

APPENDIX G

2007 Existing Intersection Analysis

Route 128 Add-A-Lane
15: Highland Ave & Gould St

AM Existing 2007
10/28/2008

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	129	889	5	474	571	307	32	145	307	248	65	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr't		0.999			0.948				0.850		0.950	
Flt Protected	0.950			0.950				0.991		0.950		
Satd. Flow (prot)	1770	3536	0	1770	3355	0	0	1846	1583	1770	1770	0
Flt Permitted	0.950			0.950				0.991		0.950		
Satd. Flow (perm)	1770	3536	0	1770	3355	0	0	1846	1583	1770	1770	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					73				334		15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		552			1005			281			235	
Travel Time (s)		12.5			22.8			6.4			5.3	
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
Adj. Flow (vph)	140	966	5	515	621	334	35	158	334	270	71	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	140	971	0	515	955	0	0	193	334	270	106	0
Turn Type	Prot			Prot			custom		custom	custom		
Protected Phases	1	6		5	2		8	8		4	4	
Permitted Phases		6			2		8		8 5	4		
Detector Phase	1	6		5	2		8	8	8 5	4	4	
Switch Phase												
Minimum Initial (s)	4.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.0	15.0		11.0	15.0		11.0	11.0		11.0	11.0	
Total Split (s)	15.0	33.0	0.0	31.0	49.0	0.0	27.0	27.0	58.0	29.0	29.0	0.0
Total Split (%)	10.6%	23.2%	0.0%	21.8%	34.5%	0.0%	19.0%	19.0%	40.8%	20.4%	20.4%	0.0%
Maximum Green (s)	10.0	28.0		26.0	44.0		22.0	22.0		24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
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
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	11.1	29.4		27.3	45.6			18.0	48.7	23.0	23.0	
Actuated g/C Ratio	0.09	0.25		0.23	0.39			0.15	0.41	0.20	0.20	
v/c Ratio	0.83	1.10		1.25	0.71			0.68	0.39	0.78	0.30	
Control Delay	90.9	102.7		170.0	33.4			61.4	3.4	62.5	39.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	90.9	102.7		170.0	33.4			61.4	3.4	62.5	39.1	
LOS	F	F		F	C			E	A	E	D	
Approach Delay		101.2			81.2			24.6			55.9	
Approach LOS		F			F			C			E	
90th %ile Green (s)	10.0	28.0		26.0	44.0		22.0	22.0		24.0	24.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. 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)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	19.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	6.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Term Code	Max	Max		Max	Max		Max	Max		Max	Max	
70th %ile Green (s)	10.0	28.0		26.0	44.0		20.8	20.8		24.0	24.0	
70th %ile Term Code	Max	Max		Max	Hold		Gap	Gap		Max	Max	
50th %ile Green (s)	10.0	28.0		26.0	44.0		17.2	17.2		24.0	24.0	
50th %ile Term Code	Max	Max		Max	Hold		Gap	Gap		Max	Max	
30th %ile Green (s)	10.0	28.0		26.0	44.0		14.7	14.7		21.2	21.2	
30th %ile Term Code	Max	Max		Max	Hold		Gap	Gap		Gap	Gap	
10th %ile Green (s)	10.0	28.0		26.0	44.0		11.1	11.1		16.5	16.5	
10th %ile Term Code	Max	Max		Max	Hold		Gap	Gap		Gap	Gap	
Queue Length 50th (ft)	104	~427		~475	287			136	0	186	56	
Queue Length 95th (ft)	#279	#751		#891	498			256	46	#401	133	
Internal Link Dist (ft)		472			925			201			155	
Turn Bay Length (ft)												
Base Capacity (vph)	168	883		412	1346			366	846	381	393	
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	0.83	1.10		1.25	0.71			0.53	0.39	0.71	0.27	

Intersection Summary

Area Type: Other
 Cycle Length: 142
 Actuated Cycle Length: 117.5
 Natural Cycle: 150
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 1.25
 Intersection Signal Delay: 76.3
 Intersection Capacity Utilization 87.5%
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 142
 70th %ile Actuated Cycle: 118.8
 50th %ile Actuated Cycle: 115.2
 30th %ile Actuated Cycle: 109.9
 10th %ile Actuated Cycle: 101.6
 ~ 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.

Intersection LOS: E
 ICU Level of Service E

Splits and Phases: 15: Highland Ave & Gould St

ø1	ø2	ø4	ø8	ø9
15 s	49 s	29 s	27 s	22 s
ø5	ø6			
31 s	33 s			

Lane Group	ø9
90th %ile Term Code	Max
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
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



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↑
Volume (veh/h)	1524	808	0	1034	0	48
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1657	878	0	1124	0	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				767		
pX, platoon unblocked						
vC, conflicting volume			2535		2658	1267
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2535		2658	1267
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	67
cM capacity (veh/h)			174		18	160

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	1104	1430	562	562	52
Volume Left	0	0	0	0	0
Volume Right	0	878	0	0	52
cSH	1700	1700	1700	1700	160
Volume to Capacity	0.65	0.84	0.33	0.33	0.33
Queue Length 95th (ft)	0	0	0	0	33
Control Delay (s)	0.0	0.0	0.0	0.0	38.1
Lane LOS					E
Approach Delay (s)	0.0		0.0		38.1
Approach LOS					E

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			78.0%	ICU Level of Service	D
Analysis Period (min)			15		

