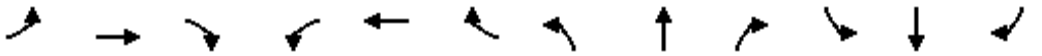
APPENDIX V

2017 Build Route 9 Intersection Analysis



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	155	2359	254	140	1779	451	3	0	29	25	154	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	390		250	0		0	0		0
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	50		50	50		50	50		50	50		50
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor												
Frt		0.985				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.950		0.950	0.999	
Satd. Flow (prot)	1752	4960	0	1752	5036	1568	0	1752	1568	1665	1751	1568
Flt Permitted	0.950			0.950				0.950		0.950	0.999	
Satd. Flow (perm)	1752	4960	0	1752	5036	1568	0	1752	1568	1665	1751	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21				422			32			26
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		3513			661			634			595	
Travel Time (s)		53.2			10.0			17.3			16.2	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	168	2564	276	152	1934	490	3	0	32	27	167	26
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	168	2840	0	152	1934	490	0	3	32	24	170	26
Turn Type	Prot			Prot		Perm	Split		custom	Split		custom
Protected Phases	1	6		5	2		8	8		4	4	
Permitted Phases						2			5 8			1 4
Detector Phase	1	6		5	2	2	8	8	5 8	4	4	1 4
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0	10.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	14.0	23.0		12.0	23.0	23.0	10.0	10.0		10.0	10.0	
Total Split (s)	14.0	41.0	0.0	12.0	39.0	39.0	10.0	10.0	22.0	11.0	11.0	25.0
Total Split (%)	14.0%	41.0%	0.0%	12.0%	39.0%	39.0%	10.0%	10.0%	22.0%	11.0%	11.0%	25.0%
Yellow Time (s)	4.0	5.0		4.0	5.0	5.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-3.0	0.0	-2.0	-3.0	-3.0	0.0	-1.0	-2.0	-1.0	-1.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lead		Lag	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	16.5	61.8		8.0	53.3	53.3		6.0	14.0	7.0	7.0	25.1
Actuated g/C Ratio	0.16	0.62		0.08	0.53	0.53		0.06	0.14	0.07	0.07	0.25

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	26%
Yellow Time (s)	10.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.58	0.92		1.09	0.72	0.47		0.03	0.13	0.21	1.38	0.06
Control Delay	49.0	25.5		126.5	15.8	2.2		45.0	10.8	48.3	251.3	7.2
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	49.0	25.5		126.5	15.8	2.2		45.0	10.8	48.3	251.3	7.2
LOS	D	C		F	B	A		D	B	D	F	A
Approach Delay		26.8			19.7			13.7			200.3	
Approach LOS		C			B			B			F	
Queue Length 50th (ft)	97	520		~111	231	4		2	0	15	~152	0
Queue Length 95th (ft)	#238	#1036		m#201	m#598	m30		11	22	43	#291	11
Internal Link Dist (ft)		3433			581			554			515	
Turn Bay Length (ft)				390		250						
Base Capacity (vph)	289	3073		140	2684	1033		105	247	117	123	413
Starvation Cap Reductn	0	0		0	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0		0	0	0	0	0
Reduced v/c Ratio	0.58	0.92		1.09	0.72	0.47		0.03	0.13	0.21	1.38	0.06

Intersection Summary

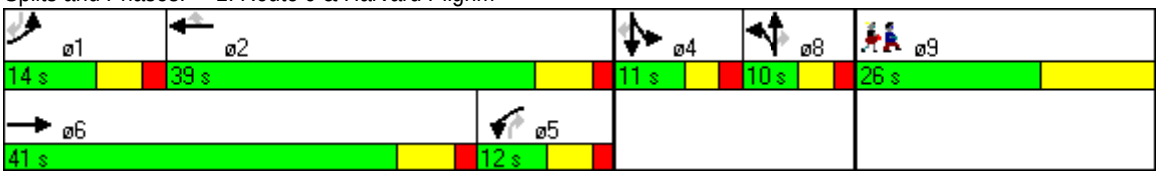
Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.38
Intersection Signal Delay: 30.2 Intersection LOS: C
Intersection Capacity Utilization 83.7% ICU Level of Service E
Analysis Period (min) 15

~ 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.

