
H. Vehicular Capacity Analysis Worksheets – 2029 Background Conditions

Queues

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Background 2029

Timing Plan: AM Peak



Lane Group	EBT	EBR	WBT	SBT
Lane Group Flow (vph)	1198	7	603	158
v/c Ratio	0.60	0.01	0.34	0.60
Control Delay	10.8	5.6	4.4	53.6
Queue Delay	0.1	0.0	0.0	0.0
Total Delay	10.9	5.6	4.4	53.6
Queue Length 50th (ft)	225	1	23	111
Queue Length 95th (ft)	283	6	28	187
Internal Link Dist (ft)	1432		152	19
Turn Bay Length (ft)		90		
Base Capacity (vph)	2008	786	1791	262
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	120	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.63	0.01	0.34	0.60
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Background 2029

Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑						↑↓	
Traffic Volume (vph)	0	1186	7	19	578	0	0	0	0	132	22	3
Future Volume (vph)	0	1186	7	19	578	0	0	0	0	132	22	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	12	12	12	9	9	9
Grade (%)		7%			-7%			0%			7%	
Total Lost time (s)		4.0	4.0		4.0						4.0	
Lane Util. Factor		0.95	1.00		0.95						1.00	
Frpb, ped/bikes		1.00	0.97		1.00						1.00	
Flpb, ped/bikes		1.00	1.00		1.00						1.00	
Frt		1.00	0.85		1.00						1.00	
Flt Protected		1.00	1.00		1.00						0.96	
Satd. Flow (prot)		2869	1123		2861						1254	
Flt Permitted		1.00	1.00		0.89						0.96	
Satd. Flow (perm)		2869	1123		2558						1254	
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	1198	7	19	584	0	0	0	0	133	22	3
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	1198	7	0	603	0	0	0	0	0	157	0
Confl. Peds. (#/hr)	7		9	9		7	5					5
Confl. Bikes (#/hr)			6			1			1			4
Heavy Vehicles (%)	2%	2%	10%	5%	4%	2%	0%	0%	0%	2%	2%	2%
Bus Blockages (#/hr)	0	0	7	0	0	0	0	0	0	0	0	0
Parking (#/hr)					0					0	0	0
Turn Type		NA	Perm	Perm	NA					Split	NA	
Protected Phases		6			2					4	4	
Permitted Phases			6	2								
Actuated Green, G (s)		82.0	82.0		82.0						23.0	
Effective Green, g (s)		84.0	84.0		84.0						25.0	
Actuated g/C Ratio		0.70	0.70		0.70						0.21	
Clearance Time (s)		6.0	6.0		6.0						6.0	
Lane Grp Cap (vph)		2008	786		1790						261	
v/s Ratio Prot		c0.42									c0.13	
v/s Ratio Perm			0.01		0.24							
v/c Ratio		0.60	0.01		0.34						0.60	
Uniform Delay, d1		9.3	5.4		7.1						43.0	
Progression Factor		1.00	1.00		0.55						1.00	
Incremental Delay, d2		1.3	0.0		0.5						9.9	
Delay (s)		10.6	5.5		4.4						52.9	
Level of Service		B	A		A						D	
Approach Delay (s)		10.6			4.4			0.0			52.9	
Approach LOS		B			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			12.1		HCM 2000 Level of Service				B			
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)				10.0			
Intersection Capacity Utilization			58.1%		ICU Level of Service				B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

2: University Ave NW & Wesley Cir NW

Background 2029

Timing Plan: AM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱					↲
Traffic Volume (veh/h)	19	16	0	0	0	22
Future Volume (Veh/h)	19	16	0	0	0	22
Sign Control	Free			Free	Yield	
Grade	5%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	22	19	0	0	0	26
Pedestrians					8	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			49		40	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			49		40	40
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			1549		967	1026
Direction, Lane #	EB 1	NB 1				
Volume Total	41	26				
Volume Left	0	0				
Volume Right	19	26				
cSH	1700	1026				
Volume to Capacity	0.02	0.03				
Queue Length 95th (ft)	0	2				
Control Delay (s)	0.0	8.6				
Lane LOS		A				
Approach Delay (s)	0.0	8.6				
Approach LOS		A				
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			15.7%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Wesley Cir NW & Massachusetts Ave NW

Background 2029

Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1313	0	0	595	42	2	3	36	0	0	0
Future Volume (Veh/h)	5	1313	0	0	595	42	2	3	36	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			-7%			5%			0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	5	1326	0	0	601	42	2	3	36	0	0	0
Pedestrians					1			5			6	
Lane Width (ft)					12.0			12.0			0.0	
Walking Speed (ft/s)					4.0			4.0			4.0	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		232			230							
pX, platoon unblocked				0.79			0.79	0.79	0.79	0.79	0.79	
vC, conflicting volume	649			1331			1642	1990	669	1340	1969	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	649			895			1287	1726	60	906	1700	328
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 %	99			100			98	96	95	100	100	100
cM capacity (veh/h)	933			595			95	69	783	168	72	668
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1							
Volume Total	447	884	401	242	41							
Volume Left	5	0	0	0	2							
Volume Right	0	0	0	42	36							
cSH	933	1700	1700	1700	370							
Volume to Capacity	0.01	0.52	0.24	0.14	0.11							
Queue Length 95th (ft)	0	0	0	0	9							
Control Delay (s)	0.2	0.0	0.0	0.0	15.9							
Lane LOS	A				C							
Approach Delay (s)	0.1		0.0		15.9							
Approach LOS					C							
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			54.5%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: University Ave NW & Sedgwick St NW/WTS Dwy

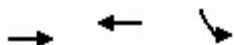
Background 2029

Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	0	2	1	0	0	1	25	0	1	15	1
Future Volume (Veh/h)	7	0	2	1	0	0	1	25	0	1	15	1
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	8	0	2	1	0	0	1	29	0	1	17	1
Pedestrians	4			5			1					
Lane Width (ft)	10.0			10.0			10.0					
Walking Speed (ft/s)	4.0			4.0			4.0					
Percent Blockage	0			0			0					
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	54	60	22	58	60	34	22				34	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	54	60	22	58	60	34	22				34	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	99	100	100	100	100	100	100				100	
cM capacity (veh/h)	935	825	1051	927	825	1036	1589				1572	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	10	1	30	19								
Volume Left	8	1	1	1								
Volume Right	2	0	0	1								
cSH	956	927	1589	1572								
Volume to Capacity	0.01	0.00	0.00	0.00								
Queue Length 95th (ft)	1	0	0	0								
Control Delay (s)	8.8	8.9	0.2	0.4								
Lane LOS	A	A	A	A								
Approach Delay (s)	8.8	8.9	0.2	0.4								
Approach LOS	A	A										
Intersection Summary												
Average Delay				1.9								
Intersection Capacity Utilization				15.2%	ICU Level of Service				A			
Analysis Period (min)				15								

