	1069	0	0	1871	77	0	9	0	217	214	21
Confl. Peds. (#/hr)	5		4	4		5	9					9
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	16	16
Turn Type	pm+pt			Perm		Perm	Split			Split		Prot
Protected Phases	5	2			6		3	3		4	4	4
Permitted Phases	2			6		6						
Actuated Green, G (s)	64.0	64.0			54.0	54.0		4.0		17.0	17.0	17.0
Effective Green, g (s)	65.0	65.0			55.0	55.0		5.0		18.0	18.0	18.0
Actuated g/C Ratio	0.65	0.65			0.55	0.55		0.05		0.18	0.18	0.18
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	181	2218			1761	859		96		303	284	267
v/s Ratio Prot	0.02	c0.31					c0.00			0.13	c0.14	0.01
v/s Ratio Perm	0.19			c0.58	0.05							
v/c Ratio	0.33	0.48			1.06	0.09		0.09		0.72	0.75	0.08
Uniform Delay, d1	21.7	8.9			22.5	10.6		45.3		38.6	38.9	34.1
Progression Factor	1.06	0.80			0.88	1.20		1.00		0.98	0.98	1.23
Incremental Delay, d2	4.2	0.7			34.5	0.1		2.0		12.6	15.6	0.5
Delay (s)	27.2	7.8			54.3	12.9		47.3		50.4	53.6	42.4
Level of Service	C	A			D	B		D		D	D	D
Approach Delay (s)	8.8				51.4			47.3		50.0		
Approach LOS		A			D			D		D		
<b>Intersection Summary</b>												
HCM Average Control Delay	38.2				HCM Level of Service					D		
HCM Volume to Capacity ratio	0.91											
Actuated Cycle Length (s)	100.0				Sum of lost time (s)					16.0		
Intersection Capacity Utilization	123.3%				ICU Level of Service					H		
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
6: South Dakota Avenue & 31st Place

2921 Fort Lincoln Phase 2  
7/6/2006

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	13	11	14	12	12	12	16	16	16	10	12	10
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	
Fr <sub>t</sub>	1.00	1.00			1.00			0.95			0.90	
Flt Protected	0.95	1.00			1.00			0.99			0.99	
Satd. Flow (prot)	1829	3420			3445			1766			1651	
Flt Permitted	0.95	1.00			1.00			0.92			0.93	
Satd. Flow (perm)	1829	3420			3445			1653			1547	
Volume (vph)	29	981	3	0	1800	32	9	12	14	44	0	142
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)	32	1066	3	0	1957	35	10	13	15	48	0	154
RTOR Reduction (vph)	0	0	0	0	1	0	0	11	0	0	85	0
Lane Group Flow (vph)	32	1069	0	0	1991	0	0	27	0	0	117	0
Bus Blockages (#/hr)	0	0	0	0	12	12	0	0	0	0	0	0
Parking (#/hr)							1	1	1			
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	6.0	63.0			53.0			27.0			27.0	
Effective Green, g (s)	6.0	64.0			54.0			28.0			28.0	
Actuated g/C Ratio	0.06	0.64			0.54			0.28			0.28	
Clearance Time (s)	4.0	5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)	110	2189			1860			463			433	
v/s Ratio Prot	0.02	c0.31			c0.58							
v/s Ratio Perm							0.02			c0.08		
v/c Ratio	0.29	0.49			1.07			0.06			0.27	
Uniform Delay, d1	45.0	9.4			23.0			26.4			28.0	
Progression Factor	0.69	2.98			0.78			1.00			1.00	
Incremental Delay, d2	5.5	0.6			34.7			0.2			1.5	
Delay (s)	36.4	28.8			52.7			26.6			29.6	
Level of Service	D	C			D			C			C	
Approach Delay (s)	29.0				52.7			26.6			29.6	
Approach LOS	C				D			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay	43.2				HCM Level of Service			D				
HCM Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	100.0				Sum of lost time (s)			12.0				
Intersection Capacity Utilization	71.9%				ICU Level of Service			C				
Analysis Period (min)	15											
c Critical Lane Group												



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Sign Control	Stop			Stop	Stop	
Volume (vph)	271	31	66	56	36	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	295	34	72	61	39	30
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total (vph)	196	132	92	41	70	
Volume Left (vph)	0	0	72	0	39	
Volume Right (vph)	0	34	0	0	30	
Hadj (s)	0.03	-0.14	0.42	0.03	-0.12	
Departure Headway (s)	4.8	4.7	5.4	5.0	4.8	
Degree Utilization, x	0.26	0.17	0.14	0.06	0.09	
Capacity (veh/h)	733	755	648	699	697	
Control Delay (s)	8.4	7.4	8.0	7.1	8.3	
Approach Delay (s)	8.0		7.7		8.3	
Approach LOS	A		A		A	
Intersection Summary						
Delay	8.0					
HCM Level of Service	A					
Intersection Capacity Utilization	25.8%		ICU Level of Service		A	
Analysis Period (min)	15					