Route 128 Add-A-Lane
1: Highland Ave & 2nd Avenue

AM Existing 2007
10/28/2008

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	11	959	356	296	727	296	388	16	140	22	16	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	
Frt		0.960			0.957			0.921				0.850	
Flt Protected				0.950			0.950	0.980			0.972		
Satd. Flow (prot)	0	3398	0	1770	1783	0	1681	1597	0	0	1811	1583	
Flt Permitted		0.939		0.101			0.950	0.980			0.972		
Satd. Flow (perm)	0	3190	0	188	1783	0	1681	1597	0	0	1811	1583	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		114			59			50				5	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		767			913			427			522		
Travel Time (s)		17.4			20.8			9.7			11.9		
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	
Adj. Flow (vph)	12	1042	387	322	790	322	422	17	152	24	17	5	
Shared Lane Traffic (%)							28%						
Lane Group Flow (vph)	0	1441	0	322	1112	0	304	287	0	0	41	5	
Turn Type	Perm			pm+pt			custom			custom		Perm	
Protected Phases		6		5	2		8	8		4	4		
Permitted Phases	6			2			8			4		4	
Detector Phase	6	6		5	2		8	8		4	4	4	
Switch Phase													
Minimum Initial (s)	4.0	4.0		3.0	4.0		4.0	4.0		4.0	4.0	4.0	
Minimum Split (s)	61.0	61.0		8.0	21.0		12.0	12.0		8.0	8.0	8.0	
Total Split (s)	61.0	61.0	0.0	8.0	69.0	0.0	13.0	13.0	0.0	8.0	8.0	8.0	
Total Split (%)	67.8%	67.8%	0.0%	8.9%	76.7%	0.0%	14.4%	14.4%	0.0%	8.9%	8.9%	8.9%	
Maximum Green (s)	56.0	56.0		3.0	64.0		8.0	8.0		4.0	4.0	4.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	0.0	0.0	
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	
Lead/Lag	Lag	Lag		Lead									
Lead-Lag Optimize?	Yes	Yes		Yes									
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0	
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None	None	
Walk Time (s)	6.0	6.0					6.0	6.0					
Flash Dont Walk (s)	24.0	24.0					14.0	14.0					
Pedestrian Calls (#/hr)	4	4					4	4					
Act Effct Green (s)		55.7		63.7	63.7		13.5	13.5			4.3	4.3	
Actuated g/C Ratio		0.62		0.71	0.71		0.15	0.15			0.05	0.05	
v/c Ratio		0.71		1.59	0.87		1.21	1.02			0.47	0.06	
Control Delay		12.8		301.7	18.4		163.2	95.5			60.9	27.4	
Queue Delay		0.0		0.0	0.0		0.0	0.0			0.0	0.0	
Total Delay		12.8		301.7	18.4		163.2	95.5			60.9	27.4	
LOS		B		F	B		F	F			E	C	
Approach Delay		12.8			82.1			130.3			57.3		
Approach LOS		B			F			F			E		
90th %ile Green (s)	56.0	56.0		3.0	64.0		8.0	8.0		4.0	4.0	4.0	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Term Code	Coord	Coord		Max	Coord		Ped	Ped		Max	Max	Max
70th %ile Green (s)	56.0	56.0		3.0	64.0		8.0	8.0		4.0	4.0	4.0
70th %ile Term Code	Coord	Coord		Max	Coord		Max	Max		Max	Max	Max
50th %ile Green (s)	56.0	56.0		3.0	64.0		8.0	8.0		4.0	4.0	4.0
50th %ile Term Code	Coord	Coord		Max	Coord		Max	Max		Max	Max	Max
30th %ile Green (s)	56.0	56.0		3.0	64.0		16.0	16.0		0.0	0.0	0.0
30th %ile Term Code	Coord	Coord		Max	Coord		Max	Max		Skip	Skip	Skip
10th %ile Green (s)	49.7	49.7		3.0	57.7		22.3	22.3		0.0	0.0	0.0
10th %ile Term Code	Coord	Coord		Max	Coord		Max	Max		Skip	Skip	Skip
Queue Length 50th (ft)		234		~136	363		~276	~205			23	0
Queue Length 95th (ft)		310		#295	#641		#444	#372			#68	11
Internal Link Dist (ft)		687			833			347			442	
Turn Bay Length (ft)												
Base Capacity (vph)		2062		203	1304		251	282			87	81
Starvation Cap Reductn		0		0	0		0	0			0	0
Spillback Cap Reductn		0		0	0		0	0			0	0
Storage Cap Reductn		0		0	0		0	0			0	0
Reduced v/c Ratio		0.70		1.59	0.85		1.21	1.02			0.47	0.06

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 20 (22%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.59
 Intersection Signal Delay: 61.5
 Intersection Capacity Utilization 126.6%
 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.





















Intersection LOS: E
 ICU Level of Service H

Splits and Phases: 1: Highland Ave & 2nd Avenue

ø2	ø4	ø8
69 s	8 s	13 s
ø5	ø6	
8 s	61 s	

Route 128 Add-A-Lane
15: Highland Ave & Gould St

PM Existing 2007
10/28/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	668	54	517	646	156	11	59	361	329	199	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr't		0.989			0.971				0.850		0.971	
Fit Protected	0.950			0.950				0.992		0.950		
Satd. Flow (prot)	1770	3500	0	1770	3437	0	0	1848	1583	1770	1809	0
Fit Permitted	0.950			0.950				0.992		0.950		
Satd. Flow (perm)	1770	3500	0	1770	3437	0	0	1848	1583	1770	1809	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			22				316		8	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		552			1005			281			235	
Travel Time (s)		12.5			22.8			6.4			5.3	
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
Adj. Flow (vph)	59	726	59	562	702	170	12	64	392	358	216	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	785	0	562	872	0	0	76	392	358	268	0
Turn Type	Prot			Prot			custom		custom	custom		
Protected Phases	1	6		5	2		8	8		4	4	
Permitted Phases		6			2		8		8 5	4		
Detector Phase	1	6		5	2		8	8	8 5	4	4	
Switch Phase												
Minimum Initial (s)	4.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.0	15.0		11.0	15.0		11.0	11.0		11.0	11.0	
Total Split (s)	11.0	35.0	0.0	35.0	59.0	0.0	17.0	17.0	52.0	41.0	41.0	0.0
Total Split (%)	7.3%	23.3%	0.0%	23.3%	39.3%	0.0%	11.3%	11.3%	34.7%	27.3%	27.3%	0.0%
Maximum Green (s)	6.0	30.0		30.0	54.0		12.0	12.0		36.0	36.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
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
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	7.1	31.4		31.4	58.3			11.0	45.7	30.7	30.7	
Actuated g/C Ratio	0.06	0.25		0.25	0.47			0.09	0.37	0.25	0.25	
v/c Ratio	0.58	0.88		1.26	0.54			0.47	0.50	0.82	0.59	
Control Delay	83.6	58.2		172.0	27.5			66.9	8.5	60.9	46.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay	83.6	58.2		172.0	27.5			66.9	8.5	60.9	46.9	
LOS	F	E		F	C			E	A	E	D	
Approach Delay		60.0			84.1			18.0			54.9	
Approach LOS		E			F			B			D	
90th %ile Green (s)	6.0	30.0		30.0	54.0		12.0	12.0		36.0	36.0	

Lane Group	ø9
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. 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)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	19.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	19.0
Yellow Time (s)	2.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	6.0
Flash Dont Walk (s)	12.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	19.0



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Term Code	Max	Max		Max	Hold		Max	Max		Max	Max	
70th %ile Green (s)	6.0	30.0		30.0	54.0		12.0	12.0		35.8	35.8	
70th %ile Term Code	Max	Max		Max	Hold		Max	Max		Gap	Gap	
50th %ile Green (s)	6.0	30.0		30.0	54.0		10.5	10.5		31.3	31.3	
50th %ile Term Code	Max	Max		Max	Hold		Gap	Gap		Gap	Gap	
30th %ile Green (s)	6.0	30.0		30.0	54.0		8.9	8.9		26.0	26.0	
30th %ile Term Code	Max	Max		Max	Hold		Gap	Gap		Gap	Gap	
10th %ile Green (s)	0.0	30.0		30.0	65.0		6.7	6.7		20.4	20.4	
10th %ile Term Code	Skip	Max		Max	Hold		Gap	Gap		Gap	Gap	
Queue Length 50th (ft)	46	311		-551	252			57	38	260	177	
Queue Length 95th (ft)	#137	#583		#1004	447			128	117	#488	326	
Internal Link Dist (ft)		472			925			201			155	
Turn Bay Length (ft)												
Base Capacity (vph)	101	888		447	1623			196	775	534	551	
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	0.58	0.88		1.26	0.54			0.39	0.51	0.67	0.49	