Queues
5: Massachusetts Ave NW & 45th St NW

Background 2029
Timing Plan: AM Peak



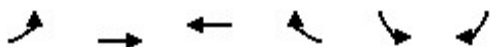
Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	1364	655	25
v/c Ratio	0.60	0.47	0.02
Control Delay	6.7	6.4	5.3
Queue Delay	0.0	0.0	0.0
Total Delay	6.7	6.4	5.3
Queue Length 50th (ft)	114	146	4
Queue Length 95th (ft)	128	178	14
Internal Link Dist (ft)	150	134	207
Turn Bay Length (ft)			
Base Capacity (vph)	2264	1397	1274
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.60	0.47	0.02
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

5: Massachusetts Ave NW & 45th St NW

Background 2029

Timing Plan: AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	57	1293	629	20	17	8
Future Volume (vph)	57	1293	629	20	17	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		4%	-7%		0%	
Total Lost time (s)		9.0	9.0		9.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3230	1757		1600	
Flt Permitted		0.88	1.00		0.97	
Satd. Flow (perm)		2847	1757		1600	
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	58	1306	635	20	17	8
RTOR Reduction (vph)	0	0	1	0	2	0
Lane Group Flow (vph)	0	1364	654	0	23	0
Confl. Peds. (#/hr)	9			9	1	5
Confl. Bikes (#/hr)				4		7
Heavy Vehicles (%)	2%	2%	4%	2%	2%	2%
Turn Type	Perm	NA	NA		D.Pm	
Protected Phases		2!	2!			
Permitted Phases	2!				2!	
Actuated Green, G (s)		88.2	88.2		88.2	
Effective Green, g (s)		90.2	90.2		90.2	
Actuated g/C Ratio		0.75	0.75		0.75	
Clearance Time (s)		11.0	11.0		11.0	
Vehicle Extension (s)		1.0	1.0		1.0	
Lane Grp Cap (vph)		2139	1320		1202	
v/s Ratio Prot			0.37			
v/s Ratio Perm		c0.48			0.01	
v/c Ratio		0.64	0.50		0.02	
Uniform Delay, d1		7.1	5.9		3.8	
Progression Factor		0.59	0.67		1.00	
Incremental Delay, d2		1.2	1.0		0.0	
Delay (s)		5.4	5.0		3.8	
Level of Service		A	A		A	
Approach Delay (s)		5.4	5.0		3.8	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			5.3		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.54			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	13.0
Intersection Capacity Utilization			101.0%		ICU Level of Service	G
Analysis Period (min)			15			
! Phase conflict between lane groups.						
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis

6: WTS Dwy & Massachusetts Ave NW

Background 2029

Timing Plan: AM Peak

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1300	10	4	649	0	2
Future Volume (Veh/h)	1300	10	4	649	0	2
Sign Control	Free			Free	Stop	
Grade	4%			-7%	0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	1313	10	4	656	0	2
Pedestrians					26	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	214			651		
pX, platoon unblocked			0.82		0.91	0.82
vC, conflicting volume			1349		2008	688
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			986		1321	180
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			561		131	670
Direction, Lane #	EB 1	EB 2	WB 1	NB 1		
Volume Total	875	448	660	2		
Volume Left	0	0	4	0		
Volume Right	0	10	0	2		
cSH	1700	1700	561	670		
Volume to Capacity	0.51	0.26	0.01	0.00		
Queue Length 95th (ft)	0	0	1	0		
Control Delay (s)	0.0	0.0	0.2	10.4		
Lane LOS			A	B		
Approach Delay (s)	0.0		0.2	10.4		
Approach LOS				B		
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			46.3%	ICU Level of Service		A
Analysis Period (min)			15			



Lane Group	EBT	WBT	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	1351	675	34	25	14	16
v/c Ratio	0.67	0.64	0.04	0.16	0.08	0.09
Control Delay	4.9	10.7	0.3	48.9	0.8	39.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	10.7	0.3	48.9	0.8	39.0
Queue Length 50th (ft)	45	217	0	17	0	8
Queue Length 95th (ft)	51	328	2	45	0	30
Internal Link Dist (ft)	571	391		281		141
Turn Bay Length (ft)						
Base Capacity (vph)	2020	1050	920	157	186	183
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.64	0.04	0.16	0.08	0.09
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: Glover Gate/Katzen Arts Center Dwy & Massachusetts Ave NW

Background 2029

Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	1232	63	30	625	33	18	6	14	3	9	4
Future Volume (vph)	16	1232	63	30	625	33	18	6	14	3	9	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		4%			-4%			-1%			5%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0		4.0	
Lane Util. Factor		0.95			1.00	1.00		1.00	1.00		1.00	
Frpb, ped/bikes		1.00			1.00	0.90		1.00	0.79		0.98	
Flpb, ped/bikes		1.00			1.00	1.00		0.96	1.00		0.96	
Frt		0.99			1.00	0.85		1.00	0.85		0.97	
Flt Protected		1.00			1.00	1.00		0.96	1.00		0.99	
Satd. Flow (prot)		2847			1572	1206		1366	984		1380	
Flt Permitted		0.94			0.89	1.00		0.82	1.00		0.96	
Satd. Flow (perm)		2689			1401	1206		1157	984		1340	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	16	1270	65	31	644	34	19	6	14	3	9	4
RTOR Reduction (vph)	0	3	0	0	0	9	0	0	12	0	3	0
Lane Group Flow (vph)	0	1348	0	0	675	26	0	25	2	0	13	0
Confl. Peds. (#/hr)	17		17	17		17	14		77	77		14
Confl. Bikes (#/hr)			11			2						
Heavy Vehicles (%)	2%	3%	5%	10%	3%	2%	10%	2%	10%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	2	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			8			4	
Permitted Phases	6			2		2	8		8	4		
Actuated Green, G (s)		88.0			88.0	88.0		14.0	14.0		14.0	
Effective Green, g (s)		90.0			90.0	90.0		16.0	16.0		16.0	
Actuated g/C Ratio		0.75			0.75	0.75		0.13	0.13		0.13	
Clearance Time (s)		6.0			6.0	6.0		6.0	6.0		6.0	
Lane Grp Cap (vph)		2016			1050	904		154	131		178	
v/s Ratio Prot												
v/s Ratio Perm		c0.50			0.48	0.02		c0.02	0.00		0.01	
v/c Ratio		0.67			0.64	0.03		0.16	0.01		0.07	
Uniform Delay, d1		7.5			7.2	3.8		46.1	45.2		45.5	
Progression Factor		0.45			1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2		1.5			3.0	0.1		2.3	0.2		0.8	
Delay (s)		4.8			10.3	3.9		48.3	45.4		46.3	
Level of Service		A			B	A		D	D		D	
Approach Delay (s)		4.8			10.0			47.3			46.3	
Approach LOS		A			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			7.6				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			82.0%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Background 2029

Timing Plan: PM Peak



Lane Group	EBT	EBR	WBT	SBT
Lane Group Flow (vph)	958	3	1139	110
v/c Ratio	0.45	0.00	0.62	0.52
Control Delay	6.8	4.0	3.7	55.2
Queue Delay	0.0	0.0	0.1	0.0
Total Delay	6.8	4.0	3.7	55.2
Queue Length 50th (ft)	131	1	2	78
Queue Length 95th (ft)	166	3	1	140
Internal Link Dist (ft)	1432		152	19
Turn Bay Length (ft)		90		
Base Capacity (vph)	2127	892	1831	210
Starvation Cap Reductn	0	0	51	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.45	0.00	0.64	0.52
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Background 2029