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	16	12	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.97	1.00			1.00	0.95	1.00			1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00			1.00	1.00	1.00			0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00			1.00	1.00	1.00			1.00
Fr <sub>t</sub>	1.00	0.85	1.00	1.00			1.00	1.00	0.85			0.92
Fl <sub>t</sub> Protected	1.00	1.00	0.95	1.00			0.95	1.00	1.00			1.00
Satd. Flow (prot)	1863	1529	3433	1863			1762	3539	1583			1430
Fl <sub>t</sub> Permitted	1.00	1.00	0.95	1.00			0.51	1.00	1.00			1.00
Satd. Flow (perm)	1863	1529	3433	1863			938	3539	1583			1430
Volume (vph)	0	15	297	96	8	0	38	21	122	0	111	117
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	16	323	104	9	0	41	23	133	0	121	127
RTOR Reduction (vph)	0	0	245	0	0	0	0	0	43	0	38	0
Lane Group Flow (vph)	0	16	78	104	9	0	41	23	90	0	210	0
Confli. Peds. (#/hr)							4				4	
Bus Blockages (#/hr)	0	0	12	0	0	0	0	0	0	0	0	0
Parking (#/hr)					1					12	12	
Turn Type	Split		Perm	Split		Perm	Perm		pt+ov	Perm		
Protected Phases	4	4		3	3			2	2	3		6
Permitted Phases			4			3	2			6		
Actuated Green, G (s)	23.0	23.0	26.0	26.0			36.0	36.0	67.0			36.0
Effective Green, g (s)	24.0	24.0	27.0	27.0			37.0	37.0	68.0			37.0
Actuated g/C Ratio	0.24	0.24	0.27	0.27			0.37	0.37	0.68			0.37
Clearance Time (s)	5.0	5.0	5.0	5.0			5.0	5.0				5.0
Lane Grp Cap (vph)	447	367	927	503			347	1309	1076			529
v/s Ratio Prot	0.01		c0.03	0.00				0.01	0.06			c0.15
v/s Ratio Perm			c0.05				0.04					
v/c Ratio	0.04	0.21	0.11	0.02			0.12	0.02	0.08			0.40
Uniform Delay, d1	29.1	30.4	27.5	26.8			20.8	20.0	5.4			23.3
Progression Factor	1.00	1.00	1.00	1.00			1.02	1.03	0.97			1.00
Incremental Delay, d2	0.1	1.3	0.2	0.1			0.7	0.0	0.2			2.2
Delay (s)	29.3	31.7	27.7	26.8			21.9	20.5	5.4			25.5
Level of Service	C	C	C	C			C	C	A			C
Approach Delay (s)	31.6			27.7				10.6				25.5
Approach LOS	C			C			B					C
<b>Intersection Summary</b>												
HCM Average Control Delay	24.8			HCM Level of Service			C					
HCM Volume to Capacity ratio	0.26											
Actuated Cycle Length (s)	100.0			Sum of lost time (s)			12.0					
Intersection Capacity Utilization	45.1%			ICU Level of Service			A					
Analysis Period (min)	15											

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↑		↑↑	↑	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	35	0	21	193	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	38	0	23	210	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				285		
pX, platoon unblocked						
vC, conflicting volume	224	212	215			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224	212	215			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	100			
cM capacity (veh/h)	744	793	1352			
Direction, Lane #	EB-1	NB-1	NB-2	SB-1		
Volume Total	38	11	11	215		
Volume Left	0	0	0	0		
Volume Right	38	0	0	5		
cSH	793	1700	1700	1700		
Volume to Capacity	0.05	0.01	0.01	0.13		
Queue Length 95th (ft)	4	0	0	0		
Control Delay (s)	9.8	0.0	0.0	0.0		
Lane LOS	A					
Approach Delay (s)	9.8	0.0		0.0		
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			1.3			
Intersection Capacity Utilization		20.5%		ICU Level of Service		A
Analysis Period (min)		15				