Intersection Summary

Area Type: Other
 Cycle Length: 150
 Actuated Cycle Length: 124.3
 Natural Cycle: 150
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 1.26
 Intersection Signal Delay: 63.5
 Intersection Capacity Utilization 83.7%
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 150
 70th %ile Actuated Cycle: 127.8
 50th %ile Actuated Cycle: 121.8
 30th %ile Actuated Cycle: 114.9
 10th %ile Actuated Cycle: 107.1
 ~ 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.

Intersection LOS: E
 ICU Level of Service E

Splits and Phases: 15: Highland Ave & Gould St

ø1	ø2	ø4	ø8	ø9
11 s	59 s	41 s	17 s	22 s
ø5	ø6			
35 s	35 s			

Lane Group	ø9
90th %ile Term Code	Max
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
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



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↑
Volume (veh/h)	1077	215	0	2101	0	108
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1171	234	0	2284	0	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				767		
pX, platoon unblocked						
vC, conflicting volume			1404		2429	702
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1404		2429	702
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	69
cM capacity (veh/h)			482		27	380

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	780	624	1142	1142	117
Volume Left	0	0	0	0	0
Volume Right	0	234	0	0	117
cSH	1700	1700	1700	1700	380
Volume to Capacity	0.46	0.37	0.67	0.67	0.31
Queue Length 95th (ft)	0	0	0	0	32
Control Delay (s)	0.0	0.0	0.0	0.0	18.6
Lane LOS					C
Approach Delay (s)	0.0		0.0		18.6
Approach LOS					C

Intersection Summary					
Average Delay			0.6		
Intersection Capacity Utilization			61.4%	ICU Level of Service	B
Analysis Period (min)			15		

Rooute 128 Add-A-Lane
1: Highland Ave & 2nd Avenue

PM Existing 2007
10/28/2008



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔		↖	↗		↖	↕			↖	↗
Volume (vph)	22	770	232	145	932	54	867	11	242	75	27	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt		0.966			0.992			0.934				0.850
Flt Protected		0.999		0.950			0.950	0.974			0.964	
Satd. Flow (prot)	0	3415	0	1770	1848	0	1681	1610	0	0	1796	1583
Flt Permitted		0.667		0.106			0.950	0.974			0.964	
Satd. Flow (perm)	0	2280	0	197	1848	0	1681	1610	0	0	1796	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53			5			45				29
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		767			913			427			522	
Travel Time (s)		17.4			20.8			9.7			11.9	
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
Adj. Flow (vph)	24	837	252	158	1013	59	942	12	263	82	29	29
Shared Lane Traffic (%)							34%					
Lane Group Flow (vph)	0	1113	0	158	1072	0	622	595	0	0	111	29
Turn Type	Perm			custom			custom			custom		Perm
Protected Phases		6		5	2 5		8	8		4	4	
Permitted Phases	6			2			8			4		4
Detector Phase	6	6		5	2 5		8	8		4	4	4
Switch Phase												
Minimum Initial (s)	4.0	4.0		3.0			4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	20.0	20.0		8.0			12.0	12.0		8.0	8.0	8.0
Total Split (s)	42.5	42.5	0.0	8.0	50.5	0.0	30.5	30.5	0.0	9.0	9.0	9.0
Total Split (%)	47.2%	47.2%	0.0%	8.9%	56.1%	0.0%	33.9%	33.9%	0.0%	10.0%	10.0%	10.0%
Maximum Green (s)	37.5	37.5		3.0			25.5	25.5		5.0	5.0	5.0
Yellow Time (s)	4.0	4.0		4.0			4.0	4.0		3.0	3.0	3.0
All-Red Time (s)	1.0	1.0		1.0			1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	0.0	0.0	0.0
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
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Min	C-Min		None			None	None		None	None	None
Walk Time (s)	6.0	6.0					6.0	6.0				
Flash Dont Walk (s)	24.0	24.0					14.0	14.0				
Pedestrian Calls (#/hr)	4	4					4	4				
Act Effct Green (s)		38.5		46.5	46.5		26.5	26.5			5.0	5.0
Actuated g/C Ratio		0.43		0.52	0.52		0.29	0.29			0.06	0.06
v/c Ratio		1.11		0.92	1.12		1.26	1.18			1.11	0.25
Control Delay		87.9		69.3	91.5		161.3	127.4			165.2	21.1
Queue Delay		0.0		0.0	0.0		0.0	0.0			0.0	0.0
Total Delay		87.9		69.3	91.5		161.3	127.4			165.2	21.1
LOS		F		E	F		F	F			F	C
Approach Delay		87.9			88.7			144.8			135.4	
Approach LOS		F			F			F			F	
90th %ile Green (s)	37.5	37.5		3.0			25.5	25.5		5.0	5.0	5.0

Lane Group	ø2
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Util. 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)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	2
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	4.0
Minimum Split (s)	21.0
Total Split (s)	42.5
Total Split (%)	47%
Maximum Green (s)	37.5
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	C-Min
Walk Time (s)	
Flash Dont Walk (s)	
Pedestrian Calls (#/hr)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	45.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Term Code	Coord	Coord		Max			Max	Max		Max	Max	Max
70th %ile Green (s)	37.5	37.5		3.0			25.5	25.5		5.0	5.0	5.0
70th %ile Term Code	Coord	Coord		Max			Max	Max		Max	Max	Max
50th %ile Green (s)	37.5	37.5		3.0			25.5	25.5		5.0	5.0	5.0
50th %ile Term Code	Coord	Coord		Max			Max	Max		Max	Max	Max
30th %ile Green (s)	37.5	37.5		3.0			25.5	25.5		5.0	5.0	5.0
30th %ile Term Code	Coord	Coord		Max			Max	Max		Max	Max	Max
10th %ile Green (s)	37.5	37.5		3.0			25.5	25.5		5.0	5.0	5.0
10th %ile Term Code	Coord	Coord		Max			Max	Max		Max	Max	Max
Queue Length 50th (ft)		~375		45	~711		~471	~411			~73	0
Queue Length 95th (ft)		#504		#135	#955		#686	#629			#178	27
Internal Link Dist (ft)		687			833			347			442	
Turn Bay Length (ft)												
Base Capacity (vph)		1006		172	957		495	506			100	115
Starvation Cap Reductn		0		0	0		0	0			0	0
Spillback Cap Reductn		0		0	0		0	0			0	0
Storage Cap Reductn		0		0	0		0	0			0	0
Reduced v/c Ratio		1.11		0.92	1.12		1.26	1.18			1.11	0.25

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 20 (22%), Referenced to phase 2:WBTL and 6:EBTL, Start of Green
 Natural Cycle: 140
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.26
 Intersection Signal Delay: 108.6
 Intersection Capacity Utilization 132.3%
 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.