Timing Plan: PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑						↕	
Traffic Volume (vph)	0	891	3	48	1011	0	0	0	0	79	21	2
Future Volume (vph)	0	891	3	48	1011	0	0	0	0	79	21	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	12	12	12	9	9	9
Grade (%)		7%			-7%			0%			7%	
Total Lost time (s)		4.0	4.0		4.0						4.0	
Lane Util. Factor		0.95	1.00		0.95						1.00	
Frpb, ped/bikes		1.00	0.96		1.00						1.00	
Flpb, ped/bikes		1.00	1.00		1.00						1.00	
Frt		1.00	0.85		1.00						1.00	
Flt Protected		1.00	1.00		1.00						0.96	
Satd. Flow (prot)		2869	1203		2916						1258	
Flt Permitted		1.00	1.00		0.85						0.96	
Satd. Flow (perm)		2869	1203		2470						1258	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	958	3	52	1087	0	0	0	0	85	23	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	958	3	0	1139	0	0	0	0	0	109	0
Confl. Peds. (#/hr)	16		22	22		16	3					3
Confl. Bikes (#/hr)			3			11			1			2
Bus Blockages (#/hr)	0	0	7	0	0	0	0	0	0	0	0	0
Parking (#/hr)					0					0	0	0
Turn Type		NA	Perm	Perm	NA					Split	NA	
Protected Phases		6			2					4	4	
Permitted Phases			6	2								
Actuated Green, G (s)		87.0	87.0		87.0						18.0	
Effective Green, g (s)		89.0	89.0		89.0						20.0	
Actuated g/C Ratio		0.74	0.74		0.74						0.17	
Clearance Time (s)		6.0	6.0		6.0						6.0	
Lane Grp Cap (vph)		2127	892		1831						209	
v/s Ratio Prot		0.33									c0.09	
v/s Ratio Perm			0.00		c0.46							
v/c Ratio		0.45	0.00		0.62						0.52	
Uniform Delay, d1		6.0	4.0		7.4						45.6	
Progression Factor		1.00	1.00		0.29						1.00	
Incremental Delay, d2		0.7	0.0		1.4						9.0	
Delay (s)		6.7	4.0		3.6						54.7	
Level of Service		A	A		A						D	
Approach Delay (s)		6.7			3.6			0.0			54.7	
Approach LOS		A			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			7.5		HCM 2000 Level of Service				A			
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)			10.0				
Intersection Capacity Utilization			85.0%		ICU Level of Service				E			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: University Ave NW & Wesley Cir NW

Background 2029

Timing Plan: PM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰					↱
Traffic Volume (veh/h)	17	24	0	0	0	26
Future Volume (Veh/h)	17	24	0	0	0	26
Sign Control	Free			Free	Yield	
Grade	5%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	20	28	0	0	0	30
Pedestrians					3	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			51		37	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			51		37	37
tC, single (s)			4.1		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	97
cM capacity (veh/h)			1552		973	1016
Direction, Lane #	EB 1	NB 1				
Volume Total	48	30				
Volume Left	0	0				
Volume Right	28	30				
cSH	1700	1016				
Volume to Capacity	0.03	0.03				
Queue Length 95th (ft)	0	2				
Control Delay (s)	0.0	8.7				
Lane LOS		A				
Approach Delay (s)	0.0	8.7				
Approach LOS		A				
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		14.3%	ICU Level of Service	A		
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Wesley Cir NW & Massachusetts Ave NW

Background 2029

Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	965	0	0	1060	88	1	7	35	0	0	0
Future Volume (Veh/h)	1	965	0	0	1060	88	1	7	35	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			-7%			5%			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)	1	1049	0	0	1152	96	1	8	38	0	0	0
Pedestrians								22			14	
Lane Width (ft)								12.0			0.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								2			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		232			230							
pX, platoon unblocked	0.85			0.88			0.91	0.91	0.88	0.91	0.91	0.85
vC, conflicting volume	1262			1071			1649	2335	546	1782	2287	638
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	953			810			923	1678	214	1070	1625	219
tC, single (s)	4.1			4.1			7.5	6.5	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			99	90	94	100	100	100
cM capacity (veh/h)	608			702			197	83	673	137	90	667
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1							
Volume Total	351	699	768	480	47							
Volume Left	1	0	0	0	1							
Volume Right	0	0	0	96	38							
cSH	608	1700	1700	1700	298							
Volume to Capacity	0.00	0.41	0.45	0.28	0.16							
Queue Length 95th (ft)	0	0	0	0	14							
Control Delay (s)	0.1	0.0	0.0	0.0	19.3							
Lane LOS	A				C							
Approach Delay (s)	0.0		0.0		19.3							
Approach LOS					C							
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			45.8%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: University Ave NW & Sedgwick St NW/WTS Dwy

Background 2029

Timing Plan: PM Peak

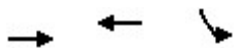
													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	5	1	3	0	0	3	2	17	0	0	17	5	
Future Volume (Veh/h)	5	1	3	0	0	3	2	17	0	0	17	5	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	
Hourly flow rate (vph)	6	1	4	0	0	4	2	20	0	0	20	6	
Pedestrians					3								2
Lane Width (ft)					10.0								10.0
Walking Speed (ft/s)					4.0								4.0
Percent Blockage					0								0
Right turn flare (veh)													
Median type							None			None			
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	53	50	23	54	53	25	26				23		
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	53	50	23	54	53	25	26				23		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1		
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2		
p0 queue free %	99	100	100	100	100	100	100				100		
cM capacity (veh/h)	938	839	1054	935	835	1047	1588				1589		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	11	4	22	26									
Volume Left	6	0	2	0									
Volume Right	4	4	0	6									
cSH	966	1047	1588	1589									
Volume to Capacity	0.01	0.00	0.00	0.00									
Queue Length 95th (ft)	1	0	0	0									
Control Delay (s)	8.8	8.4	0.7	0.0									
Lane LOS	A	A	A										
Approach Delay (s)	8.8	8.4	0.7	0.0									
Approach LOS	A	A											
Intersection Summary													
Average Delay				2.3									
Intersection Capacity Utilization				15.9%	ICU Level of Service				A				
Analysis Period (min)				15									

Queues

5: Massachusetts Ave NW & 45th St NW

Background 2029

Timing Plan: PM Peak



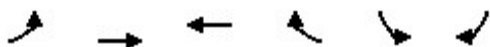
Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	1098	1284	45
v/c Ratio	0.47	0.48	0.04
Control Delay	5.7	4.0	4.0
Queue Delay	0.0	0.0	0.0
Total Delay	5.7	4.0	4.0
Queue Length 50th (ft)	131	95	5
Queue Length 95th (ft)	151	109	18
Internal Link Dist (ft)	150	134	207
Turn Bay Length (ft)			
Base Capacity (vph)	2334	2701	1237
Starvation Cap Reductn	106	0	0
Spillback Cap Reductn	0	21	9
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.49	0.48	0.04
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