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑↑	↑	
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	22	4	18	175	3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	24	4	20	190	3
Direction Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total (vph)	24	11	13	193		
Volume Left (vph)	0	4	0	0		
Volume Right (vph)	24	0	0	3		
Hadj (s)	0.57	0.23	0.03	0.02		
Departure Headway (s)	3.8	4.9	4.7	4.1		
Degree Utilization, x	0.03	0.01	0.02	0.22		
Capacity (veh/h)	893	717	747	870		
Control Delay (s)	6.9	6.8	6.6	8.3		
Approach Delay (s)	6.9	6.7		8.3		
Approach LOS	A	A		A		
<b>Intersection Summary</b>						
Delay		8.0				
HCM Level of Service		A				
Intersection Capacity Utilization		19.4%		ICU Level of Service		A
Analysis Period (min)		15				

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↗		↑↑		↗	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	10	0	18	168	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	0	20	183	2
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	193	184	185			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	193	184	185			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	777	827	1387			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	11	10	10	185		
Volume Left	0	0	0	0		
Volume Right	11	0	0	2		
cSH	827	1700	1700	1700		
Volume to Capacity	0.01	0.01	0.01	0.11		
Queue Length 95th (ft)	1	0	0	0		
Control Delay (s)	9.4	0.0	0.0	0.0		
Lane LOS	A					
Approach Delay (s)	9.4	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay		0.5				
Intersection Capacity Utilization	19.0%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsigned Intersection Capacity Analysis  
12: Unnamed Road & Fort Lincoln Drive

2921 Fort Lincoln Phase 2  
7/6/2006

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↖	↗	↖	↑		↖	↗	↖	↑	↖
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	8	15	21	5	0	4	0	14	23	134	259
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	16	23	5	0	4	0	15	25	146	282
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total (vph)	9	16	23	5	4	15	171	282				
Volume Left (vph)	0	0	23	0	4	0	25	0				
Volume Right (vph)	0	16	0	0	0	15	0	282				
Hadj (s)	0.03	-0.67	0.53	0.03	0.53	-0.67	0.11	-0.67				
Departure Headway (s)	5.5	4.8	6.0	5.5	5.5	4.3	4.8	4.0				
Degree Utilization, x	0.01	0.02	0.04	0.01	0.01	0.02	0.23	0.31				
Capacity (veh/h)	604	689	558	607	634	807	738	885				
Control Delay (s)	7.4	6.7	8.1	7.4	7.4	6.2	8.0	7.6				
Approach Delay (s)	7.0		7.9		6.5		7.7					
Approach LOS	A		A		A		A					
Intersection Summary												
Delay					7.7							
HCM Level of Service					A							
Intersection Capacity Utilization				32.7%			ICU Level of Service			A		
Analysis Period (min)					15							



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	11	0	16	2	0	252
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	0	17	2	0	274
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 <sub>1</sub> , conflicting volume	292	18		20		
vC <sub>1</sub> , stage 1 conf vol						
vC <sub>2</sub> , stage 2 conf vol						
vCu, unblocked vol	292	18		20		
tC <sub>1</sub> , single (s)	6.4	6.2		4.1		
tC <sub>2</sub> , 2 stage (s)						
tF (s)	3.5	3.3		2.2		
p0 queue free %	98	100		100		
cM capacity (veh/h)	698	1060		1597		
Direction: Lane #	WB 1	NB 1	SB 1			
Volume Total	12	20	274			
Volume Left	12	0	0			
Volume Right	0	2	0			
cSH	698	1700	1597			
Volume to Capacity	0.02	0.01	0.00			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	10.2	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	10.2	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.4				
Intersection Capacity Utilization		23.3%		ICU Level of Service		A
Analysis Period (min)		15				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	34	0	19	7	0	263
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	0	21	8	0	286
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	310	24		28		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	310	24		28		
tC, single (s)	6.4	6.2		4.1		
tC, 2 stage (s)						
tF (s)	3.5	3.3		2.2		
p0 queue free %	95	100		100		
cM capacity (veh/h)	682	1052		1585		
Direction Lane #	WB 1	NB 1	SB 1			
Volume Total	37	28	286			
Volume Left	37	0	0			
Volume Right	0	8	0			
cSH	682	1700	1585			
Volume to Capacity	0.05	0.02	0.00			
Queue Length 95th (ft)	4	0	0			
Control Delay (s)	10.6	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	10.6	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		23.8%		ICU Level of Service		A
Analysis Period (min)		15				