Splits and Phases: 1: Highland Ave & 2nd Avenue

ø2	ø4	ø8
42.5 s	9 s	30.5 s
ø5	ø6	
8 s	42.5 s	

Lane Group	ø2
90th %ile Term Code	Coord
70th %ile Green (s)	45.5
70th %ile Term Code	Coord
50th %ile Green (s)	45.5
50th %ile Term Code	Coord
30th %ile Green (s)	45.5
30th %ile Term Code	Coord
10th %ile Green (s)	45.5
10th %ile Term Code	Coord
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

Route 128 Add-A-Lane
2: Kendrick St & Hunting Rd

AM Existing 2007
10/28/2008



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕		↖	↗			↖	↗	↖	↗	
Volume (vph)	21	536	5	126	252	121	2	294	762	420	105	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	85		0	230		0	0		430	140		0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.999			0.951				0.850		0.981	
Fit Protected		0.998		0.950						0.950		
Satd. Flow (prot)	0	3529	0	1770	1771	0	0	1863	1583	1770	1827	0
Fit Permitted		0.832		0.245				0.999		0.293		
Satd. Flow (perm)	0	2942	0	456	1771	0	0	1861	1583	546	1827	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			20				495		7	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		212			1270			438			316	
Travel Time (s)		4.8			28.9			10.0			7.2	
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
Adj. Flow (vph)	23	583	5	137	274	132	2	320	828	457	114	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	611	0	137	406	0	0	322	828	457	131	0
Turn Type	Perm			custom			Perm		custom	custom		
Protected Phases		6		5	2 5			8		7	4 7	
Permitted Phases	6			2	2 5		8		8 2	4	4 7	
Detector Phase	6	6		5	2 5		8	8	8 2	7	4 7	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0			10.0	10.0		7.0		
Minimum Split (s)	12.0	12.0		12.0			15.0	15.0		12.0		
Total Split (s)	40.0	40.0	0.0	15.0	55.0	0.0	35.0	35.0	75.0	30.0	65.0	0.0
Total Split (%)	29.0%	29.0%	0.0%	10.9%	39.9%	0.0%	25.4%	25.4%	54.3%	21.7%	47.1%	0.0%
Maximum Green (s)	35.0	35.0		10.0			30.0	30.0		25.0		
Yellow Time (s)	4.0	4.0		4.0			4.0	4.0		4.0		
All-Red Time (s)	1.0	1.0		1.0			1.0	1.0		1.0		
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
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
Lead/Lag	Lead	Lead		Lag			Lead	Lead		Lag		
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0		
Recall Mode	None	None		None			None	None		None		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		29.9		43.0	43.0			26.8	73.9	57.4	57.4	
Actuated g/C Ratio		0.27		0.38	0.38			0.24	0.66	0.51	0.51	
v/c Ratio		0.78		0.49	0.59			0.72	0.68	0.80	0.14	
Control Delay		46.6		40.6	31.2			51.1	7.7	45.3	16.4	
Queue Delay		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay		46.6		40.6	31.2			51.1	7.7	45.3	16.4	
LOS		D		D	C			D	A	D	B	

Lane Group	ø2	ø4	ø9
Lane Configurations			
Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Fr't			
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)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	2	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	10.0	1.0
Minimum Split (s)	15.0	15.0	18.0
Total Split (s)	40.0	35.0	18.0
Total Split (%)	29%	25%	13%
Maximum Green (s)	35.0	30.0	16.0
Yellow Time (s)	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Walk Time (s)			6.0
Flash Dont Walk (s)			12.0
Pedestrian Calls (#/hr)			1
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		46.6			33.6			19.8			38.9	
Approach LOS		D			C			B			D	
90th %ile Green (s)	35.0	35.0		10.0			30.0	30.0		25.0		
90th %ile Term Code	Max	Max		Max			Max	Max		Max		
70th %ile Green (s)	34.1	34.1		9.0			30.0	30.0		25.0		
70th %ile Term Code	Gap	Gap		Gap			Max	Max		Max		
50th %ile Green (s)	30.2	30.2		7.0			27.6	27.6		25.0		
50th %ile Term Code	Gap	Gap		Min			Gap	Gap		Max		
30th %ile Green (s)	25.6	25.6		7.0			23.7	23.7		25.0		
30th %ile Term Code	Gap	Gap		Min			Gap	Gap		Max		
10th %ile Green (s)	20.2	20.2		7.0			17.8	17.8		25.0		
10th %ile Term Code	Gap	Gap		Min			Gap	Gap		Max		
Queue Length 50th (ft)		204		62	210			203	93	193		42
Queue Length 95th (ft)		350		139	403			#414	343	#512		112
Internal Link Dist (ft)		132			1190			358				236
Turn Bay Length (ft)				230					430	140		
Base Capacity (vph)		968		317	836			527	1257	571		1022
Starvation Cap Reductn		0		0	0			0	0	0		0
Spillback Cap Reductn		0		0	0			0	0	0		0
Storage Cap Reductn		0		0	0			0	0	0		0
Reduced v/c Ratio		0.63		0.43	0.49			0.61	0.66	0.80		0.13

Intersection Summary

Area Type: Other
 Cycle Length: 138
 Actuated Cycle Length: 111.8
 Natural Cycle: 100
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 31.9
 Intersection Capacity Utilization 96.0%
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 140
 70th %ile Actuated Cycle: 118.1
 50th %ile Actuated Cycle: 109.8
 30th %ile Actuated Cycle: 101.3
 10th %ile Actuated Cycle: 90
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: C
 ICU Level of Service F

Splits and Phases: 2: Kendrick St & Hunting Rd

ø2	ø4	ø9
40 s	35 s	18 s
ø6	ø5	ø8
40 s	15 s	35 s
		ø7
		30 s

Lane Group	ø2	ø4	ø9
Approach Delay			
Approach LOS			
90th %ile Green (s)	50.0	60.0	18.0
90th %ile Term Code	Hold	Hold	Ped
70th %ile Green (s)	48.1	60.0	0.0
70th %ile Term Code	Hold	Hold	Skip
50th %ile Green (s)	42.2	57.6	0.0
50th %ile Term Code	Hold	Hold	Skip
30th %ile Green (s)	37.6	53.7	0.0
30th %ile Term Code	Hold	Hold	Skip
10th %ile Green (s)	32.2	47.8	0.0
10th %ile Term Code	Hold	Hold	Skip
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			