5: Massachusetts Ave NW & 45th St NW

Background 2029

Timing Plan: PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑↑	
Traffic Volume (vph)	17	982	1126	43	17	24
Future Volume (vph)	17	982	1126	43	17	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		4%	-7%		0%	
Total Lost time (s)		9.0	9.0		9.0	
Lane Util. Factor		0.95	0.95		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.92	
Flt Protected		1.00	1.00		0.98	
Satd. Flow (prot)		3234	3394		1552	
Flt Permitted		0.91	1.00		0.98	
Satd. Flow (perm)		2935	3394		1552	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	1079	1237	47	19	26
RTOR Reduction (vph)	0	0	2	0	6	0
Lane Group Flow (vph)	0	1098	1282	0	39	0
Confl. Peds. (#/hr)	28			28	1	19
Confl. Bikes (#/hr)				15		
Turn Type	Perm	NA	NA		D.Pm	
Protected Phases		2!	2!			
Permitted Phases	2!				2!	
Actuated Green, G (s)		88.2	88.2		88.2	
Effective Green, g (s)		90.2	90.2		90.2	
Actuated g/C Ratio		0.75	0.75		0.75	
Clearance Time (s)		11.0	11.0		11.0	
Vehicle Extension (s)		1.0	1.0		1.0	
Lane Grp Cap (vph)		2206	2551		1166	
v/s Ratio Prot			c0.38			
v/s Ratio Perm		0.37			0.02	
v/c Ratio		0.50	0.50		0.03	
Uniform Delay, d1		5.9	5.9		3.8	
Progression Factor		0.64	0.45		1.00	
Incremental Delay, d2		0.7	0.6		0.1	
Delay (s)		4.5	3.2		3.8	
Level of Service		A	A		A	
Approach Delay (s)		4.5	3.2		3.8	
Approach LOS		A	A		A	

Intersection Summary

HCM 2000 Control Delay	3.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

6: WTS Dwy & Massachusetts Ave NW

Background 2029

Timing Plan: PM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↱↱		↱
Traffic Volume (veh/h)	994	6	14	1170	0	4
Future Volume (Veh/h)	994	6	14	1170	0	4
Sign Control	Free			Free	Stop	
Grade	4%			-7%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1092	7	15	1286	0	4
Pedestrians					36	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	214			651		
pX, platoon unblocked			0.25		0.35	0.25
vC, conflicting volume			1135		1804	1132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			55		374	42
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		100	98
cM capacity (veh/h)			381		194	251
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1099	444	857	4		
Volume Left	0	15	0	0		
Volume Right	7	0	0	4		
cSH	1700	381	1700	251		
Volume to Capacity	0.65	0.04	0.50	0.02		
Queue Length 95th (ft)	0	3	0	1		
Control Delay (s)	0.0	1.3	0.0	19.6		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.4		19.6		
Approach LOS				C		
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			62.7%		ICU Level of Service	B
Analysis Period (min)			15			



Lane Group	EBT	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1149	1234	93	111	54
v/c Ratio	0.60	0.66	0.51	0.47	0.27
Control Delay	8.1	11.6	55.6	15.0	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	8.1	11.6	55.6	15.0	33.0
Queue Length 50th (ft)	110	244	66	0	22
Queue Length 95th (ft)	123	305	122	54	61
Internal Link Dist (ft)	571	391	281		141
Turn Bay Length (ft)					
Base Capacity (vph)	1921	1876	184	236	198
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.60	0.66	0.51	0.47	0.27
Intersection Summary					

HCM Signalized Intersection Capacity Analysis

7: Glover Gate/Katzen Arts Center Dwy & Massachusetts Ave NW

Background 2029

Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	960	54	31	1046	21	76	7	99	21	8	19
Future Volume (vph)	8	960	54	31	1046	21	76	7	99	21	8	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		4%			-4%			-1%			5%	
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			1.00			1.00	0.66		0.96	
Flpb, ped/bikes		1.00			1.00			0.92	1.00		0.87	
Frt		0.99			1.00			1.00	0.85		0.95	
Flt Protected		1.00			1.00			0.96	1.00		0.98	
Satd. Flow (prot)		2874			3014			1386	829		1184	
Flt Permitted		0.94			0.88			0.73	1.00		0.86	
Satd. Flow (perm)		2709			2648			1055	829		1037	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	9	1079	61	35	1175	24	85	8	111	24	9	21
RTOR Reduction (vph)	0	4	0	0	1	0	0	0	92	0	17	0
Lane Group Flow (vph)	0	1146	0	0	1233	0	0	93	19	0	37	0
Confl. Peds. (#/hr)	10		19	19		10	39		190	190		39
Confl. Bikes (#/hr)			2			5			1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	2	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			8			4	
Permitted Phases	6			2			8		8	4		
Actuated Green, G (s)		83.0			83.0			19.0	19.0		19.0	
Effective Green, g (s)		85.0			85.0			21.0	21.0		21.0	
Actuated g/C Ratio		0.71			0.71			0.18	0.18		0.18	
Clearance Time (s)		6.0			6.0			6.0	6.0		6.0	
Lane Grp Cap (vph)		1918			1875			184	145		181	
v/s Ratio Prot												
v/s Ratio Perm		0.42			c0.47			c0.09	0.02		0.04	
v/c Ratio		0.60			0.66			0.51	0.13		0.20	
Uniform Delay, d1		8.8			9.6			44.8	41.8		42.3	
Progression Factor		0.76			1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.3			1.8			9.6	1.9		2.5	
Delay (s)		8.0			11.4			54.4	43.7		44.8	
Level of Service		A			B			D	D		D	
Approach Delay (s)		8.0			11.4			48.6			44.8	
Approach LOS		A			B			D			D	
Intersection Summary												
HCM 2000 Control Delay			13.5				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			76.1%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												