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	10	10	10	11	12	12	11	11	11	15	13	13
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flt	1.00	0.95		1.00	1.00	0.85	1.00	0.99		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1650	1650		1711	1863	1562	1710	3387		1945	3406	
Flt Permitted	0.46	1.00		0.23	1.00	1.00	0.36	1.00		0.24	1.00	
Satd. Flow (perm)	795	1650		413	1863	1562	656	3387		492	3406	
Volume (vph)	364	311	159	24	274	106	199	637	38	118	289	196
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)	396	338	173	26	298	115	216	692	41	128	314	213
RTOR Reduction (vph)	0	18	0	0	0	70	0	4	0	0	120	0
Lane Group Flow (vph)	396	493	0	26	298	45	216	729	0	128	407	0
Confl. Peds. (#/hr)	2					2	1		7	7		1
Turn Type	Perm		Perm		Perm	pm+pt		pm+pt				
Protected Phases		4			8		5	2		1		6
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	38.0	38.0		38.0	38.0	38.0	47.0	36.0		47.0	36.0	
Effective Green, g (s)	39.0	39.0		39.0	39.0	39.0	49.0	37.0		49.0	37.0	
Actuated g/C Ratio	0.39	0.39		0.39	0.39	0.39	0.49	0.37		0.49	0.37	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	310	644		161	727	609	448	1253		415	1260	
v/s Ratio Prot		0.30			0.16		c0.06	c0.22		0.04	0.12	
v/s Ratio Perm	c0.50			0.06		0.03	0.18			0.11		
v/c Ratio	1.28	0.77		0.16	0.41	0.07	0.48	0.58		0.31	0.32	
Uniform Delay, d1	30.5	26.5		19.9	22.1	19.2	15.3	25.3		15.0	22.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.16	1.18		1.00	1.00	
Incremental Delay, d2	147.5	8.4		2.1	1.7	0.2	2.8	1.5		1.9	0.7	
Delay (s)	178.0	34.9		22.0	23.9	19.4	20.4	31.4		16.9	23.2	
Level of Service	F	C		C	C	B	C	C		B	C	
Approach Delay (s)		97.4			22.6			28.9			22.0	
Approach LOS		F			C			C			C	
Intersection Summary												
HCM Average Control Delay		47.5			HCM Level of Service			D				
HCM Volume to Capacity ratio		0.88										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		105.4%			ICU Level of Service			G				
Analysis Period (min)		15										

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1	↑↑	1900	1900	1900	1900	1	↑↑	1900	1900	1900	1900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	11	12	12	12	11	11	11	11	11	11
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95			0.91		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>	1.00	0.99			0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1711	3399			4994		1707	3366		1708	3158	
Flt Permitted	0.11	1.00			0.67		0.41	1.00		0.31	1.00	
Satd. Flow (perm)	190	3399			3384		736	3366		551	3158	
Volume (vph)	211	1413	56	184	995	80	132	477	48	60	285	112
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)	229	1536	61	200	1082	87	143	518	52	65	310	122
RTOR Reduction (vph)	0	3	0	0	7	0	0	7	0	0	42	0
Lane Group Flow (vph)	229	1594	0	0	1362	0	143	563	0	65	390	0
Confl. Peds. (#/hr)	9		11	11		9	11		16	16		11
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	15
Turn Type	custom			Perm			pm+pt			pm+pt		
Protected Phases	5	2	5		6		3	8		7	4	
Permitted Phases		2			6		8			4		
Actuated Green, G (s)	44.0	48.0			36.0		36.0	30.0		36.0	30.0	
Effective Green, g (s)	46.0	50.0			38.0		38.0	32.0		38.0	32.0	
Actuated g/C Ratio	0.46	0.50			0.38		0.38	0.32		0.38	0.32	
Clearance Time (s)	4.0				6.0		4.0	6.0		4.0	6.0	
Lane Grp Cap (vph)	209	1700			1286		338	1077		279	1011	
v/s Ratio Prot	0.09	c0.47				c0.03	c0.17			0.01	0.12	
v/s Ratio Perm		c0.42			0.40		0.14			0.07		
v/c Ratio	1.10	0.94			2.44dl		0.42	0.52		0.23	0.39	
Uniform Delay, d1	22.9	23.5			31.0		21.2	27.8		20.5	26.4	
Progression Factor	1.00	1.00			1.08		1.00	1.00		0.99	1.05	
Incremental Delay, d2	90.2	11.3			40.4		3.8	1.8		1.7	1.0	
Delay (s)	113.1	34.9			73.8		25.0	29.6		22.1	28.7	
Level of Service	F	C			E		C	C		C	C	
Approach Delay (s)		44.7			73.8			28.7			27.9	
Approach LOS		D			E			C			C	
<b>Intersection Summary</b>												
HCM Average Control Delay	49.3			HCM Level of Service			D					
HCM Volume to Capacity ratio	0.83											
Actuated Cycle Length (s)	100.0			Sum of lost time (s)			16.0					
Intersection Capacity Utilization	116.5%			ICU Level of Service			H					
Analysis Period (min)	15											
dl	Defacto Left Lane. Recode with 1 though lane as a left lane.											
c	Critical Lane Group											