Route 128 Add-A-Lane
3: Kendrick St & 3rd Ave

AM Existing 2007
10/28/2008



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	247	1219	263	89	478	47	21	11	5	110	68	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	12	12	12	12	12	12
Storage Length (ft)	300		360	150		0	0		0	0		0
Storage Lanes	1		1	1		0	1		0	0		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.987			0.956				0.850
Flt Protected	0.950			0.950			0.950				0.970	
Satd. Flow (prot)	1652	3421	1531	1652	3377	0	1770	1781	0	0	1807	1583
Flt Permitted	0.950			0.950			0.377				0.801	
Satd. Flow (perm)	1652	3421	1531	1652	3377	0	702	1781	0	0	1492	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			286		8			5				17
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		578			1027			274			474	
Travel Time (s)		13.1			23.3			6.2			10.8	
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
Adj. Flow (vph)	268	1325	286	97	520	51	23	12	5	120	74	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	268	1325	286	97	571	0	23	17	0	0	194	17
Turn Type	Prot		custom	Prot			custom			Perm		custom
Protected Phases	1	6		5	2		3	8 3			4	
Permitted Phases		6	6 3		2		8	8 3		4		4 1 3
Detector Phase	1	6	6 3	5	2		3	8 3		4	4	4 1 3
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0			7.0	7.0	
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0			12.0	12.0	
Total Split (s)	40.0	40.0	60.0	40.0	40.0	0.0	20.0	45.0	0.0	25.0	25.0	85.0
Total Split (%)	32.0%	32.0%	48.0%	32.0%	32.0%	0.0%	16.0%	36.0%	0.0%	20.0%	20.0%	68.0%
Maximum Green (s)	35.0	35.0		35.0	35.0		15.0			20.0	20.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0			1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0
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
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0			2.0	2.0	
Recall Mode	None	Min		None	Min		None			None	None	
Walk Time (s)					5.0							
Flash Dont Walk (s)					11.0							
Pedestrian Calls (#/hr)					2							
Act Effct Green (s)	19.9	37.6	49.8	11.2	25.8		29.2	29.2			17.0	53.2
Actuated g/C Ratio	0.23	0.43	0.57	0.13	0.30		0.34	0.34			0.20	0.61
v/c Ratio	0.71	0.90	0.29	0.46	0.57		0.07	0.03			0.67	0.02
Control Delay	42.8	35.0	2.4	44.9	29.5		22.3	18.1			46.1	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	42.8	35.0	2.4	44.9	29.5		22.3	18.1			46.1	2.9

Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. 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)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	12.0
Total Split (s)	25.0
Total Split (%)	20%
Maximum Green (s)	20.0
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C	A	D	C		C	B			D	A
Approach Delay		31.1			31.7			20.5			42.6	
Approach LOS		C			C			C			D	
90th %ile Green (s)	28.3	40.0		15.2	26.9		7.0			20.0	20.0	
90th %ile Term Code	Gap	Hold		Gap	Gap		Min			Max	Max	
70th %ile Green (s)	22.1	35.0		11.8	24.7		7.0			20.0	20.0	
70th %ile Term Code	Gap	Max		Gap	Hold		Min			Max	Max	
50th %ile Green (s)	18.5	35.0		9.7	26.2		7.0			16.6	16.6	
50th %ile Term Code	Gap	Max		Gap	Hold		Min			Gap	Gap	
30th %ile Green (s)	15.6	35.0		8.0	27.4		7.0			13.8	13.8	
30th %ile Term Code	Gap	Max		Gap	Hold		Min			Gap	Gap	
10th %ile Green (s)	11.7	35.0		0.0	18.3		7.0			10.4	10.4	
10th %ile Term Code	Gap	Max		Skip	Hold		Min			Gap	Gap	
Queue Length 50th (ft)	140	366	0	51	136		9	4			100	0
Queue Length 95th (ft)	233	#593	39	108	227		29	21			194	7
Internal Link Dist (ft)		498			947			194			394	
Turn Bay Length (ft)	300		360	150								
Base Capacity (vph)	696	1475	1114	696	1428		435	857			367	1292
Starvation Cap Reductn	0	0	0	0	0		0	0			0	0
Spillback Cap Reductn	0	0	0	0	0		0	0			0	0
Storage Cap Reductn	0	0	0	0	0		0	0			0	0
Reduced v/c Ratio	0.39	0.90	0.26	0.14	0.40		0.05	0.02			0.53	0.01

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 87.1
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 32.0
 Intersection Capacity Utilization 65.9%
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 102.2
 70th %ile Actuated Cycle: 93.8
 50th %ile Actuated Cycle: 88.3
 30th %ile Actuated Cycle: 83.8
 10th %ile Actuated Cycle: 67.4
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 3: Kendrick St & 3rd Ave

ø1	ø2	ø3	ø4
40 s	40 s	20 s	25 s
ø5	ø6	ø8	
40 s	40 s	25 s	

Lane Group	ø8
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	32.0
90th %ile Term Code	Hold
70th %ile Green (s)	32.0
70th %ile Term Code	Hold
50th %ile Green (s)	28.6
50th %ile Term Code	Hold
30th %ile Green (s)	25.8
30th %ile Term Code	Hold
10th %ile Green (s)	22.4
10th %ile Term Code	Hold
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

Route 128 Add-A-Lane
4: Kendrick St & 4th Ave

AM Existing 2007
10/28/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	184	1146	5	5	526	357	5	5	5	137	5	68
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	200	1246	5	5	572	388	5	5	5	149	5	74
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		1027										
pX, platoon unblocked				0.64			0.64	0.64	0.64	0.64	0.64	
vC, conflicting volume	960			1251			2022	2619	626	1808	2428	480
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	960			272			1474	2406	0	1140	2107	480
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	72			99			83	64	99	0	77	86
cM capacity (veh/h)	713			826			31	15	695	56	23	532
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2					
Volume Total	823	628	291	674	16	154	74					
Volume Left	200	0	5	0	5	149	0					
Volume Right	0	5	0	388	5	0	74					
cSH	713	1700	826	1700	30	54	532					
Volume to Capacity	0.28	0.37	0.01	0.40	0.54	2.88	0.14					
Queue Length 95th (ft)	29	0	0	0	44	404	12					
Control Delay (s)	6.9	0.0	0.2	0.0	222.6	1009.0	12.9					
Lane LOS	A		A		F	F	B					
Approach Delay (s)	3.9		0.1		222.6	686.4						
Approach LOS					F	F						