I. Vehicular Capacity Analysis Worksheets – 2029 Total Future Conditions

Queues

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Total Future 2029

Timing Plan: AM Peak



Lane Group	EBT	EBR	WBT	SBT
Lane Group Flow (vph)	1200	6	606	158
v/c Ratio	0.60	0.01	0.34	0.60
Control Delay	10.8	5.5	4.4	53.6
Queue Delay	0.1	0.0	0.0	0.0
Total Delay	10.9	5.5	4.4	53.6
Queue Length 50th (ft)	226	1	23	111
Queue Length 95th (ft)	283	5	28	187
Internal Link Dist (ft)	1432		152	19
Turn Bay Length (ft)		90		
Base Capacity (vph)	2008	786	1781	262
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	123	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.64	0.01	0.34	0.60
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Total Future 2029
Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑						↑↓	
Traffic Volume (vph)	0	1188	6	20	580	0	0	0	0	132	22	3
Future Volume (vph)	0	1188	6	20	580	0	0	0	0	132	22	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	12	12	12	9	9	9
Grade (%)		7%			-7%			0%			7%	
Total Lost time (s)		4.0	4.0		4.0						4.0	
Lane Util. Factor		0.95	1.00		0.95						1.00	
Frpb, ped/bikes		1.00	0.97		1.00						1.00	
Flpb, ped/bikes		1.00	1.00		1.00						1.00	
Frt		1.00	0.85		1.00						1.00	
Flt Protected		1.00	1.00		1.00						0.96	
Satd. Flow (prot)		2869	1123		2861						1254	
Flt Permitted		1.00	1.00		0.89						0.96	
Satd. Flow (perm)		2869	1123		2545						1254	
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	1200	6	20	586	0	0	0	0	133	22	3
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	1200	6	0	606	0	0	0	0	0	157	0
Confl. Peds. (#/hr)	7		9	9		7	5					5
Confl. Bikes (#/hr)			6			1			1			4
Heavy Vehicles (%)	2%	2%	10%	5%	4%	2%	0%	0%	0%	2%	2%	2%
Bus Blockages (#/hr)	0	0	7	0	0	0	0	0	0	0	0	0
Parking (#/hr)					0					0	0	0
Turn Type		NA	Perm	Perm	NA					Split	NA	
Protected Phases		6			2					4	4	
Permitted Phases			6	2								
Actuated Green, G (s)		82.0	82.0		82.0						23.0	
Effective Green, g (s)		84.0	84.0		84.0						25.0	
Actuated g/C Ratio		0.70	0.70		0.70						0.21	
Clearance Time (s)		6.0	6.0		6.0						6.0	
Lane Grp Cap (vph)		2008	786		1781						261	
v/s Ratio Prot		c0.42									c0.13	
v/s Ratio Perm			0.01		0.24							
v/c Ratio		0.60	0.01		0.34						0.60	
Uniform Delay, d1		9.3	5.4		7.1						43.0	
Progression Factor		1.00	1.00		0.55						1.00	
Incremental Delay, d2		1.3	0.0		0.5						9.9	
Delay (s)		10.6	5.4		4.4						52.9	
Level of Service		B	A		A						D	
Approach Delay (s)		10.6			4.4			0.0			52.9	
Approach LOS		B			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			12.1		HCM 2000 Level of Service				B			
HCM 2000 Volume to Capacity ratio			0.59									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)				10.0			
Intersection Capacity Utilization			58.2%		ICU Level of Service				B			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

2: University Ave NW & Wesley Cir NW

Total Future 2029

Timing Plan: AM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰					↱
Traffic Volume (veh/h)	19	16	0	0	0	22
Future Volume (Veh/h)	19	16	0	0	0	22
Sign Control	Free			Free	Yield	
Grade	5%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	22	19	0	0	0	26
Pedestrians					8	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			49		40	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			49		40	40
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	97
cM capacity (veh/h)			1549		967	1026
Direction, Lane #	EB 1	NB 1				
Volume Total	41	26				
Volume Left	0	0				
Volume Right	19	26				
cSH	1700	1026				
Volume to Capacity	0.02	0.03				
Queue Length 95th (ft)	0	2				
Control Delay (s)	0.0	8.6				
Lane LOS		A				
Approach Delay (s)	0.0	8.6				
Approach LOS		A				
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization			15.7%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

3: Wesley Cir NW & Massachusetts Ave NW

Total Future 2029
Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1315	0	0	598	42	2	3	36	0	0	0
Future Volume (Veh/h)	5	1315	0	0	598	42	2	3	36	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			-7%			5%			0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	5	1328	0	0	604	42	2	3	36	0	0	0
Pedestrians					1			5			6	
Lane Width (ft)					12.0			12.0			0.0	
Walking Speed (ft/s)					4.0			4.0			4.0	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (ft)	232			230								
pX, platoon unblocked				0.79			0.79	0.79	0.79	0.79	0.79	
vC, conflicting volume	652			1333			1645	1995	670	1344	1974	329
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	652			896			1290	1732	59	909	1705	329
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 %	99			100			98	96	95	100	100	100
cM capacity (veh/h)	930			594			94	68	784	167	71	667
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1							
Volume Total	448	885	403	243	41							
Volume Left	5	0	0	0	2							
Volume Right	0	0	0	42	36							
cSH	930	1700	1700	1700	369							
Volume to Capacity	0.01	0.52	0.24	0.14	0.11							
Queue Length 95th (ft)	0	0	0	0	9							
Control Delay (s)	0.2	0.0	0.0	0.0	16.0							
Lane LOS	A				C							
Approach Delay (s)	0.1		0.0		16.0							
Approach LOS					C							
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			54.6%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

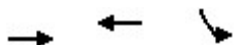
4: University Ave NW & Sedgwick St NW/WTS Dwy

Total Future 2029
Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	0	2	0	0	0	1	25	0	1	16	0
Future Volume (Veh/h)	7	0	2	0	0	0	1	25	0	1	16	0
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	8	0	2	0	0	0	1	29	0	1	18	0
Pedestrians	4			5			1					
Lane Width (ft)	10.0			10.0			10.0					
Walking Speed (ft/s)	4.0			4.0			4.0					
Percent Blockage	0			0			0					
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	55	60	23	59	60	34	22				34	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	55	60	23	59	60	34	22				34	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	99	100	100	100	100	100	100				100	
cM capacity (veh/h)	935	825	1050	926	825	1036	1589				1572	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	10	0	30	19								
Volume Left	8	0	1	1								
Volume Right	2	0	0	0								
cSH	956	1700	1589	1572								
Volume to Capacity	0.01	0.00	0.00	0.00								
Queue Length 95th (ft)	1	0	0	0								
Control Delay (s)	8.8	0.0	0.2	0.4								
Lane LOS	A	A	A	A								
Approach Delay (s)	8.8	0.0	0.2	0.4								
Approach LOS	A	A										
Intersection Summary												
Average Delay				1.7								
Intersection Capacity Utilization				15.2%	ICU Level of Service				A			
Analysis Period (min)				15								

Queues
5: Massachusetts Ave NW & 45th St NW

Total Future 2029
Timing Plan: AM Peak



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	1366	658	25
v/c Ratio	0.60	0.47	0.02
Control Delay	6.7	6.4	5.3
Queue Delay	0.0	0.0	0.0
Total Delay	6.7	6.4	5.3
Queue Length 50th (ft)	114	146	4
Queue Length 95th (ft)	128	179	14
Internal Link Dist (ft)	150	134	207
Turn Bay Length (ft)			
Base Capacity (vph)	2261	1397	1274
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.60	0.47	0.02
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