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	10	11	11	11	11	11
Total Lost time (s)	4.0			4.0			4.0			4.0		
Lane Util. Factor	1.00			1.00			0.91			0.91		
Frpb, ped/bikes	1.00			1.00			0.99			1.00		
Flpb, ped/bikes	1.00			1.00			1.00			1.00		
Fr	0.99			0.97			0.97			1.00		
Flt Protected	0.97			0.96			1.00			1.00		
Satd. Flow (prot)	1957			1736			4730			4843		
Flt Permitted	0.83			0.75			0.94			0.89		
Satd. Flow (perm)	1682			1353			4440			4302		
Volume (vph)	16	6	2	152	0	36	3	591	147	23	560	15
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)	17	7	2	165	0	39	3	642	160	25	609	16
RTOR Reduction (vph)	0	2	0	0	9	0	0	21	0	0	1	0
Lane Group Flow (vph)	0	24	0	0	195	0	0	784	0	0	649	0
Confl. Peds. (#/hr)	4		1	1		4	7		6	6		7
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	6	6
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		8			4			2			6	
Permitted Phases	8			4			2			6		
Actuated Green, G (s)	21.0			21.0			88.0			88.0		
Effective Green, g (s)	23.0			23.0			89.0			89.0		
Actuated g/C Ratio	0.19			0.19			0.74			0.74		
Clearance Time (s)	6.0			6.0			5.0			5.0		
Vehicle Extension (s)	3.0			3.0			1.0			1.0		
Lane Grp Cap (vph)	322			259			3293			3191		
v/s Ratio Prot												
v/s Ratio Perm	0.01			c0.14			c0.18			0.15		
v/c Ratio	0.08			0.75			0.24			0.20		
Uniform Delay, d1	39.8			45.8			4.9			4.7		
Progression Factor	1.00			1.00			1.00			1.00		
Incremental Delay, d2	0.1			11.7			0.2			0.1		
Delay (s)	39.9			57.5			5.0			4.9		
Level of Service	D			E			A			A		
Approach Delay (s)	39.9			57.5			5.0			4.9		
Approach LOS	D			E			A			A		
<b>Intersection Summary</b>												
HCM Average Control Delay	11.9			HCM Level of Service			B					
HCM Volume to Capacity ratio	0.34											
Actuated Cycle Length (s)	120.0			Sum of lost time (s)			8.0					
Intersection Capacity Utilization	48.8%			ICU Level of Service			A					
Analysis Period (min)	15											

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
4: South Dakota Avenue & New York Avenue Exit

2921 Fort Lincoln Phase 2  
7/6/2006

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	12	12	14	12	12	12	14	12	12	12
Total Lost time (s)	4.0			4.0			4.0		4.0		4.0	4.0
Lane Util. Factor	0.95			1.00			1.00		1.00		1.00	0.88
Flt	0.99			1.00			1.00		0.85		1.00	0.85
Flt Protected	1.00			1.00			0.95		1.00		0.99	1.00
Satd. Flow (prot)	3518			1986			1770		1689		1842	2787
Flt Permitted	1.00			0.96			0.73		1.00		0.99	1.00
Satd. Flow (perm)	3518			1910			1367		1689		1842	2787
Volume (vph)	0	1938	80	2	213	0	14	0	290	7	26	917
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	2107	87	2	232	0	15	0	315	8	28	997
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	6	0	0	352
Lane Group Flow (vph)	0	2191	0	0	234	0	15	0	309	0	36	645
Turn Type				Perm			custom		custom	Perm		custom
Protected Phases		2			9				9		4	
Permitted Phases				9			8		8	4		6
Actuated Green, G (s)	58.0			16.0			11.0		27.0		11.0	58.0
Effective Green, g (s)	59.0			17.0			12.0		29.0		12.0	59.0
Actuated g/C Ratio	0.59			0.17			0.12		0.29		0.12	0.59
Clearance Time (s)	5.0			5.0			5.0		5.0		5.0	5.0
Lane Grp Cap (vph)	2076			325			164		557		221	1644
v/s Ratio Prot	c0.62							c0.09				
v/s Ratio Perm				c0.12			0.01		0.09		0.02	0.23
v/c Ratio	1.06			0.72			0.09		0.56		0.16	0.39
Uniform Delay, d1	20.5			39.2			39.1		30.0		39.5	10.9
Progression Factor	0.53			1.00			1.00		1.00		1.00	1.00
Incremental Delay, d2	32.5			12.9			1.1		4.0		1.6	0.7
Delay (s)	43.3			52.2			40.3		34.0		41.1	11.6
Level of Service	D			D			D		C		D	B
Approach Delay (s)	43.3			52.2			34.3				12.7	
Approach LOS	D			D			C				B	
<b>Intersection Summary</b>												
HCM Average Control Delay	34.7			HCM Level of Service			C					
HCM Volume to Capacity ratio	0.93											
Actuated Cycle Length (s)	100.0			Sum of lost time (s)			12.0					
Intersection Capacity Utilization	87.4%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