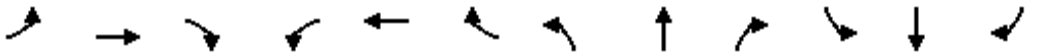
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Route 9 & Harvard Pilgrim



Lane Group	ø9
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1744	669	475	1658	0	0	0	0	0	0	712
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		1	0		0	0		0	0		2
Taper Length (ft)	50		50	50		50	50		50	50		50
Lane Util. Factor	1.00	0.95	1.00	0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Ped Bike Factor												
Frt			0.850									0.850
Flt Protected				0.950								
Satd. Flow (prot)	0	3505	1568	3400	5036	0	0	0	0	0	0	2760
Flt Permitted				0.950								
Satd. Flow (perm)	0	3505	1568	3400	5036	0	0	0	0	0	0	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			288									28
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		661			249			485			598	
Travel Time (s)		10.0			3.8			9.4			11.6	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1896	727	516	1802	0	0	0	0	0	0	774
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1896	727	516	1802	0	0	0	0	0	0	774
Turn Type			Free	Prot								custom
Protected Phases		6 8		5	2							
Permitted Phases			Free									4
Detector Phase		6 8		5	2							4
Switch Phase												
Minimum Initial (s)				4.0	4.0							4.0
Minimum Split (s)				20.0	20.0							20.0
Total Split (s)	0.0	76.0	0.0	24.0	64.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
Total Split (%)	0.0%	76.0%	0.0%	24.0%	64.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	36.0%
Yellow Time (s)				4.0	4.0							4.0
All-Red Time (s)				2.0	2.0							2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	6.0
Lead/Lag				Lag								
Lead-Lag Optimize?				Yes								
Recall Mode				None	C-Max							None
Act Effct Green (s)		70.0	100.0	18.0	58.0							30.0
Actuated g/C Ratio		0.70	1.00	0.18	0.58							0.30

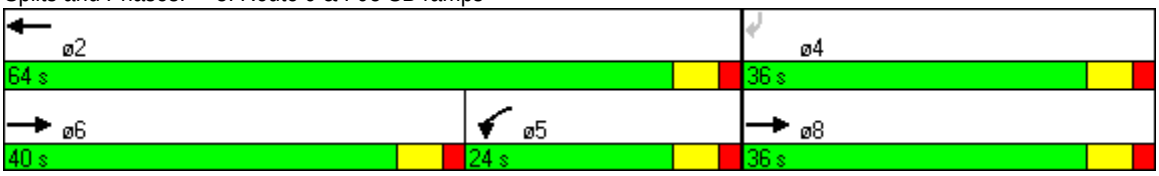
Lane Group	ø6	ø8
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Parking (#/hr)		
Mid-Block Traffic (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	10.0	20.0
Total Split (s)	40.0	36.0
Total Split (%)	40%	36%
Yellow Time (s)	4.0	4.0
All-Red Time (s)	2.0	2.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	C-Max	None
Act Effct Green (s)		
Actuated g/C Ratio		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.77	0.46	0.84	0.62							0.91
Control Delay		7.6	3.1	46.5	8.1							49.2
Queue Delay		0.1	0.0	0.0	0.0							0.0
Total Delay		7.7	3.1	46.5	8.1							49.2
LOS		A	A	D	A							D
Approach Delay		6.4			16.6							
Approach LOS		A			B							
Queue Length 50th (ft)		12	0	165	176							260
Queue Length 95th (ft)		m285	m522	#247	189							#388
Internal Link Dist (ft)		581			169			405			518	
Turn Bay Length (ft)												
Base Capacity (vph)		2454	1568	612	2921							848
Starvation Cap Reductn		48	0	0	0							0
Spillback Cap Reductn		0	0	0	0							0
Storage Cap Reductn		0	0	0	0							0
Reduced v/c Ratio		0.79	0.46	0.84	0.62							0.91

Intersection Summary

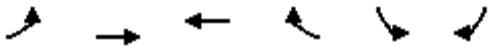
Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 98 (98%), Referenced to phase 2:WBT and 6:EBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 16.4 Intersection LOS: B
Intersection Capacity Utilization 110.0% ICU Level of Service H
Analysis Period (min) 15
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.