5: Massachusetts Ave NW & 45th St NW

Total Future 2029
Timing Plan: AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑		↑↑	
Traffic Volume (vph)	57	1295	632	20	17	8
Future Volume (vph)	57	1295	632	20	17	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		4%	-7%		0%	
Total Lost time (s)		9.0	9.0		9.0	
Lane Util. Factor		0.95	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	1.00		0.96	
Flt Protected		1.00	1.00		0.97	
Satd. Flow (prot)		3230	1757		1600	
Flt Permitted		0.88	1.00		0.97	
Satd. Flow (perm)		2846	1757		1600	
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	58	1308	638	20	17	8
RTOR Reduction (vph)	0	0	1	0	2	0
Lane Group Flow (vph)	0	1366	657	0	23	0
Confl. Peds. (#/hr)	9			9	1	5
Confl. Bikes (#/hr)				4		7
Heavy Vehicles (%)	2%	2%	4%	2%	2%	2%
Turn Type	Perm	NA	NA		D.Pm	
Protected Phases		2!	2!			
Permitted Phases	2!				2!	
Actuated Green, G (s)		88.2	88.2		88.2	
Effective Green, g (s)		90.2	90.2		90.2	
Actuated g/C Ratio		0.75	0.75		0.75	
Clearance Time (s)		11.0	11.0		11.0	
Vehicle Extension (s)		1.0	1.0		1.0	
Lane Grp Cap (vph)		2139	1320		1202	
v/s Ratio Prot			0.37			
v/s Ratio Perm		c0.48			0.01	
v/c Ratio		0.64	0.50		0.02	
Uniform Delay, d1		7.1	5.9		3.8	
Progression Factor		0.59	0.67		1.00	
Incremental Delay, d2		1.2	1.0		0.0	
Delay (s)		5.4	5.0		3.8	
Level of Service		A	A		A	
Approach Delay (s)		5.4	5.0		3.8	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			5.3		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.54			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	13.0
Intersection Capacity Utilization			101.0%		ICU Level of Service	G
Analysis Period (min)			15			
! Phase conflict between lane groups.						
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis 6: WTS Dwy & Massachusetts Ave NW

Total Future 2029
Timing Plan: AM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↖		↗
Traffic Volume (veh/h)	1300	12	6	652	0	8
Future Volume (Veh/h)	1300	12	6	652	0	8
Sign Control	Free			Free	Stop	
Grade	4%			-7%	0%	
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	1313	12	6	659	0	8
Pedestrians					26	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					2	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)	214			651		
pX, platoon unblocked			0.82		0.91	0.82
vC, conflicting volume			1351		2016	688
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			988		1323	179
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	99
cM capacity (veh/h)			560		130	670
Direction, Lane #	EB 1	EB 2	WB 1	NB 1		
Volume Total	875	450	665	8		
Volume Left	0	0	6	0		
Volume Right	0	12	0	8		
cSH	1700	1700	560	670		
Volume to Capacity	0.51	0.26	0.01	0.01		
Queue Length 95th (ft)	0	0	1	1		
Control Delay (s)	0.0	0.0	0.3	10.4		
Lane LOS			A	B		
Approach Delay (s)	0.0		0.3	10.4		
Approach LOS				B		
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			46.3%	ICU Level of Service		A
Analysis Period (min)			15			

Queues

7: Glover Gate/Katzen Arts Center Dwy & Massachusetts Ave NW

Total Future 2029

Timing Plan: AM Peak



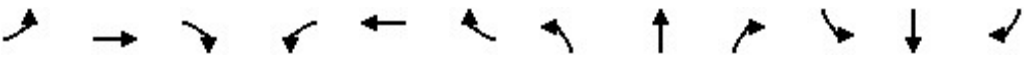
Lane Group	EBT	WBT	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	1357	680	34	25	14	16
v/c Ratio	0.67	0.65	0.04	0.16	0.08	0.09
Control Delay	4.9	10.8	0.3	49.0	0.8	39.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	10.8	0.3	49.0	0.8	39.1
Queue Length 50th (ft)	45	220	0	17	0	8
Queue Length 95th (ft)	51	334	2	45	0	30
Internal Link Dist (ft)	571	391		281		141
Turn Bay Length (ft)						
Base Capacity (vph)	2020	1050	920	154	186	182
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.65	0.04	0.16	0.08	0.09
Intersection Summary						

HCM Signalized Intersection Capacity Analysis

7: Glover Gate/Katzen Arts Center Dwy & Massachusetts Ave NW

Total Future 2029

Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↑	↗		↗	↗		↔	
Traffic Volume (vph)	16	1238	63	30	630	33	18	6	14	3	9	4
Future Volume (vph)	16	1238	63	30	630	33	18	6	14	3	9	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		4%			-4%			-1%			5%	
Total Lost time (s)		4.0			4.0	4.0		4.0	4.0		4.0	
Lane Util. Factor		0.95			1.00	1.00		1.00	1.00		1.00	
Frpb, ped/bikes		1.00			1.00	0.90		1.00	0.79		0.98	
Flpb, ped/bikes		1.00			1.00	1.00		0.96	1.00		0.96	
Frt		0.99			1.00	0.85		1.00	0.85		0.97	
Flt Protected		1.00			1.00	1.00		0.96	1.00		0.99	
Satd. Flow (prot)		2847			1572	1206		1366	984		1380	
Flt Permitted		0.94			0.89	1.00		0.82	1.00		0.96	
Satd. Flow (perm)		2689			1401	1206		1157	984		1340	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	16	1276	65	31	649	34	19	6	14	3	9	4
RTOR Reduction (vph)	0	3	0	0	0	9	0	0	12	0	3	0
Lane Group Flow (vph)	0	1354	0	0	680	26	0	25	2	0	13	0
Confl. Peds. (#/hr)	17		17	17		17	14		77	77		14
Confl. Bikes (#/hr)			11			2						
Heavy Vehicles (%)	2%	3%	5%	10%	3%	2%	10%	2%	10%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	2	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			8			4	
Permitted Phases	6			2		2	8		8	4		
Actuated Green, G (s)		88.0			88.0	88.0		14.0	14.0		14.0	
Effective Green, g (s)		90.0			90.0	90.0		16.0	16.0		16.0	
Actuated g/C Ratio		0.75			0.75	0.75		0.13	0.13		0.13	
Clearance Time (s)		6.0			6.0	6.0		6.0	6.0		6.0	
Lane Grp Cap (vph)		2016			1050	904		154	131		178	
v/s Ratio Prot												
v/s Ratio Perm		c0.50			0.49	0.02		c0.02	0.00		0.01	
v/c Ratio		0.67			0.65	0.03		0.16	0.01		0.07	
Uniform Delay, d1		7.6			7.3	3.8		46.1	45.2		45.5	
Progression Factor		0.45			1.00	1.00		1.00	1.00		1.00	
Incremental Delay, d2		1.5			3.1	0.1		2.3	0.2		0.8	
Delay (s)		4.9			10.4	3.9		48.3	45.4		46.3	
Level of Service		A			B	A		D	D		D	
Approach Delay (s)		4.9			10.1			47.3			46.3	
Approach LOS		A			B			D			D	
Intersection Summary												
HCM 2000 Control Delay			7.7				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			82.3%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Total Future 2029

Timing Plan: PM Peak



Lane Group	EBT	EBR	WBT	SBT
Lane Group Flow (vph)	960	3	1141	110
v/c Ratio	0.45	0.00	0.62	0.52
Control Delay	6.8	4.0	3.6	55.2
Queue Delay	0.0	0.0	0.1	0.0
Total Delay	6.8	4.0	3.7	55.2
Queue Length 50th (ft)	131	1	2	78
Queue Length 95th (ft)	166	3	1	140
Internal Link Dist (ft)	1432		152	19
Turn Bay Length (ft)		90		
Base Capacity (vph)	2127	892	1831	210
Starvation Cap Reductn	0	0	51	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.45	0.00	0.64	0.52
Intersection Summary				