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	11	12	11	12	12	12	15	12	12	12	12
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	0.95			0.95	1.00		1.00		0.95	0.95	1.00
Fpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	1.00
Flt	1.00	1.00			1.00	0.85		0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00			1.00	1.00		0.99		0.95	0.95	1.00
Satd. Flow (prot)	1770	3415			3539	1583		1845		1681	1585	1488
Flt Permitted	0.16	1.00			0.95	1.00		0.99		0.95	0.95	1.00
Satd. Flow (perm)	294	3415			3365	1583		1845		1681	1585	1488
Volume (vph)	215	1332	14	3	879	262	16	6	42	644	2	366
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)	234	1448	15	3	955	285	17	7	46	700	2	398
RTOR Reduction (vph)	0	1	0	0	0	162	0	30	0	0	0	214
Lane Group Flow (vph)	234	1462	0	0	958	123	0	40	0	353	349	184
Confl. Peds. (#/hr)			1	1			4				4	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	15	15
Turn Type	pm+pt			Perm		Perm	Split			Split		Prot
Protected Phases	5	2			6		3	3		4	4	4
Permitted Phases	2			6		6						
Actuated Green, G (s)	56.0	56.0			42.0	42.0		5.0		24.0	24.0	24.0
Effective Green, g (s)	57.0	57.0			43.0	43.0		6.0		25.0	25.0	25.0
Actuated g/C Ratio	0.57	0.57			0.43	0.43		0.06		0.25	0.25	0.25
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	5.0
Lane Grp Cap (vph)	315	1947			1447	681		111		420	396	372
v/s Ratio Prot	0.07	c0.43					c0.02			0.21	c0.22	0.12
v/s Ratio Perm	0.35			0.28	0.08							
v/c Ratio	0.74	0.75			0.66	0.18		0.36		0.84	0.88	0.50
Uniform Delay, d1	14.9	16.2			22.7	17.6		45.2		35.6	36.1	32.1
Progression Factor	1.35	1.26			0.87	0.29		1.00		0.56	0.56	0.13
Incremental Delay, d2	12.6	2.3			2.1	0.5		8.8		15.7	20.6	3.9
Delay(s)	32.7	22.7			21.8	5.6		54.0		35.6	40.9	8.2
Level of Service	C	C			C	A		D		D	D	A
Approach Delay (s)		24.1			18.1			54.0			27.4	
Approach LOS		C			B			D			C	
Intersection Summary												
HCM Average Control Delay		23.7			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.76										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		113.9%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis  
6: South Dakota Avenue & 31st Place

2921 Fort Lincoln Phase 2  
7/6/2006

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	13	11	14	12	12	12	16	16	16	10	12	10
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	
Fr <sub>t</sub>	1.00	1.00			0.99			0.99			0.92	
Flt Protected	0.95	1.00			1.00			0.99			0.98	
Satd. Flow (prot)	1829	3420			3436			1848			1681	
Flt Permitted	0.95	1.00			1.00			0.92			0.87	
Satd. Flow (perm)	1829	3420			3436			1723			1490	
Volume (vph)	83	1371	4	0	1097	74	17	40	4	35	0	49
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)	90	1490	4	0	1192	80	18	43	4	38	0	53
RTOR Reduction (vph)	0	0	0	0	5	0	0	2	0	0	42	0
Lane Group Flow (vph)	90	1494	0	0	1267	0	0	63	0	0	49	0
Bus Blockages (#/hr)	0	0	0	0	10	10	0	0	0	0	0	0
Parking (#/hr)							1	1	1			
Turn Type	Prot						Perm			Perm		
Protected Phases	5	2			6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	7.0	70.0			59.0			20.0			20.0	
Effective Green, g (s)	7.0	71.0			60.0			21.0			21.0	
Actuated g/C Ratio	0.07	0.71			0.60			0.21			0.21	
Clearance Time (s)	4.0	5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)	128	2428			2062			362			313	
v/s Ratio Prot	0.05	c0.44			0.37							
v/s Ratio Perm							c0.04			0.03		
v/c Ratio	0.70	0.62			0.61			0.17			0.16	
Uniform Delay, d <sub>1</sub>	45.5	7.5			12.7			32.4			32.3	
Progression Factor	0.91	0.96			2.23			1.00			1.00	
Incremental Delay, d <sub>2</sub>	12.7	0.5			1.0			1.0			1.1	
Delay (s)	54.3	7.6			29.3			33.4			33.3	
Level of Service	D	A			C			C			C	
Approach Delay (s)		10.3			29.3			33.4			33.3	
Approach LOS		B			C			C			C	
Intersection Summary												
HCM Average Control Delay		19.5			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.51										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		55.1%			ICU Level of Service			B				
Analysis Period (min)		15										
c Critical Lane Group												