Intersection Summary

Average Delay	62.4											
Intersection Capacity Utilization	87.8%				ICU Level of Service					E		
Analysis Period (min)	15											

Route 128 Add-A-Lane
2: Kendrick St & Hunting Rd

PM Existing 2007
10/28/2008

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	189	5	715	541	426	5	84	168	221	357	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	85		0	230		0	0		430	140		0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.997			0.934				0.850		0.986	
Fl _t Protected		0.991		0.950				0.997		0.950		
Satd. Flow (prot)	0	3497	0	1770	1740	0	0	1857	1583	1770	1837	0
Fl _t Permitted		0.543		0.497				0.480		0.639		
Satd. Flow (perm)	0	1916	0	926	1740	0	0	894	1583	1190	1837	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			39				183		4	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		212			1283			438			316	
Travel Time (s)		4.8			29.2			10.0			7.2	
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
Adj. Flow (vph)	46	205	5	777	588	463	5	91	183	240	388	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	256	0	777	1051	0	0	96	183	240	428	0
Turn Type	Perm			custom			Perm		custom	custom		
Protected Phases		6		5	2 5			8		7	4 7	
Permitted Phases	6			2	2 5		8		8 2	4	4 7	
Detector Phase	6	6		5	2 5		8	8	8 2	7	4 7	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0			10.0	10.0		7.0		
Minimum Split (s)	12.0	12.0		12.0			15.0	15.0		12.0		
Total Split (s)	25.0	25.0	0.0	50.0	75.0	0.0	25.0	25.0	50.0	25.0	50.0	0.0
Total Split (%)	17.5%	17.5%	0.0%	35.0%	52.4%	0.0%	17.5%	17.5%	35.0%	17.5%	35.0%	0.0%
Maximum Green (s)	20.0	20.0		45.0			20.0	20.0		20.0		
Yellow Time (s)	4.0	4.0		4.0			4.0	4.0		4.0		
All-Red Time (s)	1.0	1.0		1.0			1.0	1.0		1.0		
Lost Time Adjust (s)	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0	-1.0	-1.0	0.0
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
Lead/Lag	Lead	Lead		Lag			Lead	Lead		Lag		
Lead-Lag Optimize?	Yes	Yes		Yes			Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0			3.0	3.0		3.0		
Recall Mode	None	None		None			None	None		None		
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		20.2		71.1	71.1			17.1	92.3	34.3	34.3	
Actuated g/C Ratio		0.17		0.61	0.61			0.15	0.79	0.29	0.29	
v/c Ratio		0.77		0.86	0.98			0.73	0.14	0.58	0.79	
Control Delay		64.0		37.4	46.5			81.0	1.2	43.3	49.4	
Queue Delay		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Delay		64.0		37.4	46.5			81.0	1.2	43.3	49.4	
LOS		E		D	D			F	A	D	D	

Lane Group	ø2	ø4	ø9
Lane Configurations			
Volume (vph)			
Ideal Flow (vphpl)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. 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)			
Peak Hour Factor			
Adj. Flow (vph)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	2	4	9
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	10.0	1.0
Minimum Split (s)	15.0	15.0	18.0
Total Split (s)	25.0	25.0	18.0
Total Split (%)	17%	17%	13%
Maximum Green (s)	20.0	20.0	16.0
Yellow Time (s)	4.0	4.0	2.0
All-Red Time (s)	1.0	1.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag			
Lead-Lag Optimize?			
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	None	None	None
Walk Time (s)			6.0
Flash Dont Walk (s)			12.0
Pedestrian Calls (#/hr)			1
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach Delay		64.0			42.6			28.6			47.2	
Approach LOS		E			D			C			D	
90th %ile Green (s)	20.0	20.0		45.0			20.0	20.0		20.0		
90th %ile Term Code	Max	Max		Max			Max	Max		Max		
70th %ile Green (s)	20.0	20.0		45.0			20.0	20.0		16.0		
70th %ile Term Code	Max	Max		Max			Max	Max		Gap		
50th %ile Green (s)	20.0	20.0		45.0			17.4	17.4		11.5		
50th %ile Term Code	Max	Max		Max			Gap	Gap		Gap		
30th %ile Green (s)	19.7	19.7		45.0			14.0	14.0		7.9		
30th %ile Term Code	Gap	Gap		Max			Gap	Gap		Gap		
10th %ile Green (s)	15.5	15.5		45.0			10.0	10.0		7.0		
10th %ile Term Code	Gap	Gap		Max			Min	Min		Min		
Queue Length 50th (ft)		93		355	652			67	0	141	280	
Queue Length 95th (ft)		#215		#1067	#1456			#183	26	262	488	
Internal Link Dist (ft)		132			1203			358			236	
Turn Bay Length (ft)				230					430	140		
Base Capacity (vph)		351		902	1092			164	1331	540	739	
Starvation Cap Reductn		0		0	0			0	0	0	0	
Spillback Cap Reductn		0		0	0			0	0	0	0	
Storage Cap Reductn		0		0	0			0	0	0	0	
Reduced v/c Ratio		0.73		0.86	0.96			0.59	0.14	0.44	0.58	

Intersection Summary

Area Type: Other
 Cycle Length: 143
 Actuated Cycle Length: 116.8
 Natural Cycle: 140
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.98
 Intersection Signal Delay: 44.2
 Intersection Capacity Utilization 92.1%
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 145
 70th %ile Actuated Cycle: 121
 50th %ile Actuated Cycle: 113.9
 30th %ile Actuated Cycle: 106.6
 10th %ile Actuated Cycle: 97.5
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 2: Kendrick St & Hunting Rd