HCM Signalized Intersection Capacity Analysis

1: Tilden St NW/46th St NW & Massachusetts Ave NW

Total Future 2029
Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑						↑↓	
Traffic Volume (vph)	0	893	3	48	1013	0	0	0	0	79	21	2
Future Volume (vph)	0	893	3	48	1013	0	0	0	0	79	21	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	12	12	12	9	9	9
Grade (%)		7%			-7%			0%			7%	
Total Lost time (s)		4.0	4.0		4.0						4.0	
Lane Util. Factor		0.95	1.00		0.95						1.00	
Frpb, ped/bikes		1.00	0.96		1.00						1.00	
Flpb, ped/bikes		1.00	1.00		1.00						1.00	
Frt		1.00	0.85		1.00						1.00	
Flt Protected		1.00	1.00		1.00						0.96	
Satd. Flow (prot)		2869	1203		2916						1258	
Flt Permitted		1.00	1.00		0.84						0.96	
Satd. Flow (perm)		2869	1203		2470						1258	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	960	3	52	1089	0	0	0	0	85	23	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	960	3	0	1141	0	0	0	0	0	109	0
Confl. Peds. (#/hr)	16		22	22		16	3					3
Confl. Bikes (#/hr)			3			11			1			2
Bus Blockages (#/hr)	0	0	7	0	0	0	0	0	0	0	0	0
Parking (#/hr)					0					0	0	0
Turn Type		NA	Perm	Perm	NA					Split	NA	
Protected Phases		6			2					4	4	
Permitted Phases			6	2								
Actuated Green, G (s)		87.0	87.0		87.0						18.0	
Effective Green, g (s)		89.0	89.0		89.0						20.0	
Actuated g/C Ratio		0.74	0.74		0.74						0.17	
Clearance Time (s)		6.0	6.0		6.0						6.0	
Lane Grp Cap (vph)		2127	892		1831						209	
v/s Ratio Prot		0.33									c0.09	
v/s Ratio Perm			0.00		c0.46							
v/c Ratio		0.45	0.00		0.62						0.52	
Uniform Delay, d1		6.0	4.0		7.4						45.6	
Progression Factor		1.00	1.00		0.28						1.00	
Incremental Delay, d2		0.7	0.0		1.4						9.0	
Delay (s)		6.7	4.0		3.6						54.7	
Level of Service		A	A		A						D	
Approach Delay (s)		6.7			3.6			0.0			54.7	
Approach LOS		A			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			7.5		HCM 2000 Level of Service					A		
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					10.0		
Intersection Capacity Utilization			85.1%		ICU Level of Service					E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

2: University Ave NW & Wesley Cir NW

Total Future 2029
Timing Plan: PM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰					↱
Traffic Volume (veh/h)	17	24	0	0	0	24
Future Volume (Veh/h)	17	24	0	0	0	24
Sign Control	Free			Free	Yield	
Grade	5%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	20	28	0	0	0	28
Pedestrians					3	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			51		37	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			51		37	37
tC, single (s)			4.1		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			100		100	97
cM capacity (veh/h)			1552		973	1016
Direction, Lane #	EB 1	NB 1				
Volume Total	48	28				
Volume Left	0	0				
Volume Right	28	28				
cSH	1700	1016				
Volume to Capacity	0.03	0.03				
Queue Length 95th (ft)	0	2				
Control Delay (s)	0.0	8.6				
Lane LOS		A				
Approach Delay (s)	0.0	8.6				
Approach LOS		A				
Intersection Summary						
Average Delay		3.2				
Intersection Capacity Utilization		14.3%	ICU Level of Service		A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

3: Wesley Cir NW & Massachusetts Ave NW

Total Future 2029

Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	967	0	0	1063	88	0	7	34	0	0	0
Future Volume (Veh/h)	1	967	0	0	1063	88	0	7	34	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			-7%			5%			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)	1	1051	0	0	1155	96	0	8	37	0	0	0
Pedestrians								22			14	
Lane Width (ft)								12.0			0.0	
Walking Speed (ft/s)								4.0			4.0	
Percent Blockage								2			0	
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		232			230							
pX, platoon unblocked	0.85			0.88			0.91	0.91	0.88	0.91	0.91	0.85
vC, conflicting volume	1265			1073			1652	2340	548	1786	2292	640
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	954			811			923	1680	214	1069	1627	217
tC, single (s)	4.1			4.1			7.5	6.5	7.0	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			100			100	90	94	100	100	100
cM capacity (veh/h)	607			701			197	83	673	137	90	668
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1							
Volume Total	351	701	770	481	45							
Volume Left	1	0	0	0	0							
Volume Right	0	0	0	96	37							
cSH	607	1700	1700	1700	297							
Volume to Capacity	0.00	0.41	0.45	0.28	0.15							
Queue Length 95th (ft)	0	0	0	0	13							
Control Delay (s)	0.1	0.0	0.0	0.0	19.3							
Lane LOS	A				C							
Approach Delay (s)	0.0		0.0		19.3							
Approach LOS					C							
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			45.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: University Ave NW & Sedgwick St NW/WTS Dwy

Total Future 2029
Timing Plan: PM Peak

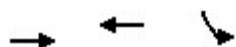
													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	5	1	3	0	0	0	2	17	0	0	17	5	
Future Volume (Veh/h)	5	1	3	0	0	0	2	17	0	0	17	5	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	
Hourly flow rate (vph)	6	1	4	0	0	0	2	20	0	0	20	6	
Pedestrians					3								2
Lane Width (ft)					10.0								10.0
Walking Speed (ft/s)					4.0								4.0
Percent Blockage					0								0
Right turn flare (veh)													
Median type							None						None
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	49	50	23	54	53	25	26				23		
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	49	50	23	54	53	25	26				23		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1		
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2		
p0 queue free %	99	100	100	100	100	100	100				100		
cM capacity (veh/h)	947	839	1054	935	835	1047	1588				1589		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	11	0	22	26									
Volume Left	6	0	2	0									
Volume Right	4	0	0	6									
cSH	972	1700	1588	1589									
Volume to Capacity	0.01	0.00	0.00	0.00									
Queue Length 95th (ft)	1	0	0	0									
Control Delay (s)	8.7	0.0	0.7	0.0									
Lane LOS	A	A	A										
Approach Delay (s)	8.7	0.0	0.7	0.0									
Approach LOS	A	A											
Intersection Summary													
Average Delay				1.9									
Intersection Capacity Utilization				14.9%	ICU Level of Service				A				
Analysis Period (min)				15									