Splits and Phases: 8: Route 9 & I-95 SB ramps

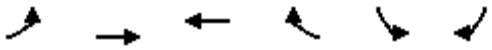


Lane Group	ø6	ø8
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



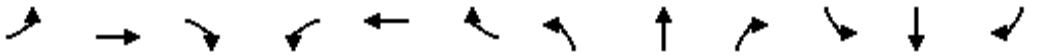
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	481	2131	1185	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)		0%	0%		0%	
Storage Length (ft)	300			0	0	0
Storage Lanes	2			0	0	0
Taper Length (ft)	50			50	50	50
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor						
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	3400	3505	3505	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	3400	3505	3505	0	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		35	
Link Distance (ft)		364	290		253	
Travel Time (s)		5.5	4.4		4.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	523	2316	1288	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	523	2316	1288	0	0	0
Turn Type	Prot					
Protected Phases	1	6	2			
Permitted Phases						
Detector Phase	1	6	2			
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			
Minimum Split (s)	22.0	22.0	22.0			
Total Split (s)	33.0	100.0	67.0	0.0	0.0	0.0
Total Split (%)	33.0%	100.0%	67.0%	0.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	4.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Max	C-Max			
Act Effct Green (s)	27.0	100.0	61.0			
Actuated g/C Ratio	0.27	1.00	0.61			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
v/c Ratio	0.57	0.66	0.60			
Control Delay	41.0	1.1	13.5			
Queue Delay	0.0	0.0	0.0			
Total Delay	41.0	1.1	13.5			
LOS	D	A	B			
Approach Delay		8.5	13.5			
Approach LOS		A	B			
Queue Length 50th (ft)	175	0	245			
Queue Length 95th (ft)	229	0	308			
Internal Link Dist (ft)		284	210		173	
Turn Bay Length (ft)	300					
Base Capacity (vph)	918	3505	2138			
Starvation Cap Reductn	0	0	0			
Spillback Cap Reductn	0	0	0			
Storage Cap Reductn	0	0	0			
Reduced v/c Ratio	0.57	0.66	0.60			

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 79 (79%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 10.0		Intersection LOS: B	
Intersection Capacity Utilization 99.5%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 10: Route 9 & I-95 NB on ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	2076	4	17	2063	69	218	0	240	271	23	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	390		250	0		0	0		0
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor												
Frt						0.850			0.850			0.850
Flt Protected	0.950			0.950				0.950		0.950	0.959	
Satd. Flow (prot)	1752	5036	0	1752	5036	1568	0	1752	1568	1665	1681	1568
Flt Permitted	0.950			0.950				0.950		0.950	0.959	
Satd. Flow (perm)	1752	5036	0	1752	5036	1568	0	1752	1568	1665	1681	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						53			261			154
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		3513			661			634			595	
Travel Time (s)		53.2			10.0			17.3			16.2	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	45	2257	4	18	2242	75	237	0	261	295	25	154
Shared Lane Traffic (%)										46%		
Lane Group Flow (vph)	45	2261	0	18	2242	75	0	237	261	159	161	154
Turn Type	Prot			Prot		Perm	Split		custom	Split		custom
Protected Phases	1	6		5	2		8	8		4	4	
Permitted Phases						2			5 8			1 4
Detector Phase	1	6		5	2	2	8	8	5 8	4	4	1 4
Switch Phase												
Minimum Initial (s)	6.0	10.0		6.0	10.0	10.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	14.0	23.0		12.0	23.0	23.0	10.0	10.0		10.0	10.0	
Total Split (s)	14.0	38.0	0.0	12.0	36.0	36.0	13.0	13.0	25.0	11.0	11.0	25.0
Total Split (%)	14.0%	38.0%	0.0%	12.0%	36.0%	36.0%	13.0%	13.0%	25.0%	11.0%	11.0%	25.0%
Yellow Time (s)	4.0	5.0		4.0	5.0	5.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-2.0	-3.0	0.0	-2.0	-3.0	-3.0	0.0	-1.0	-2.0	-1.0	-1.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lead		Lag	Lead	Lead						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	
Act Effct Green (s)	10.0	54.8		8.0	52.8	52.8		9.0	17.0	7.0	7.0	21.0
Actuated g/C Ratio	0.10	0.55		0.08	0.53	0.53		0.09	0.17	0.07	0.07	0.21

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Grade (%)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Ped Bike Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Confl. Peds. (#/hr)	
Confl. Bikes (#/hr)	
Peak Hour Factor	
Growth Factor	
Heavy Vehicles (%)	
Bus Blockages (#/hr)	
Parking (#/hr)	
Mid-Block Traffic (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	26.0
Total Split (s)	26.0
Total Split (%)	26%
Yellow Time (s)	10.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effct Green (s)	
Actuated g/C Ratio	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.26	0.82		0.13	0.84	0.09		1.50	0.54	1.36	1.36	0.34
Control Delay	45.7	23.6		26.4	18.3	6.1		288.9	7.8	244.4	246.1	7.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	23.6		26.4	18.3	6.1		288.9	7.8	244.4	246.1	7.8
LOS	D	C		C	B	A		F	A	F	F	A
Approach Delay		24.0			17.9			141.6			168.1	
Approach LOS		C			B			F			F	
Queue Length 50th (ft)	27	355		10	140	1		~211	0	~141	~143	0
Queue Length 95th (ft)	62	#782		m17	#784	m13		#362	55	#275	#277	51
Internal Link Dist (ft)		3433			581			554			515	
Turn Bay Length (ft)				390		250						
Base Capacity (vph)	175	2760		140	2659	853		158	483	117	118	451
Starvation Cap Reductn	0	0		0	0	0		0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0		0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0		0	0	0	0	0
Reduced v/c Ratio	0.26	0.82		0.13	0.84	0.09		1.50	0.54	1.36	1.36	0.34