ø2	ø4	ø9
25 s	25 s	18 s
ø6	ø5	ø8
25 s	50 s	25 s

Lane Group	ø2	ø4	ø9
Approach Delay			
Approach LOS			
90th %ile Green (s)	70.0	45.0	18.0
90th %ile Term Code	Hold	Hold	Ped
70th %ile Green (s)	70.0	41.0	0.0
70th %ile Term Code	Hold	Hold	Skip
50th %ile Green (s)	70.0	33.9	0.0
50th %ile Term Code	Hold	Hold	Skip
30th %ile Green (s)	69.7	26.9	0.0
30th %ile Term Code	Hold	Hold	Skip
10th %ile Green (s)	65.5	22.0	0.0
10th %ile Term Code	Hold	Hold	Skip
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)	21	526	32	5	1177	105	231	32	53	152	5	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	12	12	12	12	12	12
Storage Length (ft)	300		360	150		0	0		0	0		0
Storage Lanes	1		1	1		0	1		0	0		1
Taper Length (ft)	25		25	25		25	25		25	25		25
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Fr			0.850		0.988			0.906				0.850
Flt Protected	0.950			0.950			0.950				0.954	
Satd. Flow (prot)	1652	3421	1531	1652	3380	0	1770	1688	0	0	1777	1583
Flt Permitted	0.950			0.950			0.381				0.665	
Satd. Flow (perm)	1652	3421	1531	1652	3380	0	710	1688	0	0	1239	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			35		8			58				9
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		566			1027			274			474	
Travel Time (s)		12.9			23.3			6.2			10.8	
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
Adj. Flow (vph)	23	572	35	5	1279	114	251	35	58	165	5	297
Shared Lane Traffic (%)												
Lane Group Flow (vph)	23	572	35	5	1393	0	251	93	0	0	170	297
Turn Type	Prot		custom	Prot			custom			Perm		custom
Protected Phases	1	6		5	2		3	8 3			4	
Permitted Phases		6	6 3		2		8	8 3		4		4 1 3
Detector Phase	1	6	6 3	5	2		3	8 3		4	4	4 1 3
Switch Phase												
Minimum Initial (s)	7.0	10.0		7.0	10.0		7.0			7.0	7.0	
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0			12.0	12.0	
Total Split (s)	20.0	50.0	75.0	20.0	50.0	0.0	25.0	55.0	0.0	30.0	30.0	75.0
Total Split (%)	16.0%	40.0%	60.0%	16.0%	40.0%	0.0%	20.0%	44.0%	0.0%	24.0%	24.0%	60.0%
Maximum Green (s)	15.0	45.0		15.0	45.0		20.0			25.0	25.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0			4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0			1.0	1.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	-1.0
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
Lead/Lag	Lead	Lag		Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes			Yes	Yes	
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0			2.0	2.0	
Recall Mode	None	Min		None	Min		None			None	None	
Walk Time (s)					5.0							
Flash Dont Walk (s)					11.0							
Pedestrian Calls (#/hr)					2							
Act Effct Green (s)	8.3	56.5	77.7	8.1	46.4		40.3	40.3			19.2	52.7
Actuated g/C Ratio	0.08	0.53	0.73	0.08	0.43		0.38	0.38			0.18	0.49
v/c Ratio	0.18	0.32	0.03	0.04	0.95		0.57	0.14			0.77	0.38
Control Delay	53.1	17.2	2.6	51.4	45.0		29.2	9.6			64.8	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	53.1	17.2	2.6	51.4	45.0		29.2	9.6			64.8	17.5

Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. 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)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	7.0
Minimum Split (s)	12.0
Total Split (s)	30.0
Total Split (%)	24%
Maximum Green (s)	25.0
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	5.0
Flash Dont Walk (s)	11.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B	A	D	D		C	A			E	B
Approach Delay		17.7			45.1			23.9			34.7	
Approach LOS		B			D			C			C	
90th %ile Green (s)	8.4	46.4		7.0	45.0		20.0			25.0	25.0	
90th %ile Term Code	Gap	Hold		Min	Max		Max			Max	Max	
70th %ile Green (s)	7.0	57.0		0.0	45.0		20.0			23.2	23.2	
70th %ile Term Code	Min	Hold		Skip	Max		Max			Gap	Gap	
50th %ile Green (s)	7.0	57.0		0.0	45.0		16.5			18.8	18.8	
50th %ile Term Code	Min	Hold		Skip	Max		Gap			Gap	Gap	
30th %ile Green (s)	7.0	57.0		0.0	45.0		14.1			15.0	15.0	
30th %ile Term Code	Min	Hold		Skip	Max		Gap			Gap	Gap	
10th %ile Green (s)	7.0	57.0		0.0	45.0		10.9			10.4	10.4	
10th %ile Term Code	Min	Hold		Skip	Max		Gap			Gap	Gap	
Queue Length 50th (ft)	15	108	0	3	476		122	15			112	118
Queue Length 95th (ft)	45	213	13	17	#754		190	47			197	179
Internal Link Dist (ft)		486			947			194			394	
Turn Bay Length (ft)	300		360	150								
Base Capacity (vph)	248	1806	1177	248	1468		477	840			303	890
Starvation Cap Reductn	0	0	0	0	0		0	0			0	0
Spillback Cap Reductn	0	0	0	0	0		0	0			0	0
Storage Cap Reductn	0	0	0	0	0		0	0			0	0
Reduced v/c Ratio	0.09	0.32	0.03	0.02	0.95		0.53	0.11			0.56	0.33

Intersection Summary

Area Type: Other
 Cycle Length: 125
 Actuated Cycle Length: 107.1
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 34.7
 Intersection Capacity Utilization 75.6%
 Analysis Period (min) 15
 90th %ile Actuated Cycle: 118.4
 70th %ile Actuated Cycle: 115.2
 50th %ile Actuated Cycle: 107.3
 30th %ile Actuated Cycle: 101.1
 10th %ile Actuated Cycle: 93.3
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: C
 ICU Level of Service D

Splits and Phases: 3: Kendrick St & 3rd Ave

20 s	50 s	25 s	30 s
20 s	50 s	30 s	

Lane Group	ø8
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	50.0
90th %ile Term Code	Hold
70th %ile Green (s)	48.2
70th %ile Term Code	Hold
50th %ile Green (s)	40.3
50th %ile Term Code	Hold
30th %ile Green (s)	34.1
30th %ile Term Code	Hold
10th %ile Green (s)	26.3
10th %ile Term Code	Hold
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

Route 128 Add-A-Lane
4: Kendrick St & 4th Ave

PM Existing 2007
10/28/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕			↕			↕	↕
Volume (veh/h)	68	631	5	11	1104	310	16	11	32	142	5	173
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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)	74	686	5	12	1200	337	17	12	35	154	5	188
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		1027										
pX, platoon unblocked				0.95			0.95	0.95	0.95	0.95	0.95	
vC, conflicting volume	1537			691			1651	2397	346	1924	2232	768
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1537			575			1583	2367	212	1870	2193	768
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	83			99			27	56	95	0	84	45
cM capacity (veh/h)	429			947			24	27	756	23	35	344

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	417	348	612	937	64	160	188
Volume Left	74	0	12	0	17	154	0
Volume Right	0	5	0	337	35	0	188
cSH	429	1700	947	1700	53	23	344
Volume to Capacity	0.17	0.20	0.01	0.55	1.22	6.90	0.55
Queue Length 95th (ft)	15	0	1	0	142	Err	78
Control Delay (s)	5.4	0.0	0.3	0.0	321.7	Err	27.4
Lane LOS	A		A		F	F	D
Approach Delay (s)	2.9		0.1		321.7	4608.1	
Approach LOS					F	F	

Intersection Summary			
Average Delay		596.4	
Intersection Capacity Utilization		85.1%	ICU Level of Service
Analysis Period (min)		15	E

