

**Appendix H: Washington Street at Hanover Street,
2030 Alternatives One and Two**

Intersection	
Intersection Delay, s/veh	26.9
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Vol, veh/h	67	370	77	131	294	41	19	96	25	0	0	0
Future Vol, veh/h	67	370	77	131	294	41	19	96	25	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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	78	430	90	152	342	48	22	112	29	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	31.6	26	12.4
HCM LOS	D	D	B

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	14%	13%	28%
Vol Thru, %	69%	72%	63%
Vol Right, %	18%	15%	9%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	140	514	466
LT Vol	19	67	131
Through Vol	96	370	294
RT Vol	25	77	41
Lane Flow Rate	163	598	542
Geometry Grp	1	1	1
Degree of Util (X)	0.297	0.86	0.798
Departure Headway (Hd)	6.56	5.178	5.303
Convergence, Y/N	Yes	Yes	Yes
Cap	545	699	683
Service Time	4.622	3.221	3.349
HCM Lane V/C Ratio	0.299	0.856	0.794
HCM Control Delay	12.4	31.6	26
HCM Lane LOS	B	D	D
HCM 95th-tile Q	1.2	10.1	8

Intersection	
Intersection Delay, s/veh	47.8
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Vol, veh/h	77	309	63	80	386	82	22	180	48	0	0	0
Future Vol, veh/h	77	309	63	80	386	82	22	180	48	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
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	90	359	73	93	449	95	26	209	56	0	0	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	0	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	35.8	71.1	18.1
HCM LOS	E	F	C

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	9%	17%	15%
Vol Thru, %	72%	69%	70%
Vol Right, %	19%	14%	15%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	250	449	548
LT Vol	22	77	80
Through Vol	180	309	386
RT Vol	48	63	82
Lane Flow Rate	291	522	637
Geometry Grp	1	1	1
Degree of Util (X)	0.549	0.863	1.04
Departure Headway (Hd)	6.938	6.076	5.876
Convergence, Y/N	Yes	Yes	Yes
Cap	523	601	625
Service Time	4.938	4.076	3.876
HCM Lane V/C Ratio	0.556	0.869	1.019
HCM Control Delay	18.1	35.8	71.1
HCM Lane LOS	C	E	F
HCM 95th-tile Q	3.3	9.7	17.1

Washington St at Hanover St
Alternative Two

AM
09/22/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Volume (vph)	67	370	77	131	294	41	19	96	25	0	0	0
Future Volume (vph)	67	370	77	131	294	41	19	96	25	0	0	0
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5				
Lane Util. Factor		1.00			1.00			1.00				
Frt		0.98			0.99			0.98				
Flt Protected		0.99			0.99			0.99				
Satd. Flow (prot)		1813			1815			1806				
Flt Permitted		0.88			0.72			0.99				
Satd. Flow (perm)		1606			1332			1806				
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
Growth Factor (vph)	107%	107%	107%	107%	107%	107%	107%	107%	107%	100%	100%	100%
Adj. Flow (vph)	78	430	90	152	342	48	22	112	29	0	0	0
RTOR Reduction (vph)	0	6	0	0	4	0	0	8	0	0	0	0
Lane Group Flow (vph)	0	592	0	0	538	0	0	155	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4			8			2					
Actuated Green, G (s)		33.8			33.8			18.9				
Effective Green, g (s)		33.8			33.8			18.9				
Actuated g/C Ratio		0.55			0.55			0.31				
Clearance Time (s)		4.5			4.5			4.5				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		879			729			553				
v/s Ratio Prot												
v/s Ratio Perm		0.37			0.40			0.09				
v/c Ratio		0.67			0.74			0.28				
Uniform Delay, d1		10.0			10.6			16.2				
Progression Factor		1.00			1.00			1.00				
Incremental Delay, d2		2.0			3.9			1.3				
Delay (s)		12.0			14.5			17.5				
Level of Service		B			B			B				
Approach Delay (s)		12.0			14.5			17.5			0.0	
Approach LOS		B			B			B			A	
Intersection Summary												
HCM 2000 Control Delay			13.8									B
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			61.7						12.0			
Intersection Capacity Utilization			65.8%									C
Analysis Period (min)			15									
c Critical Lane Group												

Washington St at Hanover St
Alternative Two

PM
09/22/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕				
Traffic Volume (vph)	77	309	63	80	386	82	22	180	48	0	0	0
Future Volume (vph)	77	309	63	80	386	82	22	180	48	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5				
Lane Util. Factor		1.00			1.00			1.00				
Frt		0.98			0.98			0.97				
Flt Protected		0.99			0.99			1.00				
Satd. Flow (prot)		1812			1812			1806				
Flt Permitted		0.84			0.88			1.00				
Satd. Flow (perm)		1527			1601			1806				
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
Growth Factor (vph)	107%	107%	107%	107%	107%	107%	107%	107%	107%	100%	100%	100%
Adj. Flow (vph)	90	359	73	93	449	95	26	209	56	0	0	0
RTOR Reduction (vph)	0	7	0	0	8	0	0	11	0	0	0	0
Lane Group Flow (vph)	0	515	0	0	629	0	0	280	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		4			8			2				
Permitted Phases	4			8			2					
Actuated Green, G (s)		27.3			27.3			13.4				
Effective Green, g (s)		27.3			27.3			13.4				
Actuated g/C Ratio		0.50			0.50			0.24				
Clearance Time (s)		4.5			4.5			4.5				
Vehicle Extension (s)		3.0			3.0			3.0				
Lane Grp Cap (vph)		762			799			442				
v/s Ratio Prot												
v/s Ratio Perm		0.34			0.39			0.16				
v/c Ratio		0.68			0.79			0.63				
Uniform Delay, d1		10.4			11.3			18.5				
Progression Factor		1.00			1.00			1.00				
Incremental Delay, d2		2.4			5.2			3.0				
Delay (s)		12.7			16.5			21.4				
Level of Service		B			B			C				
Approach Delay (s)		12.7			16.5			21.4			0.0	
Approach LOS		B			B			C			A	
Intersection Summary												
HCM 2000 Control Delay			16.1									B
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			54.7						12.0			
Intersection Capacity Utilization			62.7%									B
Analysis Period (min)			15									
c Critical Lane Group												