Intersection Summary

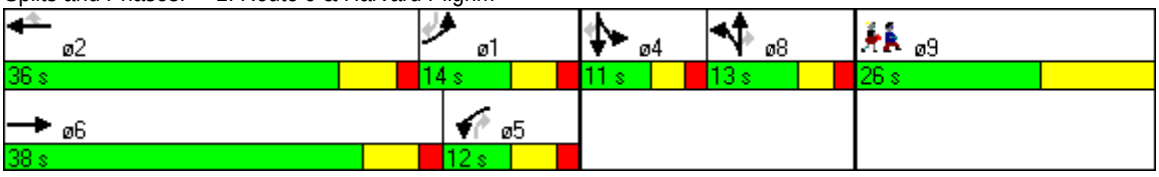
Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.50
Intersection Signal Delay: 44.1 Intersection LOS: D
Intersection Capacity Utilization 75.2% ICU Level of Service D
Analysis Period (min) 15

~ 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.

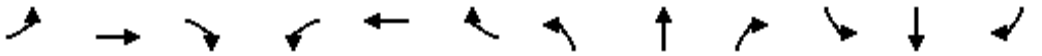
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Route 9 & Harvard Pilgrim



Lane Group	ø9
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1672	915	590	1856	0	0	0	0	0	0	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	0		1	2		0	0		0	0		2
Taper Length (ft)	25		25	100		25	25		25	100		100
Lane Util. Factor	1.00	0.95	1.00	0.97	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Ped Bike Factor												
Frt			0.850									0.850
Flt Protected				0.950								
Satd. Flow (prot)	0	3505	1568	3400	5036	0	0	0	0	0	0	2760
Flt Permitted				0.950								
Satd. Flow (perm)	0	3505	1568	3400	5036	0	0	0	0	0	0	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			412									43
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		661			249			485			598	
Travel Time (s)		10.0			3.8			9.4			11.6	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1817	995	641	2017	0	0	0	0	0	0	318
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1817	995	641	2017	0	0	0	0	0	0	318
Turn Type			Free	Prot								custom
Protected Phases		6 8		5	2							
Permitted Phases			Free									4
Detector Phase		6 8		5	2							4
Switch Phase												
Minimum Initial (s)				4.0	4.0							4.0
Minimum Split (s)				22.0	22.0							22.0
Total Split (s)	0.0	69.0	0.0	31.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0
Total Split (%)	0.0%	69.0%	0.0%	31.0%	78.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.0%
Yellow Time (s)				4.0	4.0							4.0
All-Red Time (s)				2.0	2.0							2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	4.0	6.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	6.0
Lead/Lag				Lag								
Lead-Lag Optimize?				Yes								
Recall Mode				None	C-Max							None
Act Effct Green (s)		63.0	100.0	25.0	72.0							16.0
Actuated g/C Ratio		0.63	1.00	0.25	0.72							0.16