I-95/Route 128 at Route 9 IJR
4: Rte 9 & Harvard Pilgrim Site Driveway

Existing (2007)
AM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	2334	230	164	1637	538	3	0	24	24	139	22
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	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		0.987				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.950		0.950	0.999	
Satd. Flow (prot)	1752	4970	0	1752	5036	1568	0	1752	1568	1665	1751	1568
Flt Permitted	0.082			0.057				0.360		0.756	0.995	
Satd. Flow (perm)	151	4970	0	105	5036	1568	0	664	1568	1325	1744	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				500			26			24
Link Speed (mph)		45			45			25				25
Link Distance (ft)		324			359			181				248
Travel Time (s)		4.9			5.4			4.9				6.8
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)	152	2537	250	178	1779	585	3	0	26	26	151	24
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	152	2787	0	178	1779	585	0	3	26	23	154	24
Turn Type	pm+pt			pm+pt		Perm	Perm		custom	Perm		custom
Protected Phases	1	6		5	2			8				4
Permitted Phases	6			2		2	8		5 8	4		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)	21.0	73.0	0.0	21.0	73.0	73.0	15.0	15.0	36.0	15.0	15.0	36.0
Total Split (%)	15.0%	52.1%	0.0%	15.0%	52.1%	52.1%	10.7%	10.7%	25.7%	10.7%	10.7%	25.7%
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	-1.0	-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	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	Max		None	Max	Max	None	None		None	None	
Act Effct Green (s)	81.9	69.8		84.1	70.8	70.8		11.1	27.7	11.1	11.1	26.7
Actuated g/C Ratio	0.74	0.63		0.76	0.64	0.64		0.10	0.25	0.10	0.10	0.24

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)	31.0
Total Split (%)	22%
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	

I-95/Route 128 at Route 9 IJR
 4: Rte 9 & Harvard Pilgrim Site Driveway

Existing (2007)
 AM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.53	0.89		0.64	0.55	0.49		0.04	0.06	0.17	0.88	0.06
Control Delay	21.3	23.1		35.8	13.6	3.9		53.0	9.8	53.5	92.5	10.2
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	21.3	23.1		35.8	13.6	3.9		53.0	9.8	53.5	92.5	10.2
LOS	C	C		D	B	A		D	A	D	F	B
Approach Delay		23.0			12.9			14.2			78.2	
Approach LOS		C			B			B			E	
Queue Length 50th (ft)	22	490		61	204	18		2	0	14	109	0
Queue Length 95th (ft)	124	#1093		180	475	123		13	18	52	#310	18
Internal Link Dist (ft)		244			279			101			168	
Turn Bay Length (ft)												
Base Capacity (vph)	366	3144		338	3229	1185		67	468	133	176	467
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	0.42	0.89		0.53	0.55	0.49		0.04	0.06	0.17	0.88	0.05

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 110.5
 Natural Cycle: 120
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 20.4
 Intersection LOS: C
 Intersection Capacity Utilization 80.3%
 ICU Level of Service D
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 4: Rte 9 & Harvard Pilgrim Site Driveway

ø1 21 s	ø2 73 s	ø4 15 s	ø9 31 s
ø5 21 s	ø6 73 s	ø8 15 s	

I-95/Route 128 at Route 9 IJR
 4: Rte 9 & Harvard Pilgrim Site Driveway

Existing (2007)
 PM Peak Hour

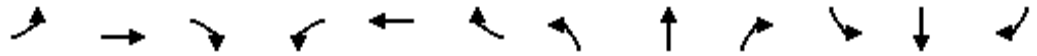


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	37	1898	4	21	1992	62	197	0	275	325	21	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	0		0	0		0	0		0	0		0
Storage Lanes	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	0.958	
Satd. Flow (prot)	1752	5036	0	1752	5036	1568	0	1752	1568	1665	1679	1568
Flt Permitted	0.064			0.064				0.404		0.369	0.362	
Satd. Flow (perm)	118	5036	0	118	5036	1568	0	745	1568	647	634	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						43			284			140
Link Speed (mph)		45			45			25				25
Link Distance (ft)		324			359			181				248
Travel Time (s)		4.9			5.4			4.9				6.8
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)	40	2063	4	23	2165	67	214	0	299	353	23	140
Shared Lane Traffic (%)										47%		
Lane Group Flow (vph)	40	2067	0	23	2165	67	0	214	299	187	189	140
Turn Type	pm+pt			pm+pt		Perm	Perm		custom	Perm		custom
Protected Phases	1	6		5	2			8			4	
Permitted Phases	6			2		2	8		5 8	4		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)	16.0	67.0	0.0	16.0	67.0	67.0	26.0	26.0	42.0	26.0	26.0	42.0
Total Split (%)	11.4%	47.9%	0.0%	11.4%	47.9%	47.9%	18.6%	18.6%	30.0%	18.6%	18.6%	30.0%
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	-1.0	-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	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	Max		None	Max	Max	None	None		None	None	
Act Effect Green (s)	72.3	63.7		72.2	63.7	63.7		22.2	34.1	22.2	22.2	34.2
Actuated g/C Ratio	0.65	0.57		0.65	0.57	0.57		0.20	0.31	0.20	0.20	0.31

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)	31.0
Total Split (%)	22%
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 Effect Green (s)	
Actuated g/C Ratio	

I-95/Route 128 at Route 9 IJR
 4: Rte 9 & Harvard Pilgrim Site Driveway

Existing (2007)
 PM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.20	0.71		0.11	0.75	0.07		1.44	0.44	1.44	1.49	0.24
Control Delay	9.9	20.4		9.0	21.3	6.7		263.7	5.7	271.5	290.0	5.0
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	9.9	20.4		9.0	21.3	6.7		263.7	5.7	271.5	290.0	5.0
LOS	A	C		A	C	A		F	A	F	F	A
Approach Delay		20.2			20.7			113.3			206.0	
Approach LOS		C			C			F			F	
Queue Length 50th (ft)	7	321		4	349	6		~191	7	~176	~182	0
Queue Length 95th (ft)	31	648		21	694	38		#439	58	#418	#423	37
Internal Link Dist (ft)		244			279			101			168	
Turn Bay Length (ft)												
Base Capacity (vph)	259	2894		259	2892	919		149	721	130	127	625
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	0.15	0.71		0.09	0.75	0.07		1.44	0.41	1.44	1.49	0.22

Intersection Summary

Area Type: Other
 Cycle Length: 140
 Actuated Cycle Length: 110.9
 Natural Cycle: 150
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 1.49
 Intersection Signal Delay: 47.1
 Intersection LOS: D
 Intersection Capacity Utilization 73.3%
 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.

Splits and Phases: 4: Rte 9 & Harvard Pilgrim Site Driveway

ø1	ø2	ø4	ø9
16 s	67 s	26 s	31 s
ø5	ø6	ø8	
16 s	67 s	26 s	