Queues

5: Massachusetts Ave NW & 45th St NW

Total Future 2029

Timing Plan: PM Peak



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	1099	1289	46
v/c Ratio	0.47	0.48	0.04
Control Delay	5.7	4.0	4.0
Queue Delay	0.0	0.0	0.0
Total Delay	5.7	4.0	4.0
Queue Length 50th (ft)	131	95	5
Queue Length 95th (ft)	151	108	18
Internal Link Dist (ft)	150	134	207
Turn Bay Length (ft)			
Base Capacity (vph)	2331	2698	1240
Starvation Cap Reductn	104	0	0
Spillback Cap Reductn	0	18	8
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.49	0.48	0.04
Intersection Summary			

HCM Signalized Intersection Capacity Analysis

5: Massachusetts Ave NW & 45th St NW

Total Future 2029
Timing Plan: PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↑↑	
Traffic Volume (vph)	17	983	1129	44	18	24
Future Volume (vph)	17	983	1129	44	18	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		4%	-7%		0%	
Total Lost time (s)		9.0	9.0		9.0	
Lane Util. Factor		0.95	0.95		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.92	
Flt Protected		1.00	1.00		0.98	
Satd. Flow (prot)		3234	3394		1554	
Flt Permitted		0.91	1.00		0.98	
Satd. Flow (perm)		2934	3394		1554	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	1080	1241	48	20	26
RTOR Reduction (vph)	0	0	2	0	6	0
Lane Group Flow (vph)	0	1099	1287	0	40	0
Confl. Peds. (#/hr)	28			28	1	19
Confl. Bikes (#/hr)				15		
Turn Type	Perm	NA	NA		D.Pm	
Protected Phases		2!	2!			
Permitted Phases	2!				2!	
Actuated Green, G (s)		88.2	88.2		88.2	
Effective Green, g (s)		90.2	90.2		90.2	
Actuated g/C Ratio		0.75	0.75		0.75	
Clearance Time (s)		11.0	11.0		11.0	
Vehicle Extension (s)		1.0	1.0		1.0	
Lane Grp Cap (vph)		2205	2551		1168	
v/s Ratio Prot			c0.38			
v/s Ratio Perm		0.37			0.03	
v/c Ratio		0.50	0.50		0.03	
Uniform Delay, d1		5.9	6.0		3.8	
Progression Factor		0.64	0.45		1.00	
Incremental Delay, d2		0.7	0.5		0.1	
Delay (s)		4.5	3.2		3.9	
Level of Service		A	A		A	
Approach Delay (s)		4.5	3.2		3.9	
Approach LOS		A	A		A	
Intersection Summary						
HCM 2000 Control Delay			3.8		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.43			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	13.0
Intersection Capacity Utilization			62.6%		ICU Level of Service	B
Analysis Period (min)			15			
! Phase conflict between lane groups.						
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis 6: WTS Dwy & Massachusetts Ave NW

Total Future 2029
Timing Plan: PM Peak

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↱↱		↱
Traffic Volume (veh/h)	992	10	22	1174	0	20
Future Volume (Veh/h)	992	10	22	1174	0	20
Sign Control	Free			Free	Stop	
Grade	4%			-7%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	1090	11	24	1290	0	22
Pedestrians					36	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					3	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	214			651		
pX, platoon unblocked			0.25		0.35	0.25
vC, conflicting volume			1137		1824	1132
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			63		389	41
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		100	91
cM capacity (veh/h)			379		186	251
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1101	454	860	22		
Volume Left	0	24	0	0		
Volume Right	11	0	0	22		
cSH	1700	379	1700	251		
Volume to Capacity	0.65	0.06	0.51	0.09		
Queue Length 95th (ft)	0	5	0	7		
Control Delay (s)	0.0	2.0	0.0	20.7		
Lane LOS		A		C		
Approach Delay (s)	0.0	0.7		20.7		
Approach LOS				C		
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			62.8%	ICU Level of Service		B
Analysis Period (min)			15			

Queues

7: Glover Gate/Katzen Arts Center Dwy & Massachusetts Ave NW

Total Future 2029

Timing Plan: PM Peak



Lane Group	EBT	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	1164	1249	93	111	54
v/c Ratio	0.61	0.67	0.51	0.47	0.27
Control Delay	8.3	11.8	55.6	15.0	33.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	8.3	11.8	55.6	15.0	33.0
Queue Length 50th (ft)	112	250	66	0	22
Queue Length 95th (ft)	126	311	122	54	61
Internal Link Dist (ft)	571	391	281		141
Turn Bay Length (ft)					
Base Capacity (vph)	1921	1876	184	236	198
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.67	0.51	0.47	0.27
Intersection Summary					

HCM Signalized Intersection Capacity Analysis

7: Glover Gate/Katzen Arts Center Dwy & Massachusetts Ave NW

Total Future 2029
Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	974	54	31	1059	21	76	7	99	21	8	19
Future Volume (vph)	8	974	54	31	1059	21	76	7	99	21	8	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	10	10	10	10	10	10	10	10	10	10	10
Grade (%)		4%			-4%			-1%			5%	
Total Lost time (s)		4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	
Frpb, ped/bikes		0.99			1.00			1.00	0.66		0.96	
Flpb, ped/bikes		1.00			1.00			0.92	1.00		0.87	
Frt		0.99			1.00			1.00	0.85		0.95	
Flt Protected		1.00			1.00			0.96	1.00		0.98	
Satd. Flow (prot)		2874			3015			1386	829		1184	
Flt Permitted		0.94			0.88			0.73	1.00		0.86	
Satd. Flow (perm)		2709			2647			1055	829		1037	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	9	1094	61	35	1190	24	85	8	111	24	9	21
RTOR Reduction (vph)	0	3	0	0	1	0	0	0	92	0	17	0
Lane Group Flow (vph)	0	1161	0	0	1248	0	0	93	19	0	37	0
Confl. Peds. (#/hr)	10		19	19		10	39		190	190		39
Confl. Bikes (#/hr)			2			5			1			
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	8%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	2	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		6			2			8			4	
Permitted Phases	6			2			8		8	4		
Actuated Green, G (s)		83.0			83.0			19.0	19.0		19.0	
Effective Green, g (s)		85.0			85.0			21.0	21.0		21.0	
Actuated g/C Ratio		0.71			0.71			0.18	0.18		0.18	
Clearance Time (s)		6.0			6.0			6.0	6.0		6.0	
Lane Grp Cap (vph)		1918			1874			184	145		181	
v/s Ratio Prot												
v/s Ratio Perm		0.43			c0.47			c0.09	0.02		0.04	
v/c Ratio		0.61			0.67			0.51	0.13		0.20	
Uniform Delay, d1		8.9			9.7			44.8	41.8		42.3	
Progression Factor		0.77			1.00			1.00	1.00		1.00	
Incremental Delay, d2		1.3			1.9			9.6	1.9		2.5	
Delay (s)		8.2			11.6			54.4	43.7		44.8	
Level of Service		A			B			D	D		D	
Approach Delay (s)		8.2			11.6			48.6			44.8	
Approach LOS		A			B			D			D	
Intersection Summary												
HCM 2000 Control Delay			13.6				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			120.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			76.5%				ICU Level of Service			D		
Analysis Period (min)			15									
c Critical Lane Group												