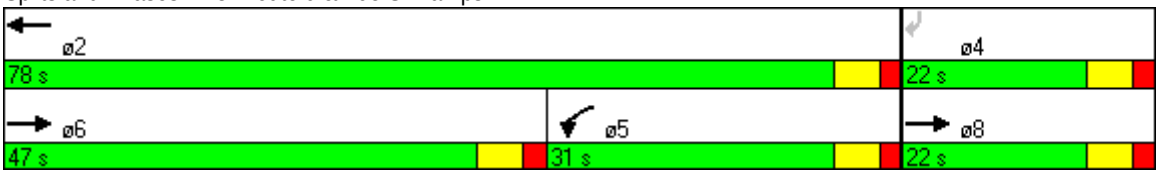
Lane Group	ø6	ø8
Lane Configurations		
Volume (vph)		
Ideal Flow (vphpl)		
Lane Width (ft)		
Grade (%)		
Storage Length (ft)		
Storage Lanes		
Taper Length (ft)		
Lane Util. Factor		
Ped Bike Factor		
Frt		
Flt Protected		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Right Turn on Red		
Satd. Flow (RTOR)		
Link Speed (mph)		
Link Distance (ft)		
Travel Time (s)		
Confl. Peds. (#/hr)		
Confl. Bikes (#/hr)		
Peak Hour Factor		
Growth Factor		
Heavy Vehicles (%)		
Bus Blockages (#/hr)		
Parking (#/hr)		
Mid-Block Traffic (%)		
Adj. Flow (vph)		
Shared Lane Traffic (%)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	6	8
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	4.0	4.0
Minimum Split (s)	22.0	22.0
Total Split (s)	47.0	22.0
Total Split (%)	47%	22%
Yellow Time (s)	4.0	4.0
All-Red Time (s)	2.0	2.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lead	
Lead-Lag Optimize?	Yes	
Recall Mode	C-Max	None
Act Effct Green (s)		
Actuated g/C Ratio		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio		0.82	0.63	0.75	0.56							0.67
Control Delay		12.9	6.5	51.7	13.0							41.6
Queue Delay		0.0	0.0	0.0	0.0							0.0
Total Delay		12.9	6.5	51.7	13.0							41.6
LOS		B	A	D	B							D
Approach Delay		10.6			22.4							
Approach LOS		B			C							
Queue Length 50th (ft)		148	280	221	412							94
Queue Length 95th (ft)		m396	m395	m249	m420							146
Internal Link Dist (ft)		581			169			405			518	
Turn Bay Length (ft)												
Base Capacity (vph)		2208	1568	850	3626							478
Starvation Cap Reductn		13	0	0	0							0
Spillback Cap Reductn		0	0	0	0							0
Storage Cap Reductn		0	0	0	0							0
Reduced v/c Ratio		0.83	0.63	0.75	0.56							0.67

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 93 (93%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 17.7		Intersection LOS: B	
Intersection Capacity Utilization 101.0%		ICU Level of Service G	
Analysis Period (min) 15			

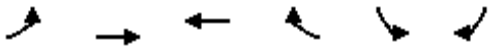
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Route 9 & I-95 SB ramps

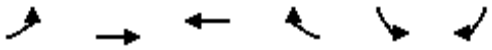


Lane Group	ø6	ø8
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (ft)		
Queue Length 95th (ft)		
Internal Link Dist (ft)		
Turn Bay Length (ft)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	731	1697	1761	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12
Grade (%)		0%	0%		0%	
Storage Length (ft)	300			0	0	0
Storage Lanes	2			0	0	0
Taper Length (ft)	100			25	25	25
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor						
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	3400	3505	3505	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	3400	3505	3505	0	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)						
Link Speed (mph)		45	45		35	
Link Distance (ft)		364	290		253	
Travel Time (s)		5.5	4.4		4.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	795	1845	1914	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	795	1845	1914	0	0	0
Turn Type	Prot					
Protected Phases	1	6	2			
Permitted Phases						
Detector Phase	1	6	2			
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0			
Minimum Split (s)	22.0	22.0	22.0			
Total Split (s)	44.0	100.0	56.0	0.0	0.0	0.0
Total Split (%)	44.0%	100.0%	56.0%	0.0%	0.0%	0.0%
Yellow Time (s)	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Max	C-Max			
Act Effct Green (s)	29.6	100.0	58.4			
Actuated g/C Ratio	0.30	1.00	0.58			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
v/c Ratio	0.79	0.53	0.93			
Control Delay	27.1	0.5	30.4			
Queue Delay	0.0	0.0	0.0			
Total Delay	27.1	0.5	30.4			
LOS	C	A	C			
Approach Delay		8.5	30.4			
Approach LOS		A	C			
Queue Length 50th (ft)	240	0	552			
Queue Length 95th (ft)	257	0	#843			
Internal Link Dist (ft)		284	210		173	
Turn Bay Length (ft)	300					
Base Capacity (vph)	1292	3505	2048			
Starvation Cap Reductn	0	0	0			
Spillback Cap Reductn	0	0	0			
Storage Cap Reductn	0	0	0			
Reduced v/c Ratio	0.62	0.53	0.93			

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 62 (62%), Referenced to phase 2:WBT and 6:EBT, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 17.7	Intersection LOS: B
Intersection Capacity Utilization 99.1%	ICU Level of Service F
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 10: Route 9 & I-95 NB on ramp