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↑↑
Sign Control	Stop			Stop	Stop	
Volume (vph)	328	26	32	143	39	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	357	28	35	155	42	37
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total (vph)	238	147	87	104	79	
Volume Left (vph)	0	0	35	0	42	
Volume Right (vph)	0	28	0	0	37	
Hadj (s)	0.03	-0.10	0.23	0.03	-0.14	
Departure Headway (s)	4.9	4.8	5.3	5.1	5.0	
Degree Utilization, x	0.32	0.20	0.13	0.15	0.11	
Capacity (veh/h)	719	734	657	686	665	
Control Delay (s)	9.1	7.7	7.9	7.8	8.6	
Approach Delay (s)	8.6		7.8		8.6	
Approach LOS	A		A		A	
Intersection Summary						
Delay	8.3					
HCM Level of Service	A					
Intersection Capacity Utilization	29.0%		ICU Level of Service		A	
Analysis Period (min)	15					

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	16	12	16	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00	0.97	1.00			1.00	0.95	1.00		1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00			1.00	1.00	1.00		1.00	
Fr <sub>t</sub>	1.00	0.85	1.00	1.00			1.00	1.00	0.85		0.98	
Flt Protected	1.00	1.00	0.95	1.00			0.95	1.00	1.00		1.00	
Satd. Flow (prot)	1863	1535	3433	1863			1767	3539	1583		1526	
Flt Permitted	1.00	1.00	0.95	1.00			0.62	1.00	1.00		1.00	
Satd. Flow (perm)	1863	1535	3433	1863			1149	3539	1583		1526	
Volume (vph)	0	32	341	556	34	0	78	53	352	0	115	20
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	35	371	604	37	0	85	58	383	0	125	22
RTOR Reduction (vph)	0	0	264	0	0	0	0	0	138	0	6	0
Lane Group Flow (vph)	0	35	107	604	37	0	85	58	245	0	141	0
Confl. Peds. (#/hr)							1				1	
Bus Blockages (#/hr)	0	0	11	0	0	0	0	0	0	0	0	0
Parking (#/hr)			1							12	12	
Turn Type	Split		Perm	Split		Perm	Perm		pt+ov	Perm		
Protected Phases	4	4		3	3			2	23		6	
Permitted Phases			4			3	2			6		
Actuated Green, G (s)	27.0	27.0	28.0	28.0			30.0	30.0	63.0		30.0	
Effective Green, g (s)	28.0	28.0	29.0	29.0			31.0	31.0	64.0		31.0	
Actuated g/C Ratio	0.28	0.28	0.29	0.29			0.31	0.31	0.64		0.31	
Clearance Time (s)	5.0	5.0	5.0	5.0			5.0	5.0			5.0	
Lane Grp Cap (vph)	522	430	996	540			356	1097	1013		473	
v/s Ratio Prot	0.02		c0.18	0.02				0.02	0.15		c0.09	
v/s Ratio Perm			c0.07				0.07					
v/c Ratio	0.07	0.25	0.61	0.07			0.24	0.05	0.24		0.30	
Uniform Delay, d1	26.4	27.9	30.6	25.7			25.7	24.2	7.7		26.2	
Progression Factor	1.00	1.00	1.00	1.00			0.71	0.74	0.00		1.00	
Incremental Delay, d2	0.2	1.4	2.7	0.2			1.4	0.1	0.5		1.6	
Delay (s)	26.7	29.2	33.3	26.0			19.5	18.1	0.5		27.8	
Level of Service	C	C	C	C			B	B	A		C	
Approach Delay (s)	29.0			32.9				5.5			27.8	
Approach LOS	C			C				A			C	
<b>Intersection Summary</b>												
HCM Average Control Delay	23.2											
HCM Volume to Capacity ratio	0.38											
Actuated Cycle Length (s)	100.0											
Intersection Capacity Utilization	60.3%											
Analysis Period (min)	15											

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑	↙
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	8	0	53	127	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	0	58	138	17
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (ft)			285			
pX, platoon unblocked						
vC, conflicting volume	176	147	155			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	176	147	155			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	797	874	1422			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	9	29	29	155		
Volume Left	0	0	0	0		
Volume Right	9	0	0	17		
cSH	874	1700	1700	1700		
Volume to Capacity	0.01	0.02	0.02	0.09		
Queue Length 95th (ft)	1	0	0	0		
Control Delay (s)	9.2	0.0	0.0	0.0		
Lane LOS	A					
Approach Delay (s)	9.2	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay		0.4				
Intersection Capacity Utilization		17.7%		ICU Level of Service		A
Analysis Period (min)		15				



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑↑	↑	
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	5	12	41	138	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	5	13	45	150	11
Direction Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total (vph)	5	28	30	161		
Volume Left (vph)	0	13	0	0		
Volume Right (vph)	5	0	0	11		
Hadj (s)	-0.57	0.27	0.03	-0.01		
Departure Headway (s)	3.8	4.9	4.6	4.1		
Degree Utilization, x	0.01	0.04	0.04	0.18		
Capacity (veh/h)	891	724	760	879		
Control Delay (s)	6.8	6.9	6.6	8.0		
Approach Delay (s)	6.8	6.7		8.0		
Approach LOS	A	A		A		
Intersection Summary						
Delay		7.6				
HCM Level of Service		A				
Intersection Capacity Utilization		20.1%		ICU Level of Service		A
Analysis Period (min)		15				

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↗	
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	0	2	0	41	146	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	0	45	159	5
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	184	161	164			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	184	161	164			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	788	855	1412			
Direction Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	2	22	22	164		
Volume Left	0	0	0	0		
Volume Right	2	0	0	5		
cSH	855	1700	1700	1700		
Volume to Capacity	0.00	0.01	0.01	0.10		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	9.2	0.0	0.0	0.0		
Lane LOS	A					
Approach Delay (s)	9.2	0.0		0.0		
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay		0.1				
Intersection Capacity Utilization		18.0%	ICU Level of Service		A	
Analysis Period (min)		15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↗	↑		↖	↗		↖	↑
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	17	4	102	18	0	2	0	39	68	45	236
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	18	4	111	20	0	2	0	42	74	49	257
Direction Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total (vph)	18	4	111	20	2	42	123	257				
Volume Left (vph)	0	0	111	0	2	0	74	0				
Volume Right (vph)	0	4	0	0	0	42	0	257				
Hadj (s)	0.03	-0.67	0.53	0.03	0.53	-0.67	0.33	-0.67				
Departure Headway (s)	5.6	4.9	6.0	5.5	5.8	4.6	5.3	4.3				
Degree Utilization, x	0.03	0.01	0.18	0.03	0.00	0.05	0.18	0.31				
Capacity (veh/h)	594	676	568	616	594	743	654	809				
Control Delay (s)	7.6	6.7	9.1	7.5	7.6	6.7	8.3	8.0				
Approach Delay (s)	7.4		8.9		6.7		8.1					
Approach LOS	A		A		A		A					
Intersection Summary												
Delay												
HCM Level of Service												
Intersection Capacity Utilization	31.8%											
Analysis Period (min)	15											

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	3	0	18	7	0	252
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	20	8	0	274
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	297	23		27		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	297	23		27		
tC, single (s)	6.4	6.2		4.1		
tC, 2 stage (s)						
tF (s)	3.5	3.3		2.2		
p0 queue free %	100	100		100		
cM capacity (veh/h)	694	1053		1587		
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	3	27	274			
Volume Left	3	0	0			
Volume Right	0	8	0			
cSH	694	1700	1587			
Volume to Capacity	0.00	0.02	0.00			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	10.2	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	10.2	0.0	0.0			
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay		0.1				
Intersection Capacity Utilization		23.3%	ICU Level of Service		A	
Analysis Period (min)		15				

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		Y		Y	
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	8	0	25	22	0	254
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	0	27	24	0	276
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	315	39			51	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	315	39			51	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	678	1032			1555	
Direction Lane #	WB 1	NB 1	SB 1			
Volume Total	9	51	276			
Volume Left	9	0	0			
Volume Right	0	24	0			
cSH	678	1700	1555			
Volume to Capacity	0.01	0.03	0.00			
Queue Length 95th (ft)	1	0	0			
Control Delay (s)	10.4	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	10.4	0.0	0.0			
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay		0.3				
Intersection Capacity Utilization		23.4%		ICU Level of Service		A
Analysis Period (min